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The Arctic in the XXI century

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Constructing the "New" Arctic: The Future of the Circumpolar North in a Changing Global Order

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ABSTRACT. *Like all spatially delimited regions in international society, the Arctic is socially constructed. Political and economic considerations play prominent roles as determinants of the region's boundaries, the identity of those states regarded as Arctic states, and the nature of the interactions between the Arctic and the outside world. From this perspective the recent history of the Arctic divides into two distinct periods: the late 1980s through 2007 and 2007 to the present. As the cold war faded, the Arctic became a peripheral region of declining importance in global political calculations. No one challenged the dominance of the eight Arctic states in regional affairs, and the Arctic Council focused on regional concerns relating to environmental protection and sustainable development. Today, by contrast, the 'new' Arctic is a focus of intense global interest, largely because climate change is proceeding more rapidly in this region than anywhere else on Earth with global consequences and because the increasing accessibility of the Arctic's natural resources has generated enhanced interest on the part of outside actors. As a result, Arctic issues have merged into global issues, making the region a prominent arena for the interplay of geopolitical forces. Cooperative arrangements established during the first period (e.g. the Arctic Council) may require adjustment to operate effectively in the 'new' Arctic. Treated as a case study, the Arctic story provides an illuminating lens through which to analyze the forces that shape thinking about the*

nature of regions in international society and the role of cooperative arrangements at the regional level.

KEY WORDS: *Arctic Council, Arctic 5, Arctic 8, non-Arctic states, Arctic region, diplomacy, foreign policy*

Introduction

The Arctic is socially constructed, an important feature it shares with all other spatially delimited segments of the planet that practitioners and analysts treat as international regions or as distinct subsystems of the overarching Earth system. What I mean by this is that there is no objectively or ontologically correct way to delineate the boundaries of the Arctic or to differentiate between what is Arctic and what is non-Arctic, providing in the process an authoritative means for distinguishing between those states that are Arctic states and others that are non-Arctic states. It follows not only that we can expect to encounter disagreements among interested parties about the proper way to delimit the Arctic but also and crucially for present purposes that we should not be surprised to encounter shifts in the thinking of influential actors regarding such matters over the course of time.

Compared with regions like the Middle East, the Arctic is an easy case when it comes to the identification of regional boundaries. There is no real argument about the proposition that the Arctic's northern boundary is the North Pole, the northernmost point on the planet where the meridians of longitude converge to a single point. Nor is there much debate about the region's eastern and western boundaries. We are generally comfortable treating the Arctic as a circumpolar region, despite the fact that some find it useful in particular contexts to distinguish between the eastern Arctic and the western Arctic or to focus on particular parts of the Arctic, such as Fenno-Scandia or what has become known as the Barents Euro-Arctic Region. Thus, the Arctic forms a planetary cap with its peak located at 90^0N and its southern boundary located at some unspecified and possibly variable lower latitude.

This is the easy part. But at this point, difficulties begin to arise. How can or should we determine the location of the Arctic's southern boundary? What terrestrial and marine areas constitute components of the Arctic region? How should we distinguish between Arctic states and non-Arctic states? What forces determine the answers to these questions at any given time, and are the answers likely to shift during the coming years? What consequences will different answers to these questions have in terms of policy?

I explore these issues in this article, paying particular attention to two formative periods in the recent history of the Arctic. First, I consider the immediate aftermath of the cold war and the collapse of the Soviet Union, a period featuring the establishment of the Arctic Environmental Protection Strategy (AEPS) in 1991 followed by the Arctic Council (AC) in 1996. Second, I examine the period following the initial collapse of Arctic sea ice in 2007, a period marked by the rise of new initiatives regarding Arctic cooperation (e.g. the Arctic 5's Ilulissat Declaration, the International Maritime Organization's Polar Code, the 5+5 agreement on Central Arctic Ocean fisheries, the increasing prominence of bilateral initiatives) coupled with a concerted and ongoing effort to maintain the role of the Arctic Council as the preeminent institutional forum for addressing the international relations of the Arctic. In the process, I seek to shed light not only on the rise of what many have taken to calling the 'new' Arctic but also, more generally, on the complex political dynamics that shape the evolution of international regions.

The post-cold war Arctic

Few leading actors have established traditions of treating the Arctic as a distinct international region in the organizational arrangements they have developed to deal with issues involving cross-border or international relations. For example, the US Department of State, which has longstanding bureaus dealing with African Affairs, East Asian and Pacific Affairs, European and Eurasian Affairs, and Near Eastern Affairs, assigns polar (both Arctic and Antarctic) affairs to the Bureau of Oceans, International Environmental and Scientific Affairs. A somewhat similar situation exists in the case of the Foreign Ministry of Russia where the Second European Department is responsible for handling Arctic issues that have international significance. Nor are these cases exceptional. Organizational arrangements in many states, which feature the assignment of issues to regional bureaus, routinely treat Arctic issues in a manner suggesting that they do not regard the Arctic as a distinct international region.[1]

In the 1980s, nevertheless, significant shifts in perspectives relating to the Arctic began to surface. A number of analysts began to develop a narrative focusing on the Arctic as a distinctive region with a policy agenda of its own. Gathering input from many sources pertaining to military, industrial, Indigenous, and environmental issues, for example, I published an article in the winter 1985/1986 issue of the prominent American journal *Foreign Policy* entitled "The Age of the Arctic" [*Young* 1985/1986; *Osherenko, Young* 1989]. At the time, some readers adopted the understandable view that this line of thinking reflected a more or less severe case of "localitis." But the proposition that it makes sense to treat the Arctic as a distinct region began to catch on in the following years.

Of particular importance, Mikhail Gorbachev, then both president of the Soviet Union and general secretary of the Communist Party of the Soviet Union, delivered a speech on 1 October 1987 marking the award to the City of Murmansk of the Order of Lenin and the Gold Star in which he called for treating the Arctic as a "zone of peace" and proposed a series of cooperative Arctic initiatives dealing with arms control, shipping, Indigenous peoples' issues, environmental protection, and science [*Gorbachev* 1987]. Simultaneously, the MacArthur Foundation, an influential American funding organization with a strong presence in Russia, announced the award of a major grant to support the creation and operation of what we called the Working Group on Arctic International Relations. This group, including both practitioners and analysts from the eight Arctic states, met regularly for a number of years, delving into issues of environmental protection and sustainable development in the Arctic and building a network of personal connections in the process [*Young* 1996]. Brian Mulroney, then Canada's Prime Minister, took another step in November 1989 with a speech in Leningrad (now St. Petersburg) promoting the idea that conditions were favorable for new initiatives designed to promote international cooperation in the Arctic.

These developments set the stage for the launching in the later part of 1989 of what we now know as the Finnish Initiative, a diplomatic advance that triggered a process eventuating in the signing on 14 June 1991 in Rovaniemi, Finland of a

1 Of course, other agencies deal with internal matters in the individual Arctic states. In Russia, for example, there is a State Commission on the Arctic, and plans are underway to expand the remit of the Ministry of the Far East to create a Ministry of the Far East and Arctic. Various federal agencies, mostly located within the Department of the Interior, handle issues relating to public lands in Alaska. Canada has a separate department responsible for northern affairs.

Ministerial Declaration on the Protection of the Arctic Environment coupled with the release of the Arctic Environmental Protection Strategy [*Young* 1998]. But this simple narrative obscures the fact that there were significant differences among the key players regarding both the delimitation of the Arctic and the appropriateness of treating the Arctic as a distinct international region in policy terms. Partly, this was a matter of differences regarding the identification of Arctic states and as a result the criteria for distinguishing between Arctic states and non-Arctic states. In part, it reflected substantial differences among the Arctic states regarding those parts of their realms to designate as Arctic. Both issues deserve additional commentary.

Many Soviet policymakers had long held the view that the term Arctic states should refer to the five states with coastlines bordering on the Arctic Ocean proper (Canada, Denmark, Norway, the Soviet Union, and the United States). This is the origin of what we often call the Arctic 5, a grouping of states that has taken the initiative on several occasions in the recent history of international cooperation in the Arctic. Yet Finland, a neutral state with a postwar history of well-crafted efforts to find safe and constructive pathways between the protagonists in the cold war, seized the initiative in 1989 launching the diplomatic process that led to the creation of the AEPS. It would have been awkward politically for the Soviet Union to spurn this initiative, especially in the wake of Gorbachev's call for Arctic cooperation. In any case, it turned out that the Soviet Union had a good deal to gain from engaging the western states in an effort to address a number of severe environmental problems in northwestern Russia (e.g. radioactive contamination and industrial pollution on the Kola Peninsula). A positive response to the Finnish Initiative made it more or less impossible to exclude Sweden, the other neutral state in northern Europe. For its part, Norway responded skeptically at first. But the Norwegians took an interest early on in promoting high quality environmental monitoring and assessment, an interest that soon morphed into strong support for the creation of what became the Arctic Monitoring and Assessment Programme (AMAP) as a key element of the AEPS. On the strength of Mulroney's Leningrad speech, Canada found it easy to support the Finnish Initiative, though the Canadians soon emerged as strong supporters of the expansion of the remit of Arctic cooperation to include sustainable development as distinct from environmental protection. The US, viewing international affairs in global terms, took a limited interest in these developments at the outset. Still, American policymakers saw a chance to endow the initiative with a western flavor, supporting the inclusion of Iceland, so that five of the eight participating states would be NATO members. Thus was born the idea of the Arctic 8, a configuration emerging more from political considerations relating to the Finnish Initiative than from any profound vision of the Arctic as a distinct international region.

Almost by default, this configuration carried over into the negotiations launched by the Canadians that culminated on 19 September 1996 in the adoption of the Ottawa Declaration on the Creation of the Arctic Council as the successor to the Arctic Environmental Protection Strategy [*English* 2013]. In terms of participation, the most innovative feature of this transition was the formalization of the status of Indigenous peoples' organizations in the workings of the council. While the eight Arctic states are the members of the Arctic Council, six organizations representing Indigenous peoples now have the status of Permanent Participants and participate actively in virtually all aspects of the council's activities.

A striking feature of the development of the Arctic as an international region is that only Iceland among the Arctic 8 is located entirely within the region. A glance at Maps 1 and 2 will suffice to demonstrate that there is considerable variation in the approaches the eight members of the Arctic Council have adopted when it comes to delineating their Arctic realms. Canada and Russia are clearly the preeminent Arctic states measured in terms of the extent of the their territory treated as Arctic. For its part, Canada was content to draw a line at 60^{0}N, the boundary between the western provinces and the northern territories, with a deviation to 56^{0}N to include Nouveau Quebec (Nord-du-Quebec). But 60^{0}N runs close to Oslo, Stockholm, and Helsinki, a boundary that none of the Nordic states found appropriate in identifying areas for inclusion in the Arctic region. They preferred an approach designating their northern counties as the Arctic sectors of their national domains – Nordlund, Troms, and Finnmark in Norway; Norbotten and Västerbotten in Sweden, and Lapland in Finland. Among other things, this has given rise to a discussion concerning cultural and historical differences between the European Arctic (sometimes known as Fenno-Scandia) and the North American Arctic (including much of Alaska as well as Canada's northern territories (now including Nunavut, which did not exist as a separate territory in 1996). Some observers go so far as to assert that the idea of the Arctic as a distinct region is an artificial construct [*Keskitalo* 2004].

The approaches that the United States and the Russian Federation have taken in designating their respective segments of the Arctic suggest several additional observations of interest. In the Arctic Research and Policy Act of 1984, the US defined the American Arctic formally as the area located north of the Porcupine, Yukon, and Kuskokwim Rivers (the PYK line) together with the Aleutian Islands and the American sector of the Bering Sea [Arctic Research and Policy Act 1984]. There is little doubt that this approach to the delimitation of the American Arctic owes more to political considerations than to any relevant biophysical or socioeconomic considerations. Russian (and previously Soviet) policymakers, on the other hand, have often made a point of distinguishing between the Arctic and the North (sometimes referred to as the Subarctic). This distinction coincides roughly with the boundary between the treeless tundra and the forested taiga, though this has never been a particularly sharp line of demarcation in policy terms. Interestingly, the distribution of the land masses of the Northern Hemisphere is such that most of the area the Russian Federation now regards as Arctic lies north of the Arctic Circle [Ordinance of RF President 2017], while only the High Arctic in Canada and the northernmost segment of Alaska in the US are located north of circle. The effect of this geographical difference is to create a significant asymmetry between the North American Arctic and the Eurasian Arctic.

Denmark is an Arctic state solely by virtue of the fact that Greenland, the bulk of which lies north of the Arctic Circle and is often treated as High Arctic in biophysical terms, is part of the Kingdom of Denmark. Should Greenland become an independent state in the future (a development considered probable in some quarters), Denmark's status as an Arctic state would be difficult (perhaps impossible) to justify. The northernmost point of land in Iceland barely reaches the Arctic Circle. Nevertheless, Iceland is the only member of the Arctic Council whose territory lies wholly within the realm the council has delineated as it catchment area. The Faroe Islands, also part of the Kingdom of Denmark, are considered Arctic largely as a courtesy to Denmark, though it is fair to note that they do lie above 60^{0}N.

One observation emerging from this account is that the demarcation of the Arctic region embedded in both the structure and the practices of the AEPS and the AC is distinctly asymmetrical and in some respects sensitive to political considerations. Differences among the eight Arctic states regarding their treatment of the southern boundaries of the Arctic are particularly striking. Another observation is that statements on the part of British and Chinese policymakers to the effect that the United Kingdom enjoys "close proximity to the Arctic" and that China is a "near Arctic state" are not altogether far-fetched [Beyond the Ice 2018; China's Arctic Policy 2018]. No doubt these assertions are politically motivated and not intended to be taken too seriously. Still, it is worth noting that the Shetland Islands, the northernmost part of the United Kingdom, do lie above 60^0N, and that Manchuria, the northernmost segment of China, stretches as far as $50–55^0$N and includes significant areas in which permafrost is present.

In the years following the creation of the AEPS in 1991 and the AC in 1996, there was little debate about the delimitation of the Arctic as an international region. The end of the cold war and the collapse of the Soviet Union had the effect of shifting attention away from the role of the Arctic as a theater for the deployment for strategic weapons, though it is worth noting that the Arctic Ocean has never lost its significance as a zone of operation for nuclear-powered submarines carrying sea-launched ballistic missiles. Despite the activities of the AEPS and the AC, the foreign ministries of the Arctic states did not proceed to create bureaus of Arctic Affairs. Some have argued that the absence of more intense debates about the delimitation of the Arctic during this time is testimony to the fact that the Arctic was regarded as a political periphery or at least not a part of any of the central arenas of international affairs during the 1990s and early 2000s. According to this line of thinking, events occurring in the outside world might have major impacts on the Arctic, but events occurring in the Arctic were not likely to make a big difference beyond the confines of the Arctic. Be that as it may, the Arctic 8 proceeded to operate the Arctic Council as a "high level forum" to "provide a means for promoting cooperation, coordination and interaction among the Arctic states," an arrangement that fostered the development of a distinct policy agenda for the region [Declaration on the Establishment of the Arctic Council 1996].

The 'new' Arctic

Whatever the merits of this perspective, recent developments have brought about a sea change in thinking about the nature of the Arctic as an international region and its role in international society. A number of factors have contributed to this development. But two stand out as particularly important. The impacts of climate change are unfolding more rapidly in the Arctic than anywhere else on the planet, and the operation of feedback mechanisms means that what happens in the Arctic can be counted on to have profound effects extending far beyond the confines of the region itself [*Wadhams* 2017; *Serreze* 2018]. At the same time, and somewhat ironically, the collapse of sea ice in the Arctic and the prospect of increased access to the region's extensive stores of natural resources have triggered a remarkable upwelling of interest in the Arctic among economic and political commentators [*Borgerson* 2008; *Anderson* 2009; *Howard* 2009; *Sale, Potapov* 2010]. In both cases, current developments are drawing attention to the importance of the links between what goes on in the Arctic and the broader currents of global affairs [Arctic Matters 2015].

It is possible that this rising tide of interest in the Arctic will crest and begin to

recede during the coming years. Nevertheless, we are witnessing today an extraordinary rise of interest in the Arctic in many quarters; the comforting logic of the Arctic as a peripheral region of interest to a limited number of states no longer applies. Among other things, this has stimulated the development and articulation of a range of new perspectives on the delimitation of the Arctic and the nature of the Arctic as a distinct region in international society. One result is the emergence of the concept of the 'new' Arctic, a phrase suggesting that the region has experienced or is now experiencing what scientists often refer to as a state change [*Anderson* 2009]. But what does this mean with regard to the evolution of the Arctic's role in international society? When did it occur, and what are the implications of this development for the political economy of this dynamic region? Do we need to develop innovative practices to achieve success in what the US National Science Foundation now refers to as "navigating the new Arctic" [Dear Colleague Letter 2018]?

The short answer to these questions is that the Arctic has experienced the impact of a stream of transformative events that have changed the status of the region from a peripheral area of comparatively little interest to those concerned with the great issues in world affairs to a focus of intense interest to those concerned with environmental, economic, and political issues on a global scale. There is no objective way to identify a specific date for the occurrence of this transition. But for purposes of analysis, it is reasonable to begin with the initial collapse of sea ice in the summer of 2007 followed by the rapid recession and thinning of sea ice now expected to lead to ice-free summers in the Arctic sometime during the next 2–3 decades. In an evocative phrase, some analysts have taken to speaking of the "death spiral" of the Arctic's sea ice [*Wadhams* 2017]. To some, this may seem like an esoteric perspective. But, in fact, its implications are momentous in global terms. The Arctic constitutes the leading edge with regard to the impacts of global climate change. What happens in the Arctic as a result of climate change will have profound global consequences [*Lenton et al.* 2008]. To take a single example, the melting of the Greenland ice sheet, an event that no longer seems far-fetched, would raise sea levels on a global scale by 6–7 meters.

The economic and political implications of these developments are profound, especially when coupled with other major developments in the realm of global geopolitics. Increases in the accessibility of the Arctic have triggered rising interest in exploiting the region's natural resources, which include an estimated 30% of the world's recoverable reserves of natural gas [*Gautier et al.* 2009]. Many anticipate rapid growth in commercial shipping in the Arctic, certainly in the form of destinational shipping focused on transporting the Arctic's natural resources to southern markets and potentially in the form of through traffic featuring container ships transporting a wide variety of goods between Asian and European markets. Credible sources have begun to speak of the prospect that the next fifteen years will see the investment of $1 trillion in various forms of infrastructure needed to realize the economic potential of the Arctic [*Roston* 2016].

Nor is the region immune to the impacts of the forces of geopolitics. The growing desire of Russia's leaders for acknowledgement of the country's reemergence as a great power coupled with reactions to Russia's annexation of Crimea in 2014 has precipitated growing East-West tensions in the Arctic. The rise of China to the status of a global power is introducing new complications into the political dynamics of the Arctic. This has led to notable developments of a specific nature, such as the major stake China has taken in the devel-

opment of the Port of Sabetta as a terminal for the shipment of liquid natural gas from northern Russia to southern markets and the rise of Chinese interest in the potential of the Northern Sea Route as a commercial shipping corridor. More generally, China and Russia have developed closer relations in the wake of the 2014 crisis, and China has declared formally that the "polar silk road" will be treated as one of three major arms of what the Chinese call the Belt and Road Initiative [*Liu* 2018]. In short, the Arctic is no longer a peripheral region with regard to the dynamics of economic and political relations. One important consequence of these developments is that the Arctic agenda is merging into the global agenda with regard to issues ranging from environmental protection to economic development and political security.

It is easy to get carried away by this line of thinking. Hazardous conditions regarding both resource development and shipping will not disappear from the Arctic anytime soon. The Northern Sea Route is not about to rival the Suez Canal Route, even under the most expansive or optimistic assumptions. Producing and delivering the Arctic's hydrocarbons to southern markets will remain an expensive proposition. The growth of hydraulic fracturing has altered the global balance of supply and demand regarding fossil fuels and nature gas in particular. Above all, the emergence of competitively priced alternative energy sources (e.g. wind, solar) could easily eventuate in a situation in which large reserves of oil and gas remain stranded in the Arctic.

It would be a mistake to assume that East-West tensions will give rise to a new cold war in the Arctic during the foreseeable future. Nor is the continued growth of China's influence in the high latitudes a foregone conclusion, despite the growing prevalence of expansive projections regarding the Chinese presence in the Arctic and the geopolitical restructuring associated with the unfolding of the Belt and Road Initiative. Without doubt, the Arctic is being drawn progressively into the dynamics of global affairs. Yet in another decade, our thinking about the links between the Arctic as an international region and the global system may seem radically different from our thinking about these links today.

What has happened in recent years is catalyzing important shifts in our thinking about the nature of the Arctic as an international region and more specifically about the role of the Arctic Council as the principal international forum for addressing transboundary concerns in the region. Despite the efforts of the Arctic 8 to persuade all those interested in the Arctic that "[t]he Arctic Council has become the preeminent high-level forum of the Arctic region and we have made this region into an area of unique international cooperation" [Vision for the Arctic 2013], many things are occurring in the Arctic that are not centered on the activities of the council and that raise important questions regarding how we should organize our thinking about the Arctic as an international region. Some of these developments feature initiatives among smaller groups of states, including bilateral measures in several cases. Others involve activities centered on other international forums that are not dependent on the efforts of the Arctic Council, though the links between the activities of the council and the initiatives of other forums are worth noting in some cases. Both these developments merit careful consideration in any effort to understand the implications of the idea of the 'new' Arctic.

Notable to begin with are recurrent initiatives on the part of the Arctic 5, justified (at least implicitly) on the basis of the assertion that it makes sense for some purposes to treat the Arctic as a region encompassing the Arctic Ocean coupled with the coastal zones surrounding this ocean. In 2008, for instance, the five coastal states gathered in Ilulissat, Greenland and issued a declaration asserting their preeminent

role in addressing issues of Arctic governance, committing themselves to handling Arctic matters peacefully under the guidelines established in the prevailing law of the sea, and opposing any idea of negotiating a comprehensive Arctic Treaty analogous to the 1959 Antarctic Treaty [*Rahbek-Clemmensen, Thomasen* 2018]. The Arctic 5 did not invite Finland, Iceland, and Sweden or the Permanent Participants of the Arctic Council to join this gathering, a matter of considerable concern to supporters of the Arctic Council as the preeminent forum for addressing issues of governance in the Arctic. A subsequent gathering of the Arctic 5 on the margins of the 2010 G8 meeting in Canada failed to produce any significant results, leading many to infer that this threat to the preeminence of the Arctic Council had passed. Yet the conception of the Arctic region embedded in the activities of the Arctic 5 refuses to die. Recently, for example, the Arctic 5 have taken the lead in dealing with issues relating to potential fisheries in the Central Arctic Ocean [*Young* 2016; *Vylegzhanin, Young, Berkman* forthcoming]. In July 2015, the five coastal states issued a declaration calling for a moratorium on commercial fishing in the Central Arctic Ocean until such time as the marine systems of the central Arctic are understood well enough to provide a basis for sustainable management of any fisheries that may arise in the area. Similarly, the coastal states will take the lead in efforts to resolve differences regarding the delimitation of jurisdiction over the seabed in the Arctic Ocean, appealing to the provisions of Art. 76 of the UN Convention on the Law of the Sea in the process.

In some ways more important from the point of view of the future of the Arctic as an international region is the rise of bilateral arrangements linking Arctic and non-Arctic actors regarding specific projects. Consider the Yamal LNG Project as a prominent case in point. Novatek, a privately owned Russian corporation, holds 50.1% of the shares in this project. But France's Total (20%), the China National Petroleum Company (20%), and the Chinese Silk Road Fund (9.9%) hold the remaining shares. Additional complexity arises from the fact that Gazprom, a state-controlled Russian corporation, holds 9.9% of the shares of Novatek. State-of-the-art icebreaking LNG tankers, built in Korea and owned/operated by Asian enterprises (e.g. China's COSCO, a state-owned enterprise) have begun to transport gas from the Yamal LNG Project to both Asian and European markets. Meanwhile, the Russian government has invested heavily in the construction of the new Port of Sabetta on the Yamal Peninsula where the gas is liquefied and loaded onto the tankers. Given the tangled ownership structure of the key players in this project, it is apparent that public policies in addition to private calculations are key determinants of the trajectory of this development. At this writing, plans are unfolding for Arctic LNG 2 designed to expand this project into adjacent areas to the east. Current projections anticipate a combined production of 55 million tons per year from LNG 1 and 2 by 2030.

Nor is the case of Yamal natural gas exceptional in this regard. China, acting largely through initiatives on the part of various state-owned enterprises, has been particularly active in exploring opportunities for involvement in the development of the Arctic's natural resources. Current prospects, at various stages of maturation, include the shipment of Alaska's sizable known reserves of natural gas to Asian markets, the initiation of largescale mining operations in Greenland, a transshipment facility located on the east coast of Iceland, and a rail line linking Rovaniemi in northern Finland to Kirkenes on the Barents Sea coast of Norway. Both the economic and the political merits and the environmental impacts of all these initiatives are subject

to vigorous debate. How specific initiatives will play out in practice is hard to forecast at this time. But what is striking in the context of this discussion is the fact that they all would have the effect of knitting together the Arctic and the outside world in a manner that dilutes the ideas that the Arctic is a distinct region with a policy agenda of its own and that the Arctic Council is the preeminent forum for the treatment of Arctic issues.

Conversely, multilateral arrangements, providing opportunities for non-Arctic states to participate and proceeding in a manner that is not subject to control by the Arctic Council, have become increasingly prominent in addressing issues of governance in the Arctic, shaping our perceptions of the 'new' Arctic in the process. Several concrete examples will serve to convey a sense of the significance of this development.

Although the Arctic Council has taken a strong interest in issues relating to commercial shipping, the action regarding measures to regulate Arctic shipping has shifted in recent years to the International Maritime Organization, a specialized agency of the United Nations open to membership on the part of all interested states. Drawing on pre-existing voluntary guidelines, the IMO acted in 2014–2016 to adopt a mandatory Polar Code dealing with matters of safety and pollution relating to the operation of commercial ships in Arctic waters [International Code for Ships 2016]. The provisions of the code entered into force on 1 January 2017 mainly in the form of a series of legally binding amendments to the 1974 Safety of Life at Sea Convention, the 1978 International Convention on Standards of Training, Certification and Watchkeeking for Mariners, and the 1973–1978 International Convention for the Prevention of Pollution from Ships. Covering cargo ships over 500 gross tons and all passenger ships (but not fishing vessels), the Polar Code is a positive development, though focused efforts are already underway to strengthen the provisions of the code regarding matters like emissions of black carbon, the combustion and carriage of heavy fuel oils, and the extension of the code to cover fishing vessels and private yachts. The important point in the context of this discussion, however, centers on what we may treat as the globalization of the Arctic. As the Arctic becomes more intimately connected to global processes, our sense of the Arctic as a distinct region with a policy agenda of its own becomes increasingly blurry.

Similar remarks are in order regarding the governance of fishing in the Central Arctic Ocean [*Vylegzhanin, Young, Berkman* forthcoming]. The CAO, encompassing roughly 2.8 million square kilometers, is high seas in the sense that it lies beyond the seaward boundary of the jurisdiction of any of the coastal states. No sooner had the Arctic 5 issued their July 2015 declaration regarding fishing in the CAO than other signatories to the Convention on the Law of the Sea began to push back, pointing out that the waters of the CAO are high seas and disputing the authority of the Arctic 5 to make decisions about such matters. This gave rise to the so-called 5+5 negotiations in which the coastal states have worked with China, Iceland, Japan, Korea, and the European Union to develop the terms of an agreement dealing with potential fishing in the CAO. Although it has not entered into force as of this writing, the resultant agreement envisions a regime in which commercial fishing activities in the CAO are to be prohibited for at least 16 years while the parties engage in a concerted and collaborative effort to improve the scientific knowledge base needed to manage any eventual fisheries in this area on a sustainable basis [Meeting on High Seas Fisheries in the Central Arctic Ocean 2017]. For present purposes, the significance of this initiative lies in the fact that the Arctic is not a region controlled

exclusively by the Arctic 5 or the Arctic 8. Under the provisions of prevailing international law, so-called non-Arctic states have a right to participate in the development of governance systems dealing with Central Arctic Ocean resources. One interesting implication of this observation is that any agreement arising from ongoing multilateral negotiations on biodiversity in areas beyond national jurisdiction, intended to take the form of an implementing agreement to the law of the sea convention, will apply to the CAO as well as areas of high seas in other parts of the world ocean. Other significant developments pertain to issues of climate change and the establishment of scientific priorities. During the 2015–2017 US chairmanship of the Arctic Council, the Obama Administration launched two Arctic initiatives explicitly framed in such a way as to take place outside the confines of the council. The August 2015 Conference on Global Leadership in the Arctic: Cooperation, Innovation, Engagement and Resilience (GLACIER) brought together policymakers from 19 countries and the European Union in an effort to showcase the dramatic impacts of climate change in the Arctic in a manner intended to spur efforts to promote progress toward the acceptance of ambitious provisions for inclusion in the 2015 Paris Climate Agreement [Conference on Global Leadership in the Arctic 2015]. Then, in September 2016, the US hosted science ministers from 25 governments and the European Union in a science ministerial to set priorities and advance scientific research on Arctic topics [Fact Sheet 2016]. A second Arctic science ministerial, co-hosted by the European Commission, Finland, and Germany took place in Berlin at the end of October 2018. A reasonable expectation is that such gatherings will continue to occur at more or less regular intervals in the future. From the perspective of this discussion of the 'new' Arctic, the important thing to notice about these developments is that they blur the distinction between Arctic states and non-Arctic states, conveying a sense that the links between the Arctic and the rest of international society have become so tight that it is no longer easy to tell where the Arctic treated as a distinct international region leaves off and the rest of international society begins. One implication of these developments is that it may no longer make sense to expect that we can formulate well-defined boundary conditions delineating the Arctic as a distinct region in international society.

What future for the Arctic region?

What are the implications of this analysis for the future of the Arctic region and more generally for our understanding of the role of spatially-delimited segments of the planet treated as international regions with policy agendas of their own? Turning first to the second part of this question, it seems clear that international society is becoming an increasingly complex and tightly-coupled system [*Young* 2017]. The phenomenon known as telecoupling is giving rise to a condition that many of us now refer to as hyperconnectivity. Nowhere is this more apparent than in the Arctic. While the Arctic is not itself a major source of greenhouse gas emissions, the impacts of climate change are unfolding more rapidly and more dramatically in the Arctic than anywhere else on the planet [*Serreze* 2018]. Feedback mechanisms ensure that developments in the Arctic will have major planetary effects [Arctic Matters 2015]. Open water has a much lower albedo than sea ice; melting permafrost is likely to release significant quantities of methane into the atmosphere, the erosion of the Greenland ice sheet will affect sea levels on a global scale. Hyperconnectivity is also apparent when it comes to socioeconomic developments in the Arctic.

The recession and thinning of sea ice attributable to climate change is making the Arctic more accessible, opening up prospects for exploiting the Arctic's natural resources, and making increased use of Arctic shipping routes feasible. Yet the attractiveness of these options is tied to a range of global forces, including world market prices for oil and gas, the rise of renewable energy options, the availability of alternative shipping routes, and the stability of the global trade system. More generally, the digital revolution and the onset of what many now refer to as the 4th industrial revolution may have profound consequences for the value of the Arctic's natural resources [*Schwab* 2016]. Increasingly, these links are making it difficult for policymakers to categorize issues, separating out a distinct subset of issues to be treated as region-specific issues and addressed through regional governance systems like the Arctic Council.

At the same time, it seems unlikely that the world's foreign ministries will abandon the practice of organizing their work along regional lines, making use of bureaus to deal with European Affairs, African affairs, North American affairs, and so forth. In this sense, it may make sense to highlight the idea of the Arctic as a distinct region, calling attention to a suite of issues that are particularly important to the welfare of Arctic residents, including Indigenous peoples for whom the Arctic is an ancestral homeland. From this perspective, the framers of the 1996 Ottawa Declaration may have got it right in providing the council with a mandate to address issues of environmental protection and sustainable development but not issues of legal jurisdiction or national security. Environment protection highlights a concern for the impacts of pollutants originating outside the Arctic, including persistent organic pollutants, ozone depleting substances, and heavy metals as well as emissions of greenhouse gases. Sustainable development remains somewhat ill-defined as framework for the formulation of innovative policies. Nevertheless, issues of environmental protection and sustainable development are prominent concerns in the Arctic, and the Arctic Council has played a role of considerable importance in identifying emerging issues in these realms, framing them for consideration on policy agendas, and moving them far enough toward the head of the policy queue in international venues to gain the attention of busy policymakers [*Stone* 2015].

A more fundamental question is whether ongoing geopolitical and geoeconomic developments will necessitate fundamental adjustments in existing governance arrangements for the Arctic and in the Arctic Council in particular. Inertia favors the continuation of the status quo, especially in an era in which the United States is looking inward and showing little interest in innovation in the realm of international governance systems. Yet the economic importance of the Arctic's natural resources to Russia and the rising roles of China and the European Union in addressing Arctic issues suggest that there is a disconnect between the emerging lines of influence regarding Arctic affairs and the character of the institutional arrangements for the region put in place during the 1990s. Among other things, it is becoming abundantly clear that the status of 'observer' in the Arctic Council will not satisfy influential states like China, intergovernmental bodies like the European Union, and nonstate actors like the leading players in the energy industry. Unless the Arctic Council demonstrates an ability to adjust to these changing realities, we can expect that major players will bypass the council in favor of bilateral or other multilateral venues in addressing a growing range of issues. Under the circumstances, hopeful pronouncements to the effect that the Arctic Council is the "preeminent high level forum of the Arctic Region" and

that it has presided over the emergence of the region as an "area of unique international cooperation" are in danger of being overtaken by events [Vision for the Arctic 2013].

Still, it would be a mistake to dismiss the relevance of the Arctic Council too quickly. The most significant roles the council plays center on what policy analysts call agenda formation [*Kingdon* 1995]. In specific cases, these roles encompasses providing early warning regarding emerging issues, developing narratives spelling out appropriate ways to think about such issues, and drawing the significance of these issues to the attention of those who have the capacity to set agendas in various forums. Since its establishment in 1996, the council has made a difference in seeding discussions of issues important to the Arctic in other venues and serving as a coordinator or integrator of the efforts of others in the increasingly dense regime complex for the Arctic [*Young* 2012]. Consider the case of the 2004 Arctic Climate Impact Assessment as an example of the first of these roles and the efforts of the council to meld considerations of shipping, marine biodiversity, and marine pollution in thinking about sustainable development as an example of the latter role.

Can the Arctic Council continue to play roles of this sort as we move deeper into the Anthropocene? The answer to this question depends on the ability of the council to adjust agilely to changing circumstances, responding in an innovative manner to newly emerging Arctic issues and engaging those actors that need to be included in any serious effort to address these issues. The necessary adjustments may require revisiting some of the constitutive features of the Arctic Council elaborated in the 1996 Ottawa Declaration. Such adjustments are never easy; they call for political actions that go well beyond the realm of technical measures. It is impossible to predict how successful the Arctic Council will be in meeting this challenge in the coming years. But one basis for hope resides in the fact that the Ottawa Declaration is not an internationally legally binding instrument. If there is sufficient political will to reach agreement on appropriate adjustments in some of the constitutive provisions of the council, the process of moving forward need not get bogged down in the complexities of negotiating amendments to legally binding instruments and taking the (often protracted) steps needed to make the changes enter into force legally. The idea that informal institutions, exemplified by the case of the Arctic Council, may have significant advantages in a hyperconnected world subject to rapid and far-reaching changes constitutes a topic that merits serious consideration as we address the challenges of the Anthropocene.

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The Economy of the Arctic in the Modern Coordinate System

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ABSTRACT. *The article provides an overview of the modern Arctic economy. It demonstrates that in the sectors of the economy that are associated with the development of natural resources (primarily mineral resources) and that emphasize return on investment, there is a growing role of new knowledge and technologies, and a significant increase in the role and importance of various forms of cooperation between the parties involved in regional projects. This approach helps solve the problem of attracting investment for high-risk, high-yield projects – however, the implementation of these 'hybrid projects' significantly limits the opportunities associated with the development of domestic scientific and production base. A direct consequence of applying this model to the development of natural resources in the Arctic Zone of the Russian Federation is a noticeable growth of the technology-intensive service sector, which satisfies the demand for equipment and labor by adopting foreign cutting edge technologies and relying on the inter-regional model of work rotation. All of this leads, among other things, to the fragmentation of the country's economic space (to a reduction in the degree of interconnectivity between the economies of different regions), as well as to stagnation and*

eventual collapse of urban-type settlements in the Russian Arctic.

KEY WORDS *Arctic zone of the Russian Federation, economic activity, economies of scale, cooperation, risk sharing, new technologies, learning process, social impact*

Introduction. Globalization

The advance of modern economy, globalization and the development of new information technologies and means of transportation have radically narrowed the 'gap' between the Arctic and the rest of the world – not only in Russia, but elsewhere on the planet (including countries far from the high-latitude regions). Much of what previously seemed unimaginable is now becoming a reality. The reasons for that include both socio-political and climate change (the decrease in the area of year-round ice coverage being the key factor).

These two factors produce new challenges and opportunities. For example, Arctic tourism is developing rapidly, while cold and permafrost are turning into an advantage for liquefied natural gas projects and the creation of data storage centers. At the same time, neglecting the distinctive features and character of the Arctic can make nature itself push back in full force (thawing of the permafrost and the cataclysms associated with it, explosive growth of deer populations[1] and the resulting rise in animal diseases, rapid depletion of pasturelands and soils).

Climate change acts more as a catalyst for the transformations we are seeing throughout the world. Socio-economic factors – such as population growth, the need to maintain economic growth, rising demand for raw materials and energy, and globalization – are among the key drivers of change. Global trends are playing an increasingly important role: there is a steady rise in the influence of migration processes, raw materials and energy markets, investment markets, and political factors.

An increasing number of countries are moving to expand their economic interests into the Arctic. For example, over the past decade, China has been rapidly ramping up its activities there. These activities take a variety of forms: from establishing the Polar Research Institute of China (2009) and opening Arctic research stations (on Svalbard and Iceland) to participating in projects for the development of mineral resources (in Canada and in Russia's Yamal) [*Conley* 2018].

In our opinion, there is one defining feature that applies to all strategies used to combat socio-economic problems in the Arctic. The emphasis is increasingly put not so much on individual projects and solutions (related to construction, extraction, transportation, etc.), but on forming frameworks and environments that ensure consistent and sustainable development and maintenance of the vast Arctic region, and help establish, promote, and expand various modes of cooperation and joint participation, so that companies can join forces in implementing particular projects.

At the same time, when addressing the issue of sustainable development of the Arctic economy, the focus is gradually shifting from achieving certain target values or metrics (with regard to social, environmental or financial processes) to its capacity for adaptation to the changing conditions.

A significant feature of the proposed procedures and approaches to imple-

1 For example, in the Yamalo-Nenets Autonomous Okrug, deer population in 2010 was estimated at 660,000, while the expected number was below 450,000 [*Khorolya* 2012, p. 272-277]. Today, the situation in the region with respect to excess deer population remains a serious issue.

menting projects in the Arctic is their focus on integration and cooperation – ranging from individual indigenous communities to large interregional and international projects to various other areas of cooperation. An example of that is the increasingly intensive process of integrating local (largely practical) experience and scientific knowledge to solve a wide range of scientific, technical, and socio-economic problems and issues arising in the Arctic. Adaptation to change is turning into a continuous process, no longer tied to specific projects or management decisions [Adaptation Actions for a Changing Arctic 2017].

Adaptation through cooperation and integration of efforts by all the parties present in the Arctic is starting to involve all areas of human activity. In April 2019, the United States Coast Guard presented its Arctic Strategic Outlook, which prioritizes America's leadership in the region while actively promoting various forms of partnership, pooling efforts, and encouraging continuous innovation across all areas of human life in the region [*Howard* 2019; Arctic Strategic Outlook 2019].

Russia's approach to solving the socio-economic development issues in the Arctic Zone of the Russian Federation (AZ-RF) has so far been primarily focused of projects and their implementation – while cooperation and integration remain largely in the background. For example, subprogram no 1, "Creation of Core Development Zones, Maintaining their Operation and Creating Favorable Conditions for the Rapid Socio-economic Development of the Russian Arctic Zone", of the state program "Socio-economic Development of the Arctic Zone of the Russian Federation" focuses on "improving investment activity on the territory of the Arctic Zone of the Russian Federation; carrying out projects of economic development in the Arctic territories and on the continental shelf of the Russian Federation" [Order of the Government of the Russian Federation 2017].

This document, while important, does not explicitly address issues of cooperation or generation of new knowledge and competencies. In light of the trends outlined above, it would be worthwhile to explore just how relevant and necessary the modes and methods of cooperation and adaptation are to the economy of Russia's Arctic Zone.

1. Economic development of Russia's Arctic Zone – moving beyond the comfort zone

1.1 THE ECONOMY OF THE ARCTIC – ONE TERRITORY, MULTIPLE MODES OF COORDINATION

The economy of the Arctic is an integral part of both the Russian economy and the global economy, as a whole. Therefore, it features the basic economic principles typical for all types of economic activity found in any part of the world – first and foremost, the need to assess and compare costs and effects in a monetary form and, based on that, determine economic efficiency. At the same time, the factor of distance, the fact that seasonal fluctuations slow down the turnover of financial resources, and the absence of local markets (including factor markets) all have a significant impact. As a result, **the Arctic economy can be divided into three segments**:

- **basic economy** that operates by the same principles and rules as the economy in any other part of the world;
- **economic activity of indigenous peoples** (subsistence economy), based on obtaining (extracting) means of subsistence from the surrounding natural environment; historically, the indigenous peoples of the Arctic have developed and per-

fected a unique way of life and specific types activities to survive in extreme natural conditions;

- **transfer-based economy** – economic activity associated with the government performing its general functions (in addition to public administration, these include maintaining the military, ensuring border security, protecting law and order, etc.) and the provision of social services to the citizens, regardless of their place of residence [*Glomsrød, Duhaime, Aslaksen* 2015].

Economic activity in each segment of the Arctic economy has its own specific modes of coordination and cooperation – ranging from predominantly redistributive models in the state-funded (transfer-based) segment to market-based models in the 'basic economy' segment to non-market ones (barter or gift giving) in the traditional subsistence economy (which is still based, to a large extent, on subsistence farming).

1.2 BASIC ECONOMY – ECONOMY OF SCALE AT ITS CORE

Arctic's basic economy runs on extracting, producing and generating not just the essential products, but goods and services with unique properties. These properties are a consequence of the distinctive and rare characteristics of plant and animal life (including the sea biomes) found in the Arctic, and the unique properties of the mineral resources contained in the ground and water. These natural resources are unique because of their rarity, low availability and a relatively low cost of producing (including the cost of physical labor required for extraction and the cost associated with wear of the material means of production, including various machines, mechanisms, infrastructure, etc.).

It is the rarity, the unique properties and characteristics of the way products and goods are produced in the Arctic that determine both their value and the high final price charged for them outside the region. The price of most goods, products and natural resources extracted (ranging from forests and fauna to mineral resources) contains a significant proportion of what is called the 'interest part' – the part of the price that allows the producer not only to compensate for the high costs associated with conducting economic activities in high latitudes (including production and transportation to remote markets), but also to receive additional profit for the labor, fixed capital and financial resources spent in the process.

For the most part, the reason for the unique properties of these products lies in the natural environment itself, and the forces of nature that give rise to these properties. It should be noted, however, that in the modern world, it's not just nature, but also – and increasingly so – the unique knowledge and expertise (sometimes an amalgamation of traditional, indigenous knowledge and scientific data accumulated by generations of explorers and scientists devoting their lives to studying the Arctic) that form these unique properties. Another distinguishing feature of the Arctic economy is how much of it is a function of climate conditions and geographical environment. In addition, the loci of economic activity are widely dispersed across the region.

While traditional economic activities are ubiquitous, areas associated with the production and extraction of unique products are relatively rare, scattered over a vast territory. Creating something that would approximate a competitive market for goods and services within these remote enclaves is an extraordinarily difficult task to accomplish. Which is why the remoteness and the extreme natural conditions – the defining factors of economic activity in the Arctic – are also accompanied by monopolization and the creation of various eco-

nomic barriers. These factors inevitably affect both the performance of the existing Arctic economy and the emergence of potential new forms of economic activity.

We believe that such 'natural' limits to the development of market relations can only be overcome by state intervention or the introduction of effective civil society institutions (including those that have formed over a long period of time as part of the process of regulating traditional economic activities).

For example, in centrally planned and managed systems, this problem was addressed by creating so-called 'territorial industry-and-transportation combines' (large conglomerates of industrial enterprises) [*Slavin* 1961].

2. The Arctic: Within and Without

2.1 CAPITAL INFLOWS AND OUTFLOWS

"While the industrial-scale natural resource exploitation creates considerable wealth, these activities are mainly carried out to supply markets outside the Arctic regions. Moreover, the resources generally belong to sources of capital outside the Arctic, which control the activities and profits A few large corporations dominate the extraction activities, and some of them are present in several Arctic countries. This fits well with the concept of "Resource frontier regions," where the massive riches are destined for export and only a fraction of the income and profits remains. Due to the geographical isolation of most Arctic regions, production costs are high. While specific raw materials can be found within the region, technology, qualified labor, and capital have to be imported most of the time... As a result, costs are often too high to successfully compete with non-Arctic manufacturers who have more access to resources (including cheaper transportation systems). In general, the role of the circumpolar North in the global economy is asymmetrical: it exports raw materials on a large scale to developed regions and imports most finished products for its own domestic consumption. Only a part of the food supply is locally produced." [*Einarsson, Larsen, Nilsson, Young* 2002-2004, pp. 69-80; *Larsen, Fondahl* 2014, pp. 151-186].

It is for this reason that GRP per capita in the larger part of the Arctic is much higher compared to non-Arctic territories. However, the territories benefitting the most from these trends are those with higher population density, as well as a more diversified and, consequently, more stable economy. As a rule, in the system of national accounts, the economic outcomes of such activities are reported for the territories where the income is generated. This makes it difficult to use GDP to measure economic performance of these territories. It is also important to note that, most of the time, a significant percentage of workers involved in these economic activities are seasonal or shift workers. Most of the capital tends to be concentrated in the hands of non-residents, which means that the profits also leave the Arctic to be used elsewhere. As a result, the income that remains at the disposal of residents is significantly less than the cost of products produced in the region [*Goldsmith* 2017].

2.2 COOPERATION IS THE WAY

In the late 20th-early 21st century, the old ways of organizing basic economic activities inherent to the centrally planned system (with its emphasis on material assets) served as the foundation for new companies and economic entities that were able to coordinate using a different approach (not entirely driven by market forces, but rather a quasi–market approach characterized by a significant role of non-market – negotiated or implicit – procedures) [*Korostelev* 2008].

As a result, over the past 25-30 years, the economy of the Russian Arctic has

changed (because the above-mentioned specifics of the Arctic economy were not fully accounted for) in the following ways:

there is a sharp decline of economic ties with the regions to the south of the Arctic circle (the main outflows of products and resources now go either westward or to the non-Russian East);

there is visible erosion of ties between the industries and a decrease in cooperation (the fact that timber is no longer exported along the Northern Sea Route; a sharp decrease in the import of goods for the needs of a significantly reduced population; the outflow of working-age population from the Arctic regions – the people not directly related to the high-impact projects for the extraction of mineral resources);

economic activity is now concentrated around large-scale projects for the extraction of mineral resources carried out by massive enterprises (usually with state participation);

the development of small and medium-sized businesses within the boundaries of public (state funded) social services sector is given preferential status;

specific skills and ways of regulating standard economic activities based on traditional knowledge and experience are gradually fading away (which results in such phenomena as: overgrazing of deer in the tundra, overfishing in the rivers, sharp decline in the role of fishing and hunting activities in the lives and income of the Northerners).

As a result, there is an de facto departure from integrated development and the implementation of socio-economic projects as a way toward long-term development in the Arctic (none of the numerous attempts at formulating a new model for solving complex problems in the North and in the Arctic – ranging from "comprehensive programs" to "core development zones" to "mineral resource centers" – have yielded any positive results).

2.3 THE MARKET KNOWS THE PRICE?

As is well known, pricing makes it possible to compare and contrast various alternatives to the use of the resources commanded by various economic agents. Relative prices are one of the key factors that change the structure of the economy and help choose the course of its development.

In the Arctic, it is virtually impossible to have "accurate" pricing or measure basic economic performance, because of the monopolies dominating entire regions and the distance to the markets the products are exported to.

A telling example of the destructive impact of changing price rations (transport tariffs, energy tariffs, borrowing costs) can be found in the way export routes for timber and wood are shifting and redirecting in Russia's east. Specifically, in 1989, the volume of timber exports from the Yenisei river (the town of Igarka) started to decline rapidly, going as low as several tens of thousands of cubic meters. The volume of sawn timber production has also been reduced significantly. There were three deciding factors: 1) due to rapid growth of fuel and energy prices, as well as rising taxes and growing credit payments (compared to the prices for forest products) in Igarka, sawmilling became unprofitable; 2) demand for imported lumber in Western Europe decreased; 3) traditional suppliers of wood and timber (from the Lower Angara region) started to modify their shipping routes: now their shipments went by rail and then through the sea ports of European Russia; the competitiveness of the Northern Sea Route declined due to rising tariffs [*Granberg, Peresypkin* 2006, p. 276-280].

The reason why the Northern Sea Route was no longer as popular for timber and lumber shipments lies not only in the so-called ice (winter surcharge) fees and transportation tariffs, but also, to a large extent, in the ways the forest industry has changed over the years. "Since the early 1990's, the number of forest industry enterprises has

more than quadrupled, accompanied by a five-fold decrease in the volume of wood export. It was only by 1999 that the volume of transported forest products started to rebound, but even to this day, there is still a lot of small enterprises with limited cargo traffic remaining in the industry. At the same time, the forest industry itself is spread across a huge territory with weak infrastructure...The bulk of the freight traffic (over 70%) is roundwood, followed by lumber, crushed wood, particleboard and fiberboard, impregnated sleepers, firewood, non-impregnated sleeper products, plywood and veneer sheets, and different types of timber ...According to water transportation workers, the main problem is the port fee, which is charged to maintain the nuclear icebreaker fleet (even in summertime, the icebreakers must be present the Kara sea)" [*Yambayeva* 2005]. The situation with energy tariffs is just as problematic: prices for heat and energy in the Arctic and the North-East of Russia are growing at a higher rate (and are, generally, higher) than similar prices in other regions of the country.

3. Markets in the Arctic

The key question with regard to economic activity in the north, and especially in the Arctic, is whether and to what extent it can be carried out on market economy principles (i.e., the costs incurred in the production of a product can be recouped by selling it). This question is more than acute than ever in the case of "secondary" types of economic activity, especially those related to ensuring the functioning of socially significant facilities.

3.1 HOW TO OVERCOME ARCTIC ISOLATION

The main obstacle is not only (and not so much) regional price increases (due to remoteness, for example), but also the local and often self-contained nature of economic systems in the north and the Arctic. This obstacle can be overcome by:

a) ensuring transport accessibility (which is often difficult);
b) introducing various government programs and initiatives to support the economy (in this case, the goal is not to improve the effectiveness of economic activity, but rather to make a shift to transfer-based economy, with all the underlying socio-political effects);
c) creating "spatially distributed effects" within supply chains – in particular, having those closest to the beginning of the chain receive a portion of the revenue from the sale of the final product [*Delgado, Mills* 2018; *Ito, Vezina* 2016].

It is widely accepted that the Northern Sea Route has always been part of the solution to the problems of development in Siberia (its southern and middle parts, and the Arctic zones). This is "the route traveled by Nordenskiöld and Wiggins, the same route that was so actively promoted in the 1860s and 1870s by our compatriots Sidorov and Sibiryakov" [Northern sea expedition 1906, p. 5].

Many researchers, both in Russia and beyond, hold this view. For example, experts from the Korea Maritime Institute in Seoul explain the stable and steady economic development of the southern and middle parts of Russia's East by the strong economic ties that exist between northern Siberia and the Arctic zones. They believe it is precisely this unity that not only ensures stable economic relations of the macroregion with its neighboring territories (European Russia and the Far East), but also actively contributes to its participation in the international division of labor.

This requires fundamentally different ideas and approaches – from exploring ways to implement these projects to creating a different technological framework (with a focus on reducing the need for out-

side labor resources, for an integration of various types of economic activities, for mobility, etc.). Economic development of the inner part of Russia's East is the basis for the sustainable functioning of the Northern Sea Route and a prerequisite for involving the Arctic in the economic system of the whole country.

It should be noted that the three solutions to the economic problems of the Russian Arctic outlined above could be facilitated by establishing a single regulatory body: a single body to manage state resources, a single coordinated plan of action, etc. When considering this possibility, many bring up the experience of Glavsevmorput (The Chief Directorate of the Northern Sea Route), Dalstroy (The Far North Construction Trust) and other trusts that operated there back in the 1930s and 1950s. We believe that, unfortunately, such unified system of management would not be able to boost economic growth in the North and in the Arctic, or even maintain the current economic activity at an acceptable level: "The system of management that formed in the North-East of Russia, manifesting in Dalstroy, was a radical operation, singular in its nature. It could almost be regarded as a special form of administration in a region with no constitutionally established bodies of state authority, a region where Dalstroy reigned supreme – a state within a state. This led to the creation of the 'Dalstroy management system'" [*Grebenyuk* 2007, p. 44-45].

3.2 BLAZING NEW TRAILS?

A number of projects have been launched in the Arctic coastal zone (on the coast of the Kara Sea and at the mouths of the three "great Siberian rivers"): natural gas and LNG (the Yamal LNG projects), coal ("VostokCoal-Dikson"), oil (Rosneft-Rosneftegaz, the Payakha oil field); there is also a project in the works to develop one of the largest deposits of rare earth elements (the Tomtor field in northwestern Yakutia), etc.

A common feature of all these projects is how "typical" they are for the Arctic. They are all characterised by a weak connection to central Russia and the southern regions of Russia's East; they also focus on local (or, more precisely, project–based) financial and economic efficiency. That said, the projects are implemented by large companies that usually command enough influence to be able to profit from the preferential tax regime. These companies also attract foreign partners – not only as investors, but also as suppliers who provide necessary equipment and a wide range of services related to production and technology.

For example, in 2019, they launched the industrial development of the Payakha oil field. "This means, first and foremost, a rise in oil production – not by a percentage, but by several-fold. Within five years, Krasnoyarsk Krai will see an increase of at least 2-3 times in terms of oil revenues entering the budget, compared to what the oil industry provides today, which is 30 billion rubles," said Krasnoyarsk Krai governor Alexander Uss [at the Payakha oil field, 2019].

3.3 TRANSPORTATION: THE LONG ROAD FROM SINGLE TRANSPORT CORRIDORS TO A LARGER NETWORK

Realizing the potential social value of Arctic projects (as well as forming the conditions for development; innovating and adapting to change) is impossible without appropriate infrastructure.

Unfortunately, so far the dominant approach has been to focus on the development of transportation in terms of latitudes – from west to east and vice versa.

In order to seize the potential social value of Arctic projects, it is necessary to create specific conditions that would allow to use the opportunities not only of the regions to the west and east of Rus-

sia's Arctic, but also the territories stretching southwards. In other words, it would require stronger economic and production ties between the economy of Russia's Arctic, on the one hand, and the economies of the central and southern parts of the Russia's East, on the other. Therefore, an important area of focus is to expand and extend the longitude component of transportation, as well. It is necessary to actively develop transportation infrastructure and basic production facilities in those areas that generate cargo within the "North – South" corridor (Northern Sea Route – ports in the upper reaches of Siberian rivers).

In the case of Eastern Arctic, for example, this involves:

1. development of the shipping industry: interconnection (and more active use) of the Lena river routes with an access to the Northern Sea Route (in both directions), on order to establish, among other things, cooperation in terms of cargo traffic between the Lena River routes and the Asia-Pacific countries;
2. active use of new opportunities provided by the "fourth industrial revolution" (big data, smart transportation, etc.);
3. creation of a network of logistics centers that combine different types of transportation (Northern Sea Route; river, rail, road and air transport);
4. establishing a stronger connection between the adjacent transportation infrastructure and the projects underway in the central and southern parts of Siberia and Russia's East.

Currently, the discussion on the issues of improving Russia's transportation network is dominated by solutions that focus on developing the Northern Sea Route and increasing the capacity of the Baikal–Amur Mainline. However, the relationship and interaction between these subsystems have only recently been put on the agenda [*Kozlov, Makosko* 2019].

It should be noted, however, that the issue itself has been debated for a considerably long time – at first, some disputed the importance of railway transportation, and now the underestimated component is the role of transport communications along longitudes. Researchers have no choice but to admit: "Extending the 'effective transportation zone' of the Northern Sea Route thousand or more kilometers deep into continental Siberia and the Far East proved to be a difficult, if not insurmountable obstacle to the northward expansion of the economic and geographical boundaries of the railway network" [*Lamin, Plenkin, Tkachenko* 1999, p. 140]. Because of this, "Russia's transportation system, despite some growth and addition of the road and air component, still retains the old economic and geographical outlines it secured in the early 20th century" [*Lamin, Plenkin, Tkachenko* 1999, p. 142].

Only in September 2018, "after more than two years of discussion between Russia's Federal Agency for Rail Transport (Roszheldor) and the SShKh company (established as a contractor for the project), the concession for the Northern Latitudinal Railway was finally signed. Russia's VTB bank may be put in charge of financing the railway megaproject. The idea of building a railroad in the northern part of Western Siberia was first explored over 50 years ago. Work on the project resumed in 2006, but it wasn't fully restarted until March 2017, when Russian Railways and Gazprom signed an agreement on the joint implementation of the Northern Latitudinal Railway project "[*Georginov, Zvorykina, Ivanov, Sychev, Tarasova, Filin* 2019; Order of the Government of the Russian Federation 2018].

The Arctic economy is increasingly becoming a part of the global economy. Due

to this, foreign researchers – specifically, from China and Korea – are also raising the above-mentioned issues of flexibility and accessibility of transportation services in the Arctic. "Most of China's researchers focused on the need to create an infrastructure in the Russian Arctic that would connect sea routes and railroads into a single network, a 'land-sea' system. More specifically, China suggested creating a railway network in Northeast Asia that would connect the Chinese port of Dalian with a Russian seaport" [*Zabrovskaya* 2019; *Kim Jong-Deog, Lee Sung-Woo* 2017].

3.4 RESOURCES OF THE ARCTIC: INVESTMENT, NEW EXPERTISE AND MODERN TECHNOLOGIES

The core of the Arctic economy is the exploration and production of the natural resources. Over time, the sources of these products (furs, gold, oil, coal, gas, diamonds, etc.) have changed significantly. Resource sites are shrinking; their useful content is decreasing; the distance, depth, etc. to the natural resources are increasing [*Innis* 2001].

For a long time, the only way this problem was addressed was by moving further north, to the Arctic, to explore new sources of raw materials and resources. While this approach to solving the problem of depleting resources remains popular, there is an increasing emphasis on exploring at greater depths, as well on introducing (and ensuring wider use of) cutting edge technology and new scientific ideas. However, effective use of new technologies and new approaches when developing natural resources in increasingly complex and risky environments also requires different models of coordination between the participants [*Kryukov* 2014, p. 184-187].

For a system of norms and regulations (a "resource regime") to be adequate to the new conditions in the Arctic, it has to create and improve models of cooperation that organize all parties involved in the extraction and development of natural resources. Active cooperation between companies that differ in terms of their level of competence and their approach to the development of natural resources allows them not only to reduce individual risks, but also to ensure an effective exchange of experience and best practices.

The most radical option (in the case of extracting mineral resources) is to grant a license (the right to exploit an area for minerals) to several companies at once (after reaching mutual agreement on the conditions and procedures, and with one company being appointed/invited to serve as the operator). The second option is to grant a license to just one company, and then entrust the functions of the project operator to another legal entity (with the participation of several companies, giving priority to the ones with unique experience and technologies).

Most Arctic countries practice the first option. In Russia, however, the second approach is commonly used. In the first case, the state, as owner of the mineral resources (with the exception of USA), usually forms a license group (a group of companies) in a way that provides a synergistic effect, giving all national stakeholders a chance to enhance their competence and improve their level of scientific and technological development. In the second option, the right to elect the project operator and form the group lies with the company that owns the mineral rights. In most cases, the deciding factor is the desire to attract investment for the project.

An example of the first option is the Kupol Gold Mine developed by the Canadian company Kinross Gold. Although there is only one company with the rights to extract mineral resources, this example still falls under the first category – there are very few cases when foreign-owned companies have the rights to develop resources (especially the so-called 'minerals of strategic importance').

As a rule, the choice of either option and the specifics of its implementation are determined by a Russian company that already holds the license, i.e. the mineral rights. Therefore, corporate (commercial) priorities usually shape the course of such projects.

Successful examples of that include the joint LNG projects of Russia's NOVATEK PJSC (the second option). The first project – Yamal LNG – with a capacity of 17.4 million tons has already been implemented [*Toporkov* 2017]. The company also owns significant gas resources on the Gydan Peninsula, which are planned to be used for the second and third projects – Arctic LNG-2, and Ob LNG [Yamal LNG project].

NOVATEK's approach to LNG projects in the Arctic is distinctive in how it involves large foreign financial and oil/gas companies as partners (co–investors). Participants of the Yamal–LNG project include NOVATEK PJSC (50.1%), Total (20%), CNPC (20%) and the Silk Road Fund (9.9%) (it is too early to classify Chinese companies as owners of unique technologies or skills with respect to projects of this type). France's Total, which has a lot of experience in the area, has also purchased a 10% stake in the Arctic LNG-2 project in 2019. Binding agreements on the terms of entering into the Arctic LNG-2 project have also been signed with China's National Oil and Gas Exploration and Development Corporation (CNODC, a subsidiary of China National Petroleum Corporation) and China National Offshore Oil Corporation (CNOOC). Both agreements provide for the acquisition of a 10% stake in the project. The consortium of partners for the project has not yet been formed. The plan is to sell up to a 40% share in Arctic LNG-2 [*Chervonnaya* (1) 2019; *Chervonnaya*, *Toporkov* 2019].

Unfortunately, the above-mentioned projects (both Arctic LNG-2 and Yamal LNG) are largely 'import-oriented' – in terms of providing an impetus for the development of domestic engineering and shipbuilding. So far, the positive socio-economic effect of these projects for the Russian economy – and for the Arctic region itself – has been rather limited.

An example of an agreement aimed at forming cooperative ties in the Arctic is the long-term deal between Gazprom Neft and Gazprom for the development of Yamburg field's Achimov oil deposits in the Yamalo-Nenets Autonomous Okrug (the second option, as defined above). Achimov deposits are classified as hard-to-recover hydrocarbon reserves. They are located deep (3-4 km underground) and characterized by a complex geological structure. Gazprom is known to produce gas from Cenomanian deposits, which are located much closer to the earth's surface – at a depth of up to 1.7 km [*Starinskaya*, *Toporkov*, *Chervonnaya* 2019].

Reaching an agreement in this case was largely made possible by the strong "familial ties" of the two companies participating in the project. Unfortunately, reaching agreements for effective cooperation in the mineral resources sector of the Russian Federation remains a very daunting undertaking. For example, the Federal Agency for Mineral Resources (Rosnedra), Rosneft and Gazprom were unable to reach a compromise on the issue of developing the Arctic shelf. Rosneft and Gazprom have disputes over a number of territories in the Arctic. For example, "in 2013, they submitted a single application for the North Wrangel zone in the East Siberian and Chukchi seas, agreeing to divide it into two parts. Later, both companies were bidding for the Murmansk oil field on the Barents Sea shelf. Ultimately, Rosnedra refused to give the oil field to any of the bidders, delaying the issue until a law is passed that would require auctions to be held to resolve such disputes. At the same time, the Agency imposed a moratorium on issuing new licenses for the devel-

opment of the Arctic shelf until the conditions of the existing licenses were met. Besides Rosneft and Gazprom, LUKOIL also seeks to develop the Arctic shelf. However, shelf areas suitable for exploration or oil and gas production can only be secured by companies with more than 50% of shares owned by the state" [Gazprom and Rosneft failed to strike a compromise 2019].

The situation is just as complicated in the case of solid minerals – particularly, complex ores and diamonds. In 2018, after years of confrontation, Norilsk Nickel and Russian Platinum reached an agreement to establish a joint venture. "Norilsk Nickel's contribution to the joint venture's capital would be its license for the development of the Maslovskoye deposit, while Russian Platinum would contribute its licenses for the Chernogorskoye deposit and the Norilsk-1 deposit. All these deposits are located in the Norilsk Industrial Area and contain impregnated complex ores" [*Terentyeva* 2018].

It should be noted that the agreement on establishing a joint venture became possible only after the parties signed a general agreement on strategic partnership in the presence of the President of the Russian Federation Vladimir Putin [Historic agreement signed in Krasnoyarsk Krai 2018].

The approach taken by large companies is understandable and reasonable – they are seeking to preserve their status quo on a territory historically entrusted to them. This can be observed by analyzing the strategy and behavior of ALROSA, a diamond mining company, in the Sakha Republic (Yakutia). This is also the reason why the Ministry of Natural Resources and Environment expressed its concerns about the declining growth of Russia's diamond reserves: Russia's largest diamond mining company ALROSA is only exploring areas where geological prospecting has already been completed, said Minister of Natural Resources and Environment Dmitry Kobylkin in an interview with Interfax" [Ministry of Natural Resources Concerned with ALROSA Exploration Strategy 2018].

4. How to ensure 'social and economic returns'

The role and place of the Arctic economy in the global economy and in Russia, in general, has to do not only with meeting the needs for raw materials, energy resources, and biological resources, but also with creating new jobs and providing tax revenues at various levels. Within modern Russia's economy, the Arctic plays the role of a "territory of the future." This role involves following environmental principles and environmentally sound practices when conducting economic activities, preserving the habitat of the indigenous peoples of the North, broad cooperation and integration of all participants within the economy: from micro-level issues to global pan-Arctic problems, focusing on the use of advanced scientific and local (practical) skills and expertise.

A unifying feature of all the principles outlined above is the priority development of science and technology. It is the basis for the development and adoption of new approaches and practices both on the continent and in the Arctic. These, in turn, allow for a significant increase in both economic and social 'output' of the various activities currently carried out in the region or expected to be carried in the future.

4.1 INPUTS COUNT AS MUCH AS OUTPUT DOES

Numerical estimates of the multiplier effect differ greatly depending on the country, the conditions under which the projects are implemented, and modes of assessing the results. For example, when considering the multiplier effect of the oil and gas sector in general, for devel-

oped countries it varies from 1.6 (Norway) to 2.4 (Australia). In the case of Russia, the multiplier is 1.6–1.9 [*Nikitin, Kibitkin* 1999].

At the same time, shelf projects, which are more capital-intensive than onshore projects, also have a greater multiplier effect in terms of their impact on related industries. For example, in 2014, Rosneft CEO I. Sechin stressed that "every dollar invested in the shelf generates $7.7 in other sectors of the economy" [Quotes from interviews with the head of Rosneft 2014].

Our research shows that in other countries (Norway, Canada, the United States (Alaska)), the non-resource sector is more actively involved in the development of Arctic oil and gas resources. In this case, the multiplier is dominated by indirect effects (creating additional demand for equipment and supplier services from other regions of the country). In Russia, for the time being, the multiplier is defined primarily by direct local effects (total additional output that either goes to the end consumer locally or is exported). This indicates that there is no proper coordination between the Arctic economy and the socio-economic processes taking place both in the regions where the product reaches its end consumer and in the industrialized regions further south – primarily, Siberia and the Far East.

Lack of complexity or unity of approach in terms of management inhibits the multiplier's effect.

On one hand, there is certain progress. For example, Rosneft and NOVATEK announced the launch of projects in the Far East and the Murmansk region (shipbuilding and construction of submersible platforms for future LNG projects). At the same time, these projects are aimed at mass-replicating previously tested foreign technological solutions, while discounting the shipbuilding experience of Tyumen, Krasnoyarsk, and Omsk (which have existing shipbuilding and ship repair facilities).

As part of Rosneft's projects, the participation of Russian suppliers from Siberia and the Urals is still limited to ensuring the supply of materials for Arctic projects. An example of that is the delivery of rolled metal products for the Zvezda shipbuilding complex currently under construction in the Far East. It must be acknowledged that a significant proportion of domestically-produced equipment does not meet the requirements in terms of product range, quality, or delivery time, since Russian companies working in the field have no experience of participating in large-scale Arctic projects. The Russian manufacturing industry – including knowledge-intensive production required for the Arctic – finds itself in an institutional trap.

The experience of NOVATEK, a pioneer of high-tech business in Russia's North, is especially telling. Since the economic efficiency of a project is in direct relationship with the level of technology and equipment, operators usually prefer to buy ready-made solutions offered mainly by foreign suppliers providing equipment and technologies.

After the launch of the Yamal LNG project and the start of preparations for the Arctic LNG-2, NOVATEK began concentrating more on the participation of Russian contractors. At the same time, Russian industrial production is largely founded on localization of foreign technologies and capacity expansion; the resulting effects are 'latitudinal' in nature and, as of yet, never go beyond the borders of Russia's regions that house new production facilities or ports. In fact, most Russian LNG projects are based on import substitution and localization of imported technologies. However, it is expected that NOVATEK's third LNG project in the Arctic – Ob LNG – will be powered by a Russian patented LNG technology called Arctic Cascade [*Chervonnaya* (2) 2019].

This makes one wonder: why is it taking Russia so long to launch these LNG

projects in the Arctic? We believe there are several key reasons:

- a weak and inefficient state system of scientific and technical programming (the scientific and expert community has been talking about LNG-related trends in training and education for decades);
- lack of willingness within the domestic business community (primarily large corporations) to cooperate and interact with domestic companies working along the same lines; proclivity to seeking and implementing the most economically viable solutions by adopting an 'individualistic' approach based on seeking preferential treatment and circumventing rules (which at first may seem much more profitable than relying on the synergy produced by cooperation, whose benefits are not as easy to see at the early stages);
- a management system for the development and use of natural resources (both in the country as a whole, and, more specifically, in the Arctic) that is inadequate to the tasks and challenges of the modern economy.

Each country has its own customs and norms regulating the management of its land, water and mineral resources. Still, all positive experience deserves to be studied and analyzed (as a way to improve the system even further). Our analysis of the system used to manage the mineral resource potential of the Norwegian continental shelf explains the reasons behind its success:

- proactive scientific and technical analysis (including the socio-economic component) and assessment of emerging problems and potential solutions;
- 'forcing' companies with mineral rights to cooperate (in the form of joint financing of scientific developments and university laboratories, support for 'common' specialized organizations, such as SINTEF);
- existence of a close relationship (from the stage of granting mineral rights) between the development of natural resource sites (not only hydrocarbons) and the creation, development and subsequent use of domestic scientific and technical potential.

As a result, Norway creates, applies and exports 40% of all scientific and technical services and products used in the development of hydrocarbon resources, which earns them more than 450 billion Norwegian krones (over $50 billion) annually (!). The strategy of the Norwegian University of Science and Technology titled "Better Resource Utilization in the 21st century" (BRU21) is based on an approach that focuses on multiplier effects of cooperation between different scientific fields and different companies [*Kryukov* 2003, p.94-95; *Weber, Kryukov* 2016, p. 32-55; NTNU Strategy for Oil and Gas 2017; *Leskinen, Bekken, Razafinjatovo, García* 2012].

In our view, the fact that the development of Russia's Arctic is dependent on several major projects is one of the limiting factors towards the goals of both achieving necessary multiplier effects and realizing the socio-economic potential of Russia's natural resources. What we need is not just large-scale projects, new shale platforms or LNG plants – but also an innovation-oriented environment that stimulates the growth of various types of companies. Small and medium-sized businesses are simultaneously the end product and the driver of such an environment. Small companies can work effectively with small oil fields and deposits, and the service sector – which is currently covering the needs of large companies with their massive projects – can become a place for small companies to apply their strengths, and also an environment that allows to make use of unique local skills and expertise.

4.2 FOR PEOPLE – OR AT PEOPLE'S EXPENSE?

More than 5 million people live in the Arctic Zone of the Russian Federation. A significant proportion of these people live in cities and urban-type settlements. The indigenous people of the Arctic (the peoples of the North) either live in settlements or lead a nomadic lifestyle. Russia's Arctic is significantly more urbanized compared to other countries.

A considerable number of its population centers are single-industry cities and towns (mono-towns). They were created for the development of region-specific resources. Managing these population centers turns especially difficult when the development of the local resource nears its the final stage – followed by the closing of the single enterprise holding the town together. One of the modern features of mineral resources development both in general and in the Arctic, specifically, is wider use of minimally manned (or unmanned) technologies for managing technological processes. In these cases, usually the most skilled and qualified personnel can live at a considerable distance from the facilities they manage – in other towns and settlements located outside the Arctic.

Using remote operations centers to monitor the production and make decisions in real time (based on data collected from multiple facilities) with limited physical presence at the field is an example of the many ways the oil and gas industry can benefit from digitization. This trend is expected to reduce the number of field personnel, improve the quality of management and move highly qualified workers from the fields to operations centers. These centers can help reduce the costs associated with moving the workforce, but also significantly reduce the number of jobs available in the Arctic. This reduction in employment in the mining regions is expected to be partially offset by the creation of 20 thousand new jobs in remote population centers. Remote operations will also allow companies to identify problems at an early stage, leading to increased production volumes. The planned cumulative effect is expected at about $140 billion. For example, in Yamalo-Nenets Autonomous Okrug, an operations center was opened for Gazpromneft Muravlenko, giving it the ability to make decisions based on data from remote monitoring and live analysis of production processes. The company can now make decisions remotely with respect to stabilizing and increasing oil production, tackling emergency situations, operating wells, equipment, measuring instruments, facilities and communications.

All of the above highlights the 'perennial' issue of settlement policy in the Arctic. It is becoming more and more obvious that we need to follow a path that would:

a) provide all Arctic residents whose physical presence and work is required in the region with decent and modern living conditions;
b) give the indigenous peoples of the North an opportunity to lead a traditional way of life in places and territories where these activities are determined by natural, cultural and historical factors and conditions.

Again, it should be emphasized that every approach with respect to settlement in the Russian Arctic or solving the social problems of its various population groups is based on procedures and norms closely tied to the process of management of natural resources in each specific area.

For example, in 2017, the town of Mirny in the Republic of Sakha (Yakutia) faced serious problems after the closing of the Mir diamond mine following an accident. We believe that these problems have to do not so much with the city or its population, but rather with the Russian diamond industry, in general. When the development of a natural resource has passed the peak of production, it is the duty of the

state to rethink the approach to the development of the remaining resources. We need to endorse new innovation-oriented companies, encourage different approaches to exploration and development, and formulate new social and environmental guidelines. It is thanks to this approach, for example, that single-industry mining towns in Canada's Arctic are doing much better at the moment, and can still look into the future with hope. Each new step is determined not so much by the amount of minerals left in the earth and how to extract them, but by the associated risks to the town's integrity (both economic and social) and how these risks can be safely distributed across all the parties involved.

One of the key features of modern systems of management used for the development of natural resources – both in general and, more specifically, in the Arctic – lies in their integrated approach and their focus on socio-economic well-being. Unfortunately, the dominant model is still the one that emerged back in the 'fat years' during the 2000s (when oil prices were high) – provision of resources and decision-making take place at the federal level, straightforward taxation, preferential advantages, ease of administration. These approaches do not meet modern requirements and standards when it comes to the use of natural resources; in no way do they contribute to solving socio-economic issues that are becoming more and more prominent on the agenda.

In addition to the above-mentioned modern problems related to the development and use of natural resources in the Arctic, there is also a wide range of 'retrospective' problems: specifically, elimination, rehabilitation and remediation – with respect to the damage done to nature and subsoil over the years. Earlier, the approach was simple: we will start addressing these problems when the time comes, but for now we can set them aside. The time has finally come – but now we have insufficient financial resources to develop practical solutions [*Anashkin, Kryukov* 2012, p. 18-27].

5. Ways of helping the Arctic economy – the search continues

Actions taken by different countries in terms of economic development of the Arctic are aimed primarily at setting frameworks and creating conditions for the launch of innovative processes that are expected become the foundation basis for solving any arising issues. The keywords are 'interaction', 'cooperation', 'skills and knowledge exchange'. For example, Norway's Ocean Strategy (much of the country's activity in the oceans takes place in high latitudes) is built on the assumption that, "if we are to ensure that Norway remains a leading ocean economy, public authorities must facilitate further growth of established ocean industries, the development of new industries, and, not least, that sector specific knowledge is shared and utilized across the industries. The policy measures put forward by the strategy will contribute to furthering and strengthening the efforts for increased transfer of knowledge and learning across the ocean industries, and to facilitate collaboration." [New Growth, Proud History 2017]

The details of modern Russia's return to the Arctic were outlined in the State Policy of the Russian Federation in the Arctic for the Period until 2020 and Beyond, approved by Vladimir Putin on September 18, 2008. The provisions of this document were re-imagined and expanded in the Strategy for the Development of the Arctic Zone of the Russian Federation and National Security up to 2020 (approved by the President of Russia on February 8, 2013) and in the state program "Socio-economic Development of the Russian Arctic Zone up to 2020" (approved by the order of the Russian government on April 21,

2014), as well as the presidential decree no 296 dated May 2, 2014 ("On the Land Territories of the Arctic Zone of the Russian Federation"). These documents outline Russia's strategic interests in the Arctic. These interests include, above all, the use of Russia's Arctic Zone as a 'strategic resource base' for the country and the role of the Northern Sea Route as Russia's single transportation corridor in the Arctic. Given the specifics of the region, the proposal was to advance Russia's presence in the Arctic by creating so-called 'core development zones'.

Currently, a new bill on the development of the Arctic is being drafted, with a focus is on providing benefits, preferences and incentives to companies that are planning to launch their projects in the region. "The idea is to extend the reach of the existing institutions working in the Far East so that they would cover the Arctic region, as well. This means helping people buy land, easing the burden of inspections, providing loans at a reduced rate. Preferences will be granted to both small and large businesses, but only in case they are working on new projects. Hydrocarbon production, LNG and other projects will also be able to receive preferences... for each specific project, the terms and details of financial incentives will be discussed individually. We will also consider a zero tax on profits, land and property for a limited period, and the option of reducing the tax burden for the entire time the project is under construction, Trutnev explained" [*Trifonova* 2019; *Petlevoy*, *Sterkin* (2019].

Conclusion

Russia's Arctic is in search of a model that, when realized, would allow for a better integration into the national economy. That said, the success of any chosen model would depend on whether it is able to successfully combine the distinctive character of the Russian economy with the overall economic trends observed in the Arctic. How does one strike a balance between these general trends, on one hand, and national (historical and geographical) features, on the other? The solution to this complex problem must integrate best practices of the past (such as the role of large-scale projects) with further efforts aimed at stimulating businesses and promoting entrepreneurial activity. In this context, science and education play a particularly significant role, which was the reasoning for the establishment of federal universities in Arkhangelsk, Yakutsk, and Krasnoyarsk.

The key feature of the Arctic economy is that nature-related risks and economic risks are very closely interconnected. Economic activity in the Arctic (its market, state-run, and traditional segments) is characterized by its own specific forms of coordination. This is why, for example, both the North and the Arctic region reject the intense competition and rivalry inherent in the economy of their southern neighbors. More specifically, it is perceived as impractical to have a separate transfer economy (primarily defense-oriented) and an independent market-oriented economy at the same time. Many facilities (primarily infrastructure) are designed with multifunctional use in mind – to support both the needs of state administration (including defense) and various economic activities (for example, ports and terminals, warehouses, settlements, etc.). At the same time, the Arctic economy is in the process of continuous change, as the ways and modes of managing the region's economy are undergoing transformation. Models based on a strict line of authority, on governance from a single decision-making center will gradually give way to a different model – one based on cooperation, partnership and reciprocity.

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Russian Experience

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Natural Resource Economy and Territorial Organization of the Economy of the Arctic and the North of Russia

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ABSTRACT. *The article shows that the modernization of existing and the creation of new industries in the developed territories, and their infrastructure development are a priority in the development of the productive forces of the North, including the Arctic. The optimism about the Arctic vector of development, according to the author, should be moderate. The main directions of modernization of the existing economic systems are considered. These areas are associated with the forms of placement of production and settlement of the population in the form of territorial and economic complexes, geographically and economically remote industrial centers, and the periphery of the predominantly rural type. Attention is focused on the rise of the role of the natural factor in the socio-economic development of the Arctic and Northern territories and the need for interregional integration in solving the problems of environmental protection. The solution to the problems of the Arctic and the North is connected with the improvement of relations in the system of economic federalism. The main point here is the need for coordination of public, state, and corporate interests for the sake of improving the standard of living of the settled population, providing the national and world markets with raw materials.*

KEYWORDS: *North, Arctic, natural resources and revenues, territorial and sectoral problems, integrated territorial and economic systems, interregional (neighbor) integration*

Introduction

The current Russian regional policy concerning the Arctic and the North underestimates the importance of the existing there territorial and economic systems (TES). Strategic federal documents primarily focus on the development of hydrocarbon deposits, the paramount im-

portance of the Northern Sea Route, and the creation of defense bases. Moreover, on the contrary, internal development strategies of all Arctic and northern regions focus more on refining the already existing extractive industries, raw material processing, optimizing the housing and public utility sector, road maintenance, power networks, and, to a lesser extent, the development of new territories and resources. Regional and municipal authorities' are primarily concerned with the improvement of the quality of life and the modernization of the existing material and technical basis of production. It is in the same vein that each region participates in the scientific and technical preparation for the development of Arctic resources [Selin, Bashmakov 2013; Lavrikov 2017]. This also requires the establishment of a legal and institutional foundation for the sustainable development of the Arctic Zone of the Russian Federation (AZRF) [*Leksin, Porfiryev* 2017].

A legally defined *cooperation among the federal, regional, and municipal authorities* could have a positive impact on the development of Arctic and northern regions, primarily in the area of a resource-based economy. This will, to some extent, help bridge the excessive spatial gap between the sites of production and revenue realization from natural resources. The second condition for the socio-economic development of the Arctic and the Russian North is *the streamlining of the economic management and the distribution of productive forces, which would account for the extreme climate and the use of appropriate new production technologies*. Here it is essential to identify the logic behind the fading mineral mining, the maximum possible preservation of the existing fuel-energy industries and natural-resources sectors, the regeneration of biological resources in the tundra and taiga. The third condition is *economic integration*. These three conditions should correspond to the Arctic and northern territories' management framework (including the legal framework, economic relations, technical rules and standards, various income regulating factors, etc.).

Resource-based regions in the system of economic federalism

Economic geography and regional economics pay special attention to resource-type regions. The idea to highlight them belongs to M.K. Bandman, who, in the 1990s, organized research on this topic, involving employees of many academic institutes. This scientific movement is still on the rise [*Kuleshov*, 2017]. It must be emphasized, against the context of this Article, that the problems of such regions persist due to the significance of natural resources, especially when it comes to transforming the natural and resource capital into financial and, later, social capital.

The share of natural and resource industries in the GRP of the northern regions varies from 25% in the Kamchatka Territory to 70% in the Nenets Autonomous District (2016). All over the North, the nature and dynamics of almost all types of employment are determined mainly by the organization of the extractive industry, its institutions, and the role played by the natural factor in the scientific and technological development of the country.

If one were to arrange natural objects and resources of the Russian North, including the Arctic, in the order of their relative importance for the population and national and regional economy, then the sequence would be as follows: land resources, boreal forests, tundra vegetation (mosses and lichens), rivers and lakes, oil and gas, ore minerals (diamonds, gold, tin, nepheline-apatite ores, bauxites, titanium, iron, manganese, nickel and cobalt, rare and rare earth metals, etc.), coal, non-metallic raw materials. This ranking re-

flects the hierarchy among separate natural resources in the life of the Northerners, which often fails to correspond with the interests of large capital holders, resulting in a severe contradiction.

At the same time, to correctly define the strategy for the development of natural resource regions, the above ranking cannot serve as a supporting argument against the allegedly toxic dependence of the Russian economy on oil and gas. The development and exploitation of natural resources is a principal element of the socio-economic development of Russia and its northern regions.

It is in this aspect that many authors prove the need to form a new system of capitalization of labor and natural resources. Its national significance is reflected in the works of D.S. L'vov [*L'vov* 1998; *L'vov* 1999]. The regional view on rent taxation, accounting for geographical, mining, geological, and social conditions, was thoroughly analyzed by V.A. Kryukova, V.V. Shmata, I.E. Dmitrieva and other authors [*Kryukov* 2016; *Kryukov*, *Tokarev* 2005; *Kryukov*, *Tokarev*, *Shmat* 2007; *Lazhentsev* 2002]. It was shown that the "ideal" calculation, removal and distribution of resource rents could significantly change not the volume and structure of GRP, but increase the incomes of the population and territorial budgets. However, methodological difficulties in identifying a practically-acceptable decision on the definition, calculation, and removal of rent income have also been identified.

Let us address the following fact at the outset: the share of taxes contributing to the federal budget and the consolidated budgets of the northern regions of

Table 1. Mineral extraction tax (MET) as a part of the GRP and tax revenues of the northern regions of Russia, 2016*

Russia and the Northern Regions	GRP, billion rubles**	Tax Revenue, Billion rubles	MET, Billion rubles	MET	
				As a share of the GRP, %	As a share of tax revenue, %
Russian Federation	69254	14386	2929	4.2	20.4
Nenetsky Autonomous Okrug	256	62	52	20.3	84.0
Khanty-Mansi Autonomous Okrug	3031	1701	1234	40.7	72.5
Yamalo-Nenets Autonomous Okrug	1964	811	537	27.3	66.3
Republic of Komi	547	148	68	12.4	46.0
Sakha Republic (Yakutia)	869	160	64	7.4	40.1
Krasnoyarsk Krai	1765	371	121	6.9	32.7
Chukotsky Autonomous Okrug	66	16	5	7.6	31.9
Magadan Oblast	147	19	5	3.4	26.8
Sakhalin Oblast.* **	768	178	9	1.2	5.1
Arkhangelsk Oblast	428	53	2	0.5	4.0
Republic of Karelia	233	26	0.8	0.34	3.0
Kamchatka Krai	198	31	0.6	0.3	2.0

* Calculated according to the Federal Tax Service of Russia // http://www.nalog.ru, last visited 12.12.2019.
** Total of the regions of the Russian Federation.
*** Excluding payments under product sharing agreements

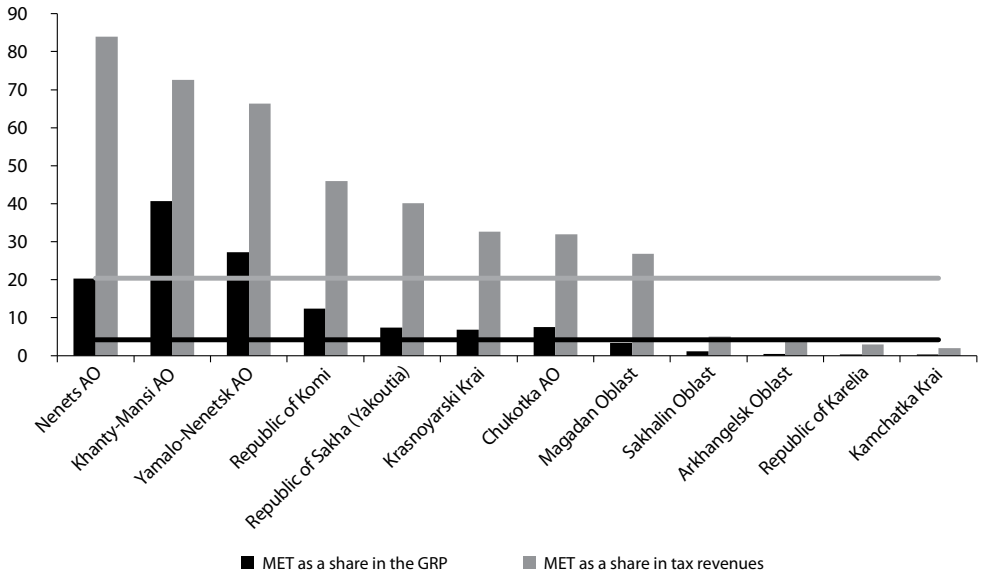
the Russian Federation (in aggregate), respectively, amounted to 48 and 52%, that is, quite an acceptable figure. But this ratio varies significantly across specific regions. Thus, in 2016 the ratio of tax revenues of federal and territorial budgets was (in percentage): In the Khanty-Mansi Autonomous Okrug - 85:15; in the Yamal-Nenets Autonomous Okrug - 81:20; in the Nenets Autonomous Okrug - 77:23; and in the Komi Republic – 56:44.

It should further be noted that these proportions are influenced mainly by the distribution of taxes in the environmental management system. Redistribution of natural-resource taxes and payments in favor of federal or territorial budgets depends on the type of resources (taxes on oil, gas, coal, land, forests, water are distributed in different ways). Therefore, the very problem of the unsatisfactory state of territorial budgets should also be considered in a differentiated manner. It is particularly acute in the regions specializing in oil and gas, but hardly noticeable in places dominated by fishing, agriculture, and forestry [*Chuzhmarova* 2009]. The Mineral Extraction Tax takes the leading role (see Table 1, fig. 1).

The dual importance of MET for the socio-economic development of the Arctic and other northern regions is that, on the one hand, the Federal budget enjoys a legal priority when it comes to natural resources of statewide significance. On the other hand, the close ties of the territorial budgets to low-income types of resources and economic activities prompt a constant deficit, which leads to a sense of injustice and a desire to replenish the resources of territorial development through high-income oil and gas production.

Deviations from the principle of social justice in relation to the Arctic and the

Fig. 1. Mineral Extraction Tax (MET) as a share in the GRP (black) and tax revenues (grey) of the northern regions of Russia, 2016 (the lines show the average share in the Russian Federation).



Source: Statistical Tax Reporting of the Federal Tax Service of Russia // http://www.nalog.ru, last accessed 12.12.2019.

North are not so much due to the shortcomings in the implementation of regulations on guarantees and compensation for additional production costs and life support in a challenging and extreme climate, as it is due to a violation of the foundations of economic federalism (including the level of municipalities), the unstable business interactions, regional governments, and local self-government bodies [*Loginov* 2007]. This led the northerners to demand the creation of so-called "funds for future generations." The experience of foreign countries and regions demonstrates the overall effectiveness of such funds [*Lazhentsev, Dmitriev* 1993; *Hikl* 2004], but one should account for specific Russian circumstances. Regional funds for future generations should not be created, absent the removal of the existing obstacles, and present a well-developed method to harmonize interests between the population and the various levels of government. Besides, in Russia, the role of such a fund is, to some extent, played by the National Welfare Fund. However, at present, it does not stand true to its name.

Even less acceptable is the proposal to equally distribute taxes and fees between federal and territorial budgets. For some resource-type regions, this would lead to the surplus of funds and their inability to spend them, while depriving others of interbudgetary maneuvering and even reducing the volume of budgetary funds.

The correct way is to reform the entire fiscal system of the country, based on the following foundations: a clear systematization of taxable activities, prioritizing direct taxes over the hidden ones, and correctly assigning sources of taxation to the appropriate budgetary levels, and finally, fixing development expenditures, etc.

While a detailed analysis of the above would be outside the scope of the present article, the difficulties of the fiscal reform encourage to look for development resources for the Arctic and North regions in other spheres of economy and finance.

An example of this is depreciation, which is of critical importance for the capital-intensive production of the North. During economic crises, the depreciation decreases to 10–12% of its original value. However, the accrued depreciation is mostly "ground off." Thus, the share of depreciation in capital investments in the fixed assets of the Komi Republic in 2012 was 14.8% (32.8 out of 221.1 billion rubles); the total amount of depreciation was about 50 billion rubles; as a source of investment, therefore, 65% of depreciation was used, the other part (35%) was used for purposes other than intended.[1] In 2016, the total depreciation amounted to just over 2 percent of the book value of fixed assets at a six-percent renewal rate. This means that 64% of capital investments in fixed assets were made on profit, bank loans, and public finances.[2] We propose to implement a strict depreciation policy when depreciation charges can be used only for capital construction, modernization, and the introduction of new equipment.

Rationalization of economy and forms of distribution of productive forces

Mining. The main problem here is the difficulties of overcoming the geographical and economic gap of new deposits and the lack of logistical and financial resources for their development. This problem is further compounded by a low level of geo-

1 Since 2012, investment statistics have not separately specified depreciation.

2 Note that in developed countries, even with their vast financial-credit system, the share of depreciation in fixed investment is 55–60%.

logical exploration work, weak knowledge of the properties and qualities of natural materials, non-integrated use of resources, absence of the standard order of formation of investment funds. New methods of resource and mineral resource assessment are slowly being developed, especially in the already developed geological provinces.

The challenges of the *coal industry* stem from the difficulties of its diversification through the integrated use of coals, the production of liquid fuels, adsorbents, carbon-graphite materials, and thermographites. In *oil and gas*, the production efficiency increased due to the combination of vertical and horizontal drilling, the creation of underground gas storage facilities, overcoming the risk of ultra-high terrastatic pressure, the transition to new oil processing technologies. In recent years, improvements in the Arctic and North mining operations have been linked to the implementation of basic innovations such as power-loaders, remote and self-guided equipment, wireless communication systems, mining pressure management, etc. [*Lazhentsev* 2006]

In our opinion, the prospects of development of mineral-raw materials in the already developed territories of the Arctic and the North should be linked with the assessment of the expediency of *organizing production and territorial holdings*. This corresponds to A.A. Mints's long-standing idea of territorial combinations of natural resources as a natural basis of complex territorial organization of production [Mints 1972].

Bio-resource economy. Numerous works on *agriculture and food security in the Arctic and the North* show the paramount importance of the allocation of land according to the type of ownership.

The northern regions' problems arise out of the fact that the federal policy cost them a significant part of the lands, which had previously been set aside for agriculture. The remaining lands are misused, only nominally listed in the books of agricultural organizations, saddling their work. The current food security problems pertain not to the fact that Russia imports much food, but rather that the imported and domestically produced goods do not meet the safety and health standards. The northern territories (unlike many others) are most suitable for organic agriculture; they are less saturated with chemicals and can be relatively easily incorporated in adaptive-landscape farming [*Lazhentsev* 2018].

The recovery of *tundra geosystems* has changed for the worse. The result is a crisis condition of the food supply for reindeer herding. The number of domestic deer and the natural resource potential of the tundra must be urgently balanced [*Elsakov* 2014]. Little attention is paid to the sustainable use of biological resources of northern seas [*Vasiliev, Zabolotskiy* 2010].

The challenges of modernizing *forestry and sustainable forest management are closely related to the proper account, evaluation, and capitalization of forest resources*. The integration of logging and woodworking persists as a general development direction. What makes it more pertinent is the current fragmentation of the logging industry into hundreds of temporarily created brigades. These allegedly small enterprises cut about 10-15 thousand m^3 of forest per year, without hiring the locals or building infrastructure. Small enterprises of the forest sector should be included in the general technological forest complex, have high and sustainable production, technological and socio-economic sub-contracts with medium and large enterprises (firms). Permanent forest management on a reproductive basis can only be achieved through relatively large-scale farming, encompassing (8-10 thousand square kilometers).

First of all, the forestry sector should be put in order. The satellite imaging of taiga territories in the European North of Rus-

sia reveals empty spaces, on which the forest has not been restored. These vast, visible gaps occupy no less than a third of the area officially listed as "covered forested." For example, pine woods located within 50-60 km around Syktyvkar, are subject to mass deforestation. Such barbarism is almost impressive. In the meantime, forest inventory data have not been updated for decades.

Biologists and economists are primarily concerned with the dynamics of forest-forming species. The bio-resource economy plays second-role to fuel and energy and mineral resources. However, to organize life in the Arctic and Northern Regions, it should soon become a priority. Therefore, capital flows from the mineral industries into agriculture, forestry, and water sector require more precise regulation. As of now, this has to be conducted through the state budget system.

The development of these industries requires more funds, taking into account their importance for the ecology. The adverse effects of industrial development of the Arctic and northern territories are well-known: intensive disruption of the structure of a biological community, air pollution, chemical contamination of soils, depletion of surface freshwater and fish stocks in reservoirs, intensification of negative permafrost-hydrological processes, increase in the incidence of population morbidity.

Ecologists and biologists alike advocate for a positive approach to environmental protection. This includes, for example: using new technologies to remedy the damage done by mining, or creating artificial meadows in the tundra to provide a reliable food supply for livestock, establishing regimes for grazing reindeer and preserving mosses and lichens; developing construction standards for permafrost conditions and much more. Specialists in geoinformatics have also advocated for nature monitoring, which would systematically cover all points of contact of fauna and flora. Special attention is drawn to the development of a national network of interregional reserves and parks with limited permitted technogenic activities, and the delimitation of territories of traditional uses by indigenous peoples.

The integrated use of biological resources is directly related to medicine, in particular, to human adaptation to severe climate and health protection of various groups of people: temporarily and permanently residing in the area, indigenous and "alien" peoples, those of various age groups. Physicians have obtained scientific results for rationing not only medicinal treatment but also for the use of bioactive substances obtained from local raw materials, as well as nutrition, which takes into account the intensity of physical activity.

From the standpoint of developing the Arctic Sector, the development and creation of large scientific-technological and production programs and projects "specifically for the Arctic" requires such substantial intellectual and financial resources, that the science itself becomes its material and technical base. [*Lazhentsev* 2016].

The solution to the mentioned national economic problems is closely connected ***with the forms of territorial organization of production and economic*** *systems* as a whole. The Author identified three types of territorial-economic systems in the North [*Lazhentsev* 2015]. Table 2 indicates them in connection with the AZRF.

Territorial economic complexes[3] are based on non-expendable resources, and everything connected and forming a part of such complexes requires modernization. Their organization is justified from the stand-point of creating territorial production complexes in the context of goal-oriented planning [*Zhukov* 2017].

3 Murmansk, Apatito-Monchegorsk, Arkhangelsk, Vorkuta, Salekhards (Including Labytnangi), Novo-Urengoy, Norilsk.

Industrial periphery[4] is mainly engaged in the development of minerals and servicing the infrastructure. These settlements usually develop in a boom-bust fashion, and they eventually and inevitably die out, failing to find a new economic foundation to hold on to. Some peripheral centers could serve as necessary facilities for the organization of watch, district, and expedition methods for the development and processing of minerals.

Rural periphery[5] (not only of agricultural but also all of those settlements which adhere to a rural way of life[6]) could be a part of "center-periphery" if equipped with a specific infrastructure, namely: stable year-round transport with use of river navigation where necessary, floating pontoon bridges, winter roads, small aviation; telephone, postal, telegraph, cellular networks, television, and Internet, using high-speed fiber and space communications.

This system adequately reflects, to a large extent, the differentiation of the Arctic space in terms of the forms of the organization not only of production but also of the population [*Fauzer, Lytkina, Smirnov* 2017]. This system is entirely consistent with the idea of a "return" trajectory of the development of resource-based regions – that is, the development and use of the previously "missed" mineral-raw resources and "unnoticed" sources of "unconventional" fuels. At the same time, among the drivers of the transition to a "return" trajectory are not only (and not so much) technologies, but "new quality of the institutional environment" [*Kuleshov* 2017, p. 12].

Interregional integration as a factor in the development of the Arctic and northern regions

Interregional integration also touches upon all the classic forms of the organization of production and the social sphere. Integration is viewed as a managed cooperation [*Minakir, Demyanenko* 2014].

The inclusion of the North and the Arctic in the spatial integration of Russia is primarily due to the formation of transport infrastructure in a grid-like pattern: that is, the intersection of latitudinal roads with large rivers running from the south

Table 2. The population of AZRF in 1990 and 2017, according to the types of economy, in thousands of people.*

Types of economy	The number of TES	1990	2017	Dynamics, 2017 to 1990 , %	Structure in 1990 , %	Structure in 2017, %
Territorial economic complexes	7	2194	1667	76.0	67.9	69.3
Industrial periphery	18	425	339	93.8	13.2	14.1
Mostly Rural periphery	35	612	400	65.4	18.9	16.6
Total for the AZRF	60	3231	2406	74.5	100.0	100.0

* The results for 1990 were determined by the Author based on district and municipal data available online. The calculations for 2017 are based on the "Population Estimate in the territories of the Arctic zone of the Russian Federation."

4 Cities: Zapolyarny, Nickel, Pechenga, Kovdor, Belomorsk, Kem, Onega, Naryan-Mar, Nadym, Gubkinsky, Muravlenko, Tarko-Sala, Dudinka, Tiksi, Bilibino, Pevek, Anadyr (including urban settlement Coal mines), as well as the shift settlement of Sabetta.

5 Settlements not included in the first two types of TES

6 For example, in AZRF, 253 thousand people were registered as of 2017; according to our estimates, 400 thousand people lived in rural settlements of the zone at that time

to the north. Meridional integration concerns not only the leading mining and processing industries but also science, construction methods on frozen soils, the conduct of northern commercial, agricultural and greenhouse farming, the development of samples of winter clothes and shoes, etc. What is studied and created specifically for the North, can then be used elsewhere just as effectively.

The relationship among the regions is of particular importance when it comes to resettlement. The Middle North and the pre-northern regions are more well-suited than the southern regions for the resettlement and residence of migrants From The Far North. At the same time, the same regions should become centers for the training of qualified personnel throughout the North.

The mismatch of federal districts with the economic zoning and the lack of integrated territorial administration still preclude binding the socio-economic space. According to the Author, this all the more speaks to the crucial role of neighbourly relations.

Development programs of vast territories likewise have not yielded a positive result, for example, as is the case with the Far East. The accession of the Republic of Buryatia and Zabaykalsky Krai to the far Eastern District may create additional difficulties for a truly prom-based control. Therefore, the desire of leaders of some constituencies (2-3 neighboring entities) to unite their efforts in tackling their tasks is not incidental.

The common grounds for neighboring integration for the Arctic territories can be determined as follows: preservation of natural landscapes, improvement of hydrological regime of rivers and lakes taking into account the high environmental importance of global watersheds, aligning the economic functions of tundra and taiga with their natural-resource capacity, restoration of river navigation, road construction, creation of thermal and electric power systems, processing of solid and gaseous wastes, cooperation in front-end loading and design. Integration should also be considered in terms of pooling of regional resources and efforts to develop their peripheral "corners." Neighboring municipalities of neighboring regions could have a single program of active development, taking into account the environmental advantages of the peripheral.

Conclusion

The Author recommends the following:

- strategic planning of socio-economic development of the Arctic and northern regions has to pay more attention to the modernization of existing production facilities, the infrastructure development of the developed territories, improvement of the quality of life of the local population, taking into account the characteristics of traditional economy of small peoples;
- to develop and implement such technologies, which allow working effectively and for a long time in already developed fields and areas;
- to take into account the increasing role of biological resources as the basis of life-sustenance. This can be done through by transferring financial capital received in the field of mineral resource management into a bio-resource economy;
- to improve the licensing of mineral resource management with mandatory participation of regional governments and to provide for additional conditions necessary for the systematic development of the mineral deposits and social development of the territories;
- to distribute the entire agricultural land fund according to ownership

and use; to strengthen the role of municipalities in land management;
– to organize forestry under international rules of sustainable forest management; to restore forestry agencies as supervisors of forest reproduction and to strengthen federal control functions;
– to strengthen economic ties among the regions (primarily, neighboring) with the formation and implementation of joint programs in the field of infrastructure development, natural resources management, and environmental protection

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Russian Arctic: The Logic and Paradoxes of Changes

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ABSTRACT. *The paper contemplates massive transformation processes in the Russian Arctic zone, identified by the authors as the "re-development" of the Arctic, which integrate resource-intensive but necessary exploitation of the huge "Soviet legacy" and construction of the novel industrial and social facilities and infrastructure. The key role of Russian Arctic "re-development" as the most appropriate model at the country and regional levels is substantiated. The success of the Arctic development will depend to a decisive extent on the advanced revision of the basic provisions of the current state of industrial, energy, transport, demographic, etc policies. The paradoxes of the demographic situation in the Russian Arctic are considered and the directions of the organization of health care system in this macro-region are introduced taking into account: (a) specificity of the urbanized and rural*

areas in the Western and Eastern (beyond the Urals) parts of the Russian Arctic; (b) specific needs for medical service provided to miners and metalworkers, servicemen, sailors and shift workers as well as communities of the indigenous peoples of the Russian North. Peculiarities of interaction between the state policy and that of the big corporations in the Arctic are disclosed including those concerning climatic risks mitigation. Given this perspective the public policy measures to regulate greenhouse gas emissions proposed by the Ministry of economic development of the Russian Federation are critically assessed. In conclusion, the consistency of recent changes in the development policy in the Russian Arctic that should result in organization of a special Federal ministry for the Arctic is substantiated.

KEY WORDS: *Arctic, re-development, population, indigenous minority peoples of the North, state, large corporations, demographic paradoxes, health, climate change, public administration*

Statement of the problem

The Russian Arctic is a macroregion of our country most riddled with paradox, combining both unique and typical features, traditions and innovations. The Russian Arctic zone is undergoing a rapid and distinctly different kind of transformation processes, which require a tailored scientific approach to determining their genesis and essence in order to define and subsequently implement a government policy in the Arctic. The authors believe that the first requirement for that is to form scientifically sound notions about the subject of such a policy, which is now fundamentally different not only from the way it was at the end of the Soviet era and in the early 1990s, but also from the Russian Arctic of the 2000s. These notions are to be based on extensive data about the developments in the Russian Arctic and a unique methodology for its analysis proposed by the authors, as well as new approaches to understanding sustainability of the Arctic territorial system and assessing the possibilities of combining the goals of state governance and corporate interests in the context of the controversial effects produced by new external and internal factors.

In the light of this, there is a special cognitive and practical interest for the following issues that experts see as the most controversial:

- the very feasibility of objectively assessing the social, economic and political situation in the Russian Arctic considering the widespread opinion that the input data is of low quality (incomplete or inaccurate);
- the paradigm of the current transformation processes in the Russian Arctic and their interconnection with the developments across Russia, primarily nationwide reforms;
- the actual role big Russian corporations play in the "re-development" of the Russian Arctic;
- the role and form of state governance in the transformation processes in the Russian Arctic;
- the possibilities of solving the long-standing issue of creating the national "Arctic law" as a key factor in securing the interests of the state, the business community and the people in the transformation processes in the Russian Arctic.

Any of the aforementioned issues can serve as a focus for separate articles, while the format of this article allows us only to outline the essence of them and the interconnection, which we believe is of the utmost importance at this point.

Informational and methodological options for systemic analysis of the current situation in the Arctic

The existing database on the current situation in the Russian Arctic and prospects for its development is huge and constantly growing, thanks to the international network of universities, colleges, research institutes and other organizations involved in education and research in the Circumpolar North [*Moskaleva*, *Osipov*, *Eremenko*, *Hirshberg*, *Kullerud*, *Radford*, *Herzog* 2016]. Fundamental and practical issues related to the Russian Arctic have been thoroughly analyzed in articles by Russian researchers and academicians. In 2018, the authors proposed and along with researchers from a number of aforementioned institutions participated in creating a research and analysis publication about all research studies conducted in 2000-2017 and promising studies of the social and economic issues in the Russian Arctic to be completed in 2018-2021. The publication also contained short descriptions of key personalities and an annotated list of publications (over 4,000 items) and thesis papers.

The abundance of input data on various aspects of Arctic-related issues creates both hypothetical opportunities and significant obstacles for its systemic analysis. In our experience, even statistical data from Rosstat requires correcting.

Unfortunately, many research studies of the Arctic are limited by their scope and allocated resources, and thus remain within the boundaries of traditional scientific specialization, which sharply decreases their effectiveness. This is evident from the fact that research studies on the current transformation processes in the Russian Arctic frequently fail to take into consideration the tremendous (and often decisive) impact made by the realities of Russian regulatory environment, i.e. the combination of procedures and restrictions on the authorities, individuals and legal entities and, no less importantly, the way they are implemented and perceived by society and individuals. The insufficient attention our Arctic experts pay to this issue becomes particularly apparent in juxtaposition to an array of studies on federal, regional and municipal law (including those that are especially significant in terms of analyzing the spatial characteristics of the Russian Arctic, constitutional and legal foundations of the territorial structure of Russia and about territories in public law [*Leksin* 2014; *Narutto*, *Shugrina*, *Isaev*, *Alebastrova* 2013]), with its recent addition in the form of thorough legal analytics methodology [*Isakov* 2016].

The heterogeneous and diverse issues in the Arctic, as will be explained below, all have the same roots and consequences, which prompted the authors to develop and use a methodology for studying the socio-economic and legal nature of the Arctic realities that would reflect their systemic nature to the fullest possible extent. Such is the methodology for systemic diagnostic assessment of socio-economic and other processes, situations and problems based on the principles of applied system analysis, which involves, first of all, insight into the systemic nature of these issues.

The authors also used a methodological approach to processing and analyzing input data through econometric operations, including correlation matrices and clustering indicators by correlation coefficients, thus forming the informational and methodological basis for the concepts introduced in the next sections of the article.

Genesis of existing problems in the Arctic

The current state of affairs in the Russian Arctic is in equal parts determined by the unique consequences of its post-Soviet transition and its close connection to the general situation in Russia. In our analysis we would like to draw attention to the fact that researchers barely delve into how the "Soviet legacy" functions and is utilized. While this legacy played an important role for the country as a whole (and served as a major reason for its stability in the 1990s), we have to take into consideration the problems arising from integrating the facilities created within the largely isolated and noncompetitive command economy into the new market economy. The prime example of this is the situation in the Russian Arctic.

Soviet and Russian researchers [*Aganbegyan* 1984; *Timoshenko* 2011; *Timoshenko* 2012] have conducted thorough studies on the development of the Arctic in the Soviet era, when over 90% (according to our assessment) of the economic and infrastructural potential capabilities that the Russian Arctic is to a certain extent utilizing even now were created. However, everything – from economic ties to social policies – has changed, and since the early 1990s the transformation of the "Soviet legacy" in the Russian Arctic has been proceeding in the form of "re-development", i.e. maintaining, modernizing or eliminating the non-competitive parts of the legacy, while altering motivations and paternalistic notions of the generation that grew up at the same time as they were set up.

In post-Soviet Russia, the Arctic turned into one of the most rapidly developing macroregions in a fundamentally different context of competitive market and social responsibility. We're seeing a more active use of the Northern Sea Route with new ice-class ships, upgraded or new ports and innovative logistics. The defense infrastructure network has basically been rebuilt from scratch. Largest and widely known hydrocarbon fields have been discovered and mined. In Murmansk Oblast, the production of non-ferrous metals and apatites is being expanded and modernized. In the northern parts of Krasnoyarsk Krai, the Norilsk mining and metallurgical combine facilities have been upgraded and relocated. In Chukotka Autonomous Okrug, large gold ore fields are being mined, with new ones readied for mining.

Admittedly, most new projects have been successful, but we cannot disregard the costs of bringing any "Soviet legacy" facility (industrial facilities, ports, housing, social infrastructure) up to date with new requirements. In some cases, it means cutting off the funding. It is clear that the towns and settlements that were established solely to ensure the operation of factories and facilities working with nonrenewable natural resources would eventually cease to exist. These Arctic towns, unlike monotowns which could no longer survive on noncompetitive economic basis, can't use the same approach of changing their specialization or utilizing commuting mechanisms. The related problems, as well as the combination of advantages and disadvantages that come with the "Soviet legacy" are an inherent part of the new "redevelopment" transformation processes in Russian Arctic. This should be properly reflected in the federal and regional budgets and funds allocated for the Russian Arctic, social and economic development priorities and all strategic development documents.

A key aspect of the suggested approach to studying the issues of the Russian Arctic is acknowledging that their essence and solutions are the direct result of the foreign, economic, social, financial and regional policies implemented over the last several decades. Without taking that into account, any attempts to resolve these issues and even create strategic documents out-

lining solutions will be doomed to remain limited by the Arctic geography, artificially separated from the developments across the rest of the country, and outside it.

Here are two specific examples concerning the "negative population growth and outflow of labor resources" in the Arctic, which the Strategy for the Development of the Arctic Zone of the Russian Federation and National Security up to 2020 (hereinafter referred to as the Strategy) recognizes as an Arctic-only issue. The out-migration of residents of the Soviet Arctic "capital" (as the town of Dikson was often referred to in the 1960s and 1970s), established in the Soviet times to perform tasks of crucial national importance, saw a ten-time spike, which was triggered solely by the fact that until recently they have been excluded from post-Soviet Russia's national policy. One of the reasons Chukotka Autonomous Region saw a three-time increase in "negative population growth and out-migration" was its swift and unjustified demilitarization – a reflection of the foreign policy adopted by the Russian federal government in the early 1990s based on the conviction that "Russia no longer has any enemies."

All the developments in the Russian Arctic are a direct consequence of the nationwide "transition process", with its paradoxical and uniquely shaped continuous reforms, all-encompassing and fast privatization, "budget federalism" and center-region relationships, unprofitable domestic investment, scaling down or closing down machine building, defense, technical and other facilities, social gap and so on, exacerbated by extreme external pressure (including in the form of sanctions) experienced by the entire country.

There is also new proof of a strong correlation between nationwide policies and the situation in the Russian Arctic. Only the successful implementation of the "digitalization" aspect of the national policy ensured the expansion and quality increase in digital communication between all Arctic towns. Russia's new military policy was the reason for the polar defense shield revival, which involved establishing a fully functioning network of nicely equipped polar towns. Modernizing and expanding ship and machine building, as well as other Russian industries helped to start providing the Northern Sea Route projects with state-of-the-art icebreakers and so on. As the country develops, so does the Arctic, and with it comes prosperity for Russia as a whole. This was the main message in the address delivered by the Russian President in April 2019 at the "Arctic: Territory of Dialogue" 5th International Arctic Forum. We are convinced that in many cases solving the issues plaguing the Arctic is an extraterritorial task and can be accomplished only through combining all the aspects of the Arctic "re-development" with the recently launched re-evaluation of all the aspects of Russia's domestic policy.

Big corporations and national interests

Achieving the development goals for the Russian Arctic requires tremendous resources in the form of investment, technology and administration. With the current socio-economic and foreign policy factors, the state and big corporations have become the main actors. While not disputing the importance of small and medium-sized enterprises for the development of the Russian Arctic, the state focuses primarily on big businesses, possibly because at this time they are the ones who manage to successfully implement corporate social responsibility policies.

The state is interested in the efficiency of such companies. In Norilsk, for example, the company managed to save 11 billion rubles thanks to the Russian government's decision to clear all tariffs on non-alloyed nickel and copper cathodes

in advance. Only one fifth of 2,500 Nornickel employees chose to quit, while retirees received funds to move "to the mainland" (10-12 fixed salaries in addition to a relocation allowance); over 4 billion rubles was spent on social concerns alone. A key government support measure for big businesses operating in the Russian Arctic is preferential treatment envisaged by the decision to create "core development zones in the Russian Arctic." The Russian President spoke about the need for new preferential regimes at the "Arctic: Territory of Dialogue" 5th International Arctic Forum in April 2019.

It stands to reason that the policies of the corporations with larger government shares are more closely aligned with government interests. This is the case with PJSC Rosneft, 50% of which in December 2019 was owned by Rosneftegaz (a Russian company which manages state assets in the oil and gas industry)[1]. The corporation has been developing the great potential of its the Arctic cluster, which includes the company's own mining projects in the region, such as Vankor, Suzun, Tagul and Lodochnoe fields, as well as a number of exploration projects in the southern and, in the future, eastern Taymyr. With the resources provided by strategic investors from Western counties and South-East Asia, oil production is expected to reach 100 million tons by 2030, at the same time ensuring conditions for integrated development of related industry sectors. For that, we need an attractive investment climate, including a special tax regime, throughout the life cycle of new projects.

Another aspect of Rosneft's Arctic cluster connected to the Northern Sea Route has to do with modernizing the Zvezda shipyard, which includes resolving related social issues and, first and foremost, housing construction. As of spring 2019, Rosneft has placed orders for 25 ships with Zvezda, including four multifunctional reinforced ice class supply vessels and 10 Aframax tankers running on natural gas motor fuel for transporting crude materials via the Northern Sea Route. The construction of ten shuttle tankers of a new design (110,000 DWT) is underway. The total deadweight tonnage of ships ordered by Rosneft and mainly slated for operating in the Arctic exceeds 2 million tons. Apart from Rosneft's orders, the shipyard has been contracted to build 11 more ships: five for Gazprom and Sovcomflot each, and one for Rosmorport. In addition, Novatek signed a capacity-payment contract with Zvezda to construct LNG carriers. If successful, in the future Zvezda will be able to compete with South Korean shipyards, which are going to take part in the first stages of building these LNG carriers.

Arctic development as part of state policy

One of the most controversial and, unfortunately, politicized issues is related to the reasons for designating the Arctic a special zone and justifiability of its spatial characteristics. In expert and public discussions, the laws and regulations on governing the Russian Arctic are frequently criticized in terms of their purpose, contents and feasibility. Several years ago the authors in collaboration with Russian Academy of Sciences member Viktor Ivanter substantiated the claim that government interests dominate the development and implementation of policies concerning the Russian Arctic. There is no other macroregional entity in the world of that size and diversity, and the sole reason

1 With 19.75% owned by BP Russian Investments Limited and 18.9% by QH Oil Investments LLC. (Share Capital Structure // Rosneft // https://www.rosneft.ru/Investors/structure/share_capital/, accessed 12.12.2019).

it exists has to do with clear-cut national interests.

Russia's *geopolitical and defense interests* in the Arctic have to do with provable need to ensure the entire country (not just the Arctic) is safe from potential foreign aggression involving the navy, air forces, IBMs or spacecraft, especially when it comes to the Northern Sea Route facilities and users. This has always been an extremely challenging task, and it still hasn't been fully tackled. Moreover, continuous adjustment is needed due to the increasingly complicated situation in the international arena and military buildup in other countries.

Our country's *economic interests* are perfectly obvious, as the Arctic provides the bulk of extracted hydrocarbons, non-ferrous, rare and precious metals, apatites, as well as fishery resources, ship construction and repair and so on.

Russia's *social interests* largely concern the 2.4 million people[2] living in the Arctic, which is more than in all Arctic-bordering countries, and twice as much in terms of percentage of each respective country's total population. The state is compelled to maintain a working social infrastructure and provide social benefits to the people living in the Arctic, a small but important part of whom is the indigenous peoples of the North.

The national importance of the Arctic zone is exceptionally high in the context of *huge opportunities for scientific research*, as it's an absolutely unique place in terms of size, diversity and potential for studying important natural phenomena (e.g. climate change anomalies). Ensuring our Arctic-related research moves with the times is only possible through having and implementing state interests, which have recently become evident.

The aforementioned national interests, but, more importantly, the fact that they are all systemically interconnected and can be effectively pursued only through comprehensive government action, is the rationale for making the Arctic a separately regulated entity within Russia. Nevertheless, for a number of years the way the Arctic was governed has failed to meet the basic effectiveness requirements and to rationally use the program and target technology and project-based approach. This was a reflection of the enduring nominal approach to matters of state importance (e.g. how the Russian government and federal ministries treated the Russian President's instructions) and a conviction that adopting a strategic document (concept, strategy or program) is more important than implementing it. Ironically, the centralized government control that dominates across Russia was conspicuously absent in the Arctic. However, it's possible that one of the reasons for incompetent state management of the Arctic development was the fact that the goals set in the official documents were disproportionally ambitious in the context of no longer available Soviet-era management tools and capacities (including staff- and administration-related) for designing and implementing spatial megaprojects.

The Russian Arctic was transformed into a separately governed entity in several stages. First, Government Resolution no 228 of March 14, 2015, and Government Directive no 431-R of March 14, 2015, established the State Commission for Arctic Development. The step that furthered the government responsibility for the Arctic development in addition to the established collegiate commission was outlined in Government Resolution no 1064 "On Amending Government Resolution

2 Not counting rotational employees who permanently reside in other parts of the country.

no 366 of April 21, 2014 'On Adopting the Socioeconomic Development of the Russian Arctic Zone up to 2020 State Program'" of August 31, 2017. One of the appendices contained amendments to Government Resolution no 437 "On the Ministry of Economic Development of the Russian Federation" of June 5, 2008, specifying the Ministry's mandate in the light of its new powers and responsibilities regarding the formation and development of core development zones in the Arctic that are regarded as the key element for developing the region.

A considerable step to creating a federal ministry on developing the Russian Arctic was taken with the adoption of Presidential Decree no 78 "On Improving State Governance in the Development of the Arctic Zone of the Russian Federation" of February 26, 2019, in accordance to which the Ministry for the Development of the Russian Far East was transformed into the Ministry for the Development of the Russian Far East and the Arctic and made responsible for developing and enforcing government policy and legal regulation aimed at developing the Arctic. In three months, the Russian government was to clarify the new ministry's mandate, determine the number of employed officials and present proposals on how to integrate the changes envisioned in the decree into presidential decisions. While the process of unlocking the potential for state management of the Arctic development has admittedly begun, it's worth noting that so far it doesn't solve the issue of creating a separate federal body for that. Moreover, it leads to a certain conflict with the Ministry of Economic Development that was, as we mentioned above, recently put in charge of "creating and developing core development zones in the Arctic."

On the Russian "Arctic law"

The objective to develop and implement special regulations for economic, social, environmental and other processes in the Russian Arctic was formulated by the President in the Strategy for the Development of the Arctic Zone of the Russian Federation and National Security up to 2020[3] , and was supposed to have been accomplished by 2015. The fact that it is still not the case, despite our leading legal experts participating in the discussion and conducting relevant research[4] is surprising. In our opinion, the main reason is that, strange as it may seem, there is no consensus on the subject of this regulation.

Several years ago, when the discussions on the purpose and contents of a federal law aimed at developing the Russian Arctic only just began, the authors of this article voiced their fairly tough stance, and maintain it still. We believe that before drafting a federal law, there has to be an agreement on what specific issues and situations in the Arctic are not covered by existing legal norms, and conclusively require new ones. We stressed the fact that the Arctic is not a "lawless desert" and that (circa late 2018) there were hundreds of presidential decrees, federal laws, government-issued directives and thousands of legal instruments by Russian federal subjects partially or fully applicable to the Arctic zone. They set out regulations for the most important

3 Article 24 of the Strategy envisages "improvements of the legal framework aimed at developing the foundations of governance of the Arctic zone of the Russian Federation, the legislative recognition of its status as a special subject of state regulation, specifying the list of municipalities whose territories are part of it, as well as the establishment of special regimes for natural resource management and environmental protection, regulation of shipping along the Northern Sea Route."

4 Namely, a series of "Russian Arctic: Territory of Law" publications by the Institute of Legislation and Comparative Law under the Government of the Russian Federation.

aspects of legal matters and relationships in the Arctic. Over time, the idea to create a kind of "Arctic code" that would contain the entire body of legal norms regulating economic, social, infrastructural, environmental and even international activities in the Russian Arctic was superseded by other proposals, which to a large extent was shaped by a realistic assessment of the so-called international "Arctic law."

Drafting and adopting a federal law on developing the Russian Arctic, with due consideration for the aforementioned ideas on its subject, seems more than useful. Indeed, there are a number of issues that can be legally resolved only at the federal level (such as the issue of a fundamentally different approach to organizing healthcare in the Arctic). We would like to add that since the Arctic issues are an inherent part of the developments in Russia in general, it's necessary to amend federal laws, including for the purposes of developing the Russian Arctic zone from beyond its territory. We believe that it's only possible on the condition that legal tools for implementing Presidential Decree no 204 "On National Goals and Strategic Objectives of the Russian Federation through to 2024" of May 7, 2018, are developed in the near future, with due consideration for specific features of different parts of the Russian Arctic macroregion.

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Arctic Offshore Oil in Russia: Optimism, Pessimism and Realism

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ABSTRACT. *A strong global interest in the hydrocarbon resources of the Arctic emerged in the mid-2000s, after the US Geological Survey published data on its petroleum potential. While oil prices were growing, an "Arctic optimism" prevailed everywhere, and it was anticipated that a broad-scale oil production in the Arctic would soon begin. At that time, a political aspect dominated in the Russian plans to develop Arctic offshore. Russia intended to prove that it was an energy power capable of establishing a new petroleum province in the Polar seas to replace the aging West Siberia.*

But later the global energy sector underwent radical changes, and optimism was gradually replaced by realism. The decline of oil prices and introduction of anti-Russian sanctions contributed to the downgrading of the Arctic plans in Russia. Besides, the monopoly of Gazprom and Rosneft on the Arctic shelf hinders the development of its hydrocarbon resources because the state companies do not have sufficient competencies to operate offshore fields on their own.

After 2014, Russian oil companies began to revise downwards their plans of oil production in the Arctic seas. Given the sanctions and low oil prices, now relevant ministries also more realistically perceive the prospects of the northern continental shelf development, and their new attitude is clearly visible in their public statements. Thus, they indirectly admit that Russia is not ready yet for environmentally sustainable activities in the Arctic offshore. Actually, many experts and oil companies previously demonstrated a cautious approach to the possibility of the broad-scale oil production in the Polar seas reminding that the potential of the mature Russian oil provinces onshore is still significant. Now, the government makes a strong focus on the onshore alternatives to the Arctic shelf of Russia: the development of hard-to-recover reserves, enhanced oil recovery, and support of small and mid-size companies, i.e. the priorities seemingly shift from the extensive to the intensive mode of the sector development. However, pessimistically one can recall that such plans were often made in the past and they remained on paper.

Ultimately, broad-scale oil production on the Arctic continental shelf will not begin before 2035. Russian oil and shipping

sectors benefit from such time-out, because they receive a chance to train qualified personnel capable of operating on the Arctic shelf with strict adherence to the environmental sustainability principles.

KEY WORDS: *Arctic, oil companies, oil production, continental shelf, Rosneft, Gazprom neft, environmental safety, hard-to-recover reserves*

The Arctic first gained its 'celebrity status' on the world energy stage in 2007, when the United States Geological Survey announced that its subsurface may contain up to 25% of the world's undiscovered and untapped hydrocarbon resources[1]. Another factor that pushed the Arctic into the limelight was the global climate change, whose consequences have been particularly pronounced in the Arctic region and have been associated with new challenges and opportunities. On the one hand, the projected thawing of the ice cover in the Arctic seas should facilitate access to offshore oil and gas resources and make their transportation easier; on the other hand, increased weather and climate variability generates considerable risks for the development of these resources – not least because of the growing intensity and potential damage of natural disasters.

In recent years, the region has become the focus of attention, both in the Arctic countries and elsewhere. While Russia, the United States, Canada, and Norway (all of them Arctic states) are already the world's major oil producers, non-Arctic emerging economies with a high demand for energy resources like China and India are particularly interested in the region's hydrocarbon resources, including those on the continental shelf. Both Chinese and Indian companies have been successfully competing for access to the Russian Arctic against international oil and gas majors, especially in the face of Western sanctions.

In the 2000s, while oil prices were on the rise, the general atmosphere was that of 'Arctic optimism': it seemed that the age of the offshore Arctic oil (and later gas) exploration and production was right around the corner. However, much has changed since then in global energy sector: realism gradually replaced optimism, both globally and particularly in Russia, where falling oil prices and Western sanctions snapped people back to reality about the Arctic and the opportunities it promised. After 2014, Russia entered a period of 'Arctic realism', when oil companies started to scale back their plans for oil production in the Arctic offshore. It is noteworthy that relevant ministries have adopted a more down-to-earth view of the prospects for developing offshore fields in the Arctic, which is reflected very clearly in their public statements. By doing this, they have indirectly admitted that Russia is not ready yet to extract offshore resources in an environmentally sustainable way.

Does the world really need the Arctic oil?

The hydrocarbon potential of the Arctic can be realistically estimated within the framework of the global energy balance. Until recently, experts have been arguing whether the world's hydrocarbon resources are sufficient to meet the rapidly growing demand for energy (the so-called 'peak oil' debate). Now, in a radical reversal of expectations, they are discussing when oil demand will peak. In-

1 Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle (2008) // United States Geological Survey // https://pubs.usgs.gov/fs/2008/3049/fs2008-3049.pdf, accessed 12.12.2019.

deed, global oil supply is immense, and the world's oil reserves are increasing as technology develops. According to ExxonMobil analysts, technological progress is gradually making extraction of shale hydrocarbons, as well as production of oil from oil sands and deepwater fields commercially viable. In addition, new effective technologies are being developed that extend the life of mature oil fields. ExxonMobil estimates that less than a quarter of global oil resources have been extracted, and that the remaining reserves can meet up to 150 years of demand at its current level [Outlook for Energy 2018].

According to BP experts, when it comes to the Arctic, in the foreseeable future oil companies will mainly conduct geological exploration there, as the region is far from the top on their list of priorities. Here they present some simple but convincing statistics. Over the century and a half-long history of the world's oil industry, about 4.5 trillion barrels of oil and gas have been discovered. Approximately 1 trillion barrels were extracted, and another 1.6 trillion barrels are proven reserves, i.e. the reserves that humanity will be able to extract with a sufficient degree of certainty. The remaining 2 trillion barrels are by most accounts unrecoverable at this moment. Beyond these 4.5 trillion barrels, we can expect to discover about 1 trillion more, mostly in deep waters, on shore and in the Arctic. The US Geological survey estimates that the Arctic may contain 90 billion barrels, which is about 1/10th of the total number. To compare: this is slightly less than UAE's proven reserves (97 billion barrels) and much less than Venezuela's reserves (303 billion) [Statistical Review of World Energy 2019]. The Arctic may also contain about 47 trillion cubic meters of gas – but gas is much more difficult to transport than oil, which means that, in the medium term, companies will prioritize Arctic oil[2].

Many oil companies have been conducting onshore exploration in the Arctic for a long time, with some gradually moving offshore, as well. However, they recognize that maritime operations are fraught with additional risks. The biggest hazards are associated with sea ice and icebergs, low temperatures, permafrost, short daylight, remote location of the region and lack of infrastructure. Because of these reasons, environmental accidents, especially oil spills, can turn into real disasters. According to Igor Chestin, CEO of WWF-Russia: "Talking about the Arctic, there is not a single company with the technology to extract oil from under the ice. When it is on the surface, it's not a problem; when it is snowing, it may be a bit more difficult, but still easier than extraction from water; but if you want to extract oil from under a meter-thick cover of ice – that just isn't done[3]."

Given these environmental risks that exacerbate the existing financial, technological, managerial, logistical and other difficulties associated with developing the Arctic, the oil majors have long held very realistic views about Arctic projects, emphasizing that one should not expect quick results there. For example, in 2012, Peter Voser, the former CEO of Shell, said: "Let's put it this way: Russia and other countries have a massive resource base in the Arctic. But because of the conditions there, they would need to create and widely in-

2 The Changing Global Energy Landscape – Prospects for Arctic Oil and Gas (2013) // British Petroleum // https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/news-and-insights/speeches/speech-archive/the-changing-global-energy-landscape-prospects-for-arctic-oil-and-gas-dev-sanyal-2013.pdf, accessed 12.12.2019.

3 I. Chestin (2012) It is unprofitable and dangerous to drill for oil in the Arctic // Vedomosti. October 3, 2012 // https://www.vedomosti.ru/opinion/articles/2012/10/03/chto_skryvaet_arkticheskij_shelf, accessed 12.12.2019.

troduce special technologies, knowledge and expertise. The Arctic will be developed! It will happen, sooner or later. It may take years or even decades, but the Arctic will be developed."[4] And in 2013, the late Christophe de Margerie, then head of Total, came out with a warning: "Given the risks, the Arctic should be left well enough alone, for the time being.[5]"

Indeed, in September 2015, Royal Dutch Shell decided not to conduct exploration on the Alaskan continental shelf in the foreseeable future. The company said that "this decision reflects both the Burger J well results, the high costs associated with the project, and the challenging and unpredictable federal regulatory environment in offshore Alaska.[6]" Thus the Dutch-British energy company ended its $7 billion Arctic venture, following ExxonMobil, Chevron and BP, who also abandoned their plans to develop the Arctic seas in the face of consistently low prices[7], which became an important factor that undermined economic feasibility of the Arctic projects.

The approach chosen by the majors seems reasonable, since humanity has no need for the Arctic hydrocarbons yet. Also, the US shale revolution, which led to dramatic shifts in the balance of supply and demand on the global oil market, was sobering to many – as a result, Arctic oil simply lost its relevance. And the fall in oil prices has further reduced the intensity of competition in the Arctic. As the US State Department's Special Representative for the Arctic Admiral Robert Papp noted in 2016: "Just 10 years ago, the US was looking for more oil, which is why companies like Shell, ConocoPhillips, and British Petroleum came to the Arctic. We felt we needed additional energy resources. But now that the US became an energy exporter itself, there is not much interest in Arctic resources. Companies no longer view working in the Arctic as a profitable investment. This may change some day, but it is unlikely to happen within the next decade.[8]"

Following that, the US oil policy with respect to the Arctic offshore drilling changed dramatically, influenced by oil prices, the shale revolution and large-scale protests by environmentalists. In 2016, the US President Barack Obama imposed a ban on new oil and gas drilling in the US federal waters of the Chukchi Sea, most of the Beaufort Sea, and the northern part of the Atlantic ocean, reasoning that the Arctic oil production poses too much of an environmental risk[9]. His successor, Donald Trump, attempted to restore oil and gas leasing in these waters – however, his order was blocked in early 2019 by the US District Judge Sharon Gleason, whose decision became a win for environmentalists who argue that the risks of offshore drill-

4 E. Derbilova (2012) Interview - Peter Vozer, Chief Executive Officer of Royal Dutch Shell // Vedomosti. October 15, 2012 // https://www.vedomosti.ru/newspaper/articles/2012/10/15/my_v_rossii_nadolgo_piter_vozer_glavnyj_ispolnitelnyj, accessed 12.12.2019..

5 A. Razintseva (2013) Should Russia hurry with the development of the Arctic shelf // Vedomosti. March 4, 2013 // https://www.vedomosti.ru/library/articles/2013/03/04/ostorozhno_arktika, accessed 12.12.2019.

6 Shell Updates on Alaska Exploration (2015) // Shell, September 28, 2015 // https://www.shell.com/media/news-and-media-releases/2015/shell-updates-on-alaska-exploration.html, accessed 12.12.2019.

7 Kent S. (2015) Shell to Cease Oil Exploration in Alaskan Arctic after Disappointing Drilling Season // Wall Street Journal, September 28, 2015 // https://www.wsj.com/articles/shell-to-cease-oil-exploration-offshore-alaska-1443419673, accessed 12.12.2019.

8 "Now that the US is an energy exporter itself, there is not much interest in Arctic resources" (2016) // Kommersant. January 13, 2016 // https://www.kommersant.ru/doc/2890393, accessed 12.12.2019.

9 Obama Bans New Oil and Gas Drilling Off Alaska and Part of the Atlantic Coast (2016) / / Fortune, December 21, 2016 // https://fortune.com/2016/12/21/barack-obama-oil-gas-drilling-ban-arctic-alaska-atlantic-coast/, accessed 12.12.2019.

ing are unjustifiably high[10]. In other words, the development of offshore Arctic projects in North America was, figuratively speaking, put on ice.

In Arctic oil we trust?

In the 2000s, Russia also went through a period of 'Arctic optimism', when state officials and oil producers alike were thrilled and excited by the potential wealth of hydrocarbon resources contained in the Far North: in 2008, President Dmitry Medvedev announced a strategic goal – to turn the Arctic into Russia's resource base for the 21st century.[11]

Indeed, Russia's Arctic is expected to have enormous potential. The Ministry of Natural Resources and Environment estimates that land and sea in the Russian Arctic Zone contain 258 billion tons of recoverable hydrocarbons, or 60% of Russia's total hydrocarbon resources. It should be noted that the Russian Arctic onshore has been developed for a long time: in 2017, it produced 96.2 million tons of oil (3.8% more than in 2016) and 568.9 billion cubic meters of gas (9.6%)[12].

The situation with the Arctic offshore is more complicated. While the existence of oil reserves in the Kara, Barents and Okhotsk seas was proven in the Soviet Union back in the early 1980s, their development never started due to the limited petroleum infrastructure and, most importantly, due to lack of technologies for offshore hydrocarbon production in the USSR[13]. As noted in 2017 by the then head of the Ministry of Natural Resources and Environment Sergey Donskoy, "the USSR was the first country in the world to develop gas and oil in the Arctic, albeit only on land. As for offshore development, the West beat us to it. The gap in technology became especially pronounced in the 1990s, when Russia had other business to attend to, besides the shelf.[14]"

For these reasons, the development of hydrocarbon resources (primarily oil) on the Arctic shelf is a particular challenge to Russia. According to the Russian Ministry of Energy, 33 oil fields have been discovered in the waters of the Russian Arctic, with estimated 120 billion tons of oil equivalent (TOE) of recoverable reserves, mainly natural gas[15].

Since oil production in Western Siberia is gradually declining, Russia's strategic goal is to develop new oil and gas resources that could support the aging giant – for a time, it was believed that offshore petroleum production in the Arctic would serve as a replacement[16].

Moreover, in the 2000s, the development of polar sea resources seemed a great opportunity to prove to the world that Russia is a global energy power capable of establishing a major hydrocarbon province: the scope of this task rivaled the launch by the Soviet Union of the oil province in Western Siberia in the 1960s and 1970s. In

10 J. A. Dlouhy, K. Mehrotra (2019) Trump's Arctic Oil Drilling Edict Blocked by Federal Judge / / Bloomberg, March 30, 2019 // https://www.bloomberg.com/news/articles/2019-03-30/trump-s-arctic-oil-drilling-plan-is-shelved-by-federal-judge, accessed 12.12.2019.

11 Arctic will have its borders defined (2008) // Rossiyskaya Gazeta. September 18, 2008 // https://rg.ru/gazeta/2008/09/18.html, accessed 12.12.2019.

12 Reversing the Polarity (2018) // Severpress. March 28, 2018 // https://sever-press.ru/2018/03/28/polyus-na-minus/, accessed 12.12.2019.

13 N. Milchakova (2018) We've got the Shale! // Oil and capital. September 21, 2018 // https://oilcapital.ru/article/general/21-09-2018/slanets-nash?ind=450, accessed 12.12.2019.

14 Keys to the North (2017) // Ogonek. No 12. March 27, 2017. p. 16 // https://www.kommersant.ru/doc/3247645, accessed 12.12.2019.

15 Reversing the Polarity (2018) // Severpress. March 28, 2018 // https://sever-press.ru/2018/03/28/polyus-na-minus/, accessed 12.12.2019.

16 Time for exploration (2018) // Rossiyskaya Gazeta. July 3, 2018 // https://rg.ru/gazeta/rg/2018/07/03.html, accessed 12.12.2019.

other words, Arctic optimism at that stage had strong political and reputational overtones. It is no wonder that in April 2012, at a presentation dedicated to Rosneft's strategic alliance with ExxonMobil, aimed mainly at developing offshore operations in the Arctic, Igor Sechin, then Deputy Prime Minister, stressed that this cooperation "was greater than some of humanity's major endeavors – like the first spacewalk or the flight to the moon – and in terms of investment, it surpassed the development of hydrocarbon resources in the Brazilian shelf and the North Sea"[17].

In terms of its global image, when it comes to creating an Arctic offshore petroleum province, it is vital for Russia to not repeat the environmental mistakes made during the 'conquest' of Western Siberia. To this day, our country can feel the effects of the environmental atrocities committed under socialism, when it was deemed politically expedient to extract as much West Siberian oil as possible and as quickly as possible [*Tchourilov, Gorst, Poussenkova* 1996].

In this context, Konstantin Simonov, Director General of the National Energy Security Fund, stressed that there are different views on the development of the Arctic in modern Russia: "Some lobbyists still hold on to what I would call the Soviet approach: "the region must be developed, no matter the cost" But times are different now, and the state actually considers environmental risks, breaks with the old ways, and rectifies errors of the past by cleaning up the Arctic.[18]"

Indeed, Russian oil companies, caring about their international image, have announced their commitment to ensuring environmental safety in the Arctic – at least on paper. Ever since the 2012–2013 Greenpeace campaigns against environmentally unsustainable and economically unfeasible oil production in the Arctic[19], Gazprom Neft has been making a particularly strong focus on environmental aspects of developing the Prirazlomnoye field. According to the company, special purpose icebreakers equipped with the latest technology for oil spill response are on continuous emergency duty around the platform. Gazprom Neft says the Prirazlomnaya platform operates under a 'zero discharge' system: drilling mud and other wastes are re-injected into a special purpose absorbing well[20].

In addition, while in the Soviet era, economic and financial aspects were not considered in the development of Western Siberia, they are now becoming a real obstacle to the implementation of oil and gas projects in the Arctic offshore. Experts note that the cost of a small exploration well on the Arctic shelf is over $150 million. For comparison: in the Caspian Sea, drilling such a well would cost less than $100 million, while in Western Siberia, a medium-size exploration well costs $1.5-2 million, with costs of larger wells ranging between 5 and 10 million dollars[21].

Financial challenges are further aggravated by uncertain prospects: Russian Arctic seas remain largely unexplored,

17 K. Melnikov (2012) Igor Sechin emptied his closet of all the skeletons // Kommersant. April 19, 2012 // https://www.kommersant.ru/doc/1918809, accessed 12.12.2019.

18 Russia does not want to be seen as a nation that spits on the environment in the Arctic (2017) // Regnum. April 26, 2017 // https://regnum.ru/news/polit/2268338.html, accessed 12.12.2019.

19 Greenpeace activists climb aboard Prirazlomnaya platform (2013) // Greenpeace. September 18, 2013 // https://www.greenpeace.org/russia/ru/news/2013/18-09-action-on-Prirazlomnaya/, accessed 12.12.2019.

20 Gazprom Neft's output of the first oil produced on the Russian Arctic shelf in 2016 shows a 2.5-fold increase (2017) // Gazprom Neft. January 26, 2017 // https://www.gazprom-neft.ru/press-center/news/1116140/?sphrase_id=5470927, accessed 12.12.2019.

21 A. Razintseva (2013) Should Russia hurry with the development of the Arctic shelf // Vedomosti. March 4, 2013 // https://www.vedomosti.ru/library/articles/2013/03/04/ostorozhno_arktika, accessed 12.12.2019.

meaning their resource potential is unclear. Russia has yet to study more than 90% of the Arctic shelf (and 53% of the Arctic coastline). There has been very limited seismic exploration of the Arctic shelf: by the mid-2010s, the level of exploration in most of the Arctic seas remained either low (0.1-0.3 km per square km) or, in the case of the East Siberian Sea, for example, very low (less than 0.1 km per square km). This rate of exploration is at least an order of magnitude lower than in Norway, Denmark, Britain, Brazil, and even several African countries[22]. Thus, the Arctic holds a lot of potential for both major discoveries – such as the Pobeda field on the Kara Sea shelf – and for bitter disappointments.

However, even if discoveries are made on the Arctic shelf, the question immediately arises whether Russia is capable to extract these hydrocarbons in an economically efficient and, most importantly, environmentally sustainable manner, especially in the polar seas to the east of the Urals? After all, Arctic waters strongly differ depending on the location. In areas covered with ice for several months a year, hydrocarbons are already being extracted with the use of existing technologies. Some areas remain frozen for about six months a year; environmentally safe development of these zones requires progressive development of these technologies. And still other regions are covered with ice for almost the entire year: exploring these areas would demand radical technological breakthroughs. The eastern part of Russia's Arctic belongs to this third category. With this in mind, a worrisome trend is observed that the draft Energy Strategy of Russia until 2035 says: "...developing the hydrocarbon potential of the continental shelf of the Arctic seas and the Far North is the biggest geopolitical and technological challenge for the Russian oil and gas industry" [Draft Energy Strategy of Russia, 2017], while disregarding the environmental challenge, which is of no less importance to the region.

Wishful planning

During the above-mentioned period of 'Arctic optimism', Rosneft and Gazprom divided the continental shelf between them, bought up licenses for exploration and development of offshore resources, signed strategic agreements with the majors and actively prepared to launch the production of hydrocarbons in the Arctic. But Gazprom, which had planned to develop the Shtokman field in the Barents Sea, quickly pulled the plug on the project, deciding to postpone it indefinitely in 2012. Low natural gas prices and transformation of the United States from a potential importer of liquefied natural gas (LNG) to an exporter undermined the profitability of the Shtokman field. In February 2018, Sergey Donskoy commented on the situation, saying that "today it remains a reserve, an excellent reserve for the future, which will certainly be used one day. But with the current economic situation and gas prices, the development of the Shtokman field is unprofitable."[23]

However, in December 2013, Gazprom's subsidiary Gazprom Neft commissioned the Prirazlomnoye field[24], becom-

22 Time for exploration (2018) // Rossiyskaya Gazeta. July 3, 2018 // https://rg.ru/gazeta/rg/2018/07/03.html, accessed 12.12.2019.
23 Sergey Donskoy: Too early to talk about stabilization of the oil market (2018) // TASS. February 16, 2018 // https://tass.ru/forumsochi2018/articles/4962147, accessed 12.12.2019.
24 Discovered in 1989 in the Pechora Sea (60 km off the shore at a depth of 20 m), the Prirazlomnoye field has 70 million tons of recoverable oil reserves. It produced 2.15 million tons of oil in 2016, 2.64 million tons in 2017, and is soon expected to reach peak production of 5 million tons of oil. To develop the field, Gazprom built the Prirazlomnaya offshore ice-resistant stationary platform.

ing the only Russian company to produce oil in the Arctic offshore. A new oil export grade (ARCO – Arctic Oil) from Prirazlomnoye hit the global market in April 2014. Gazprom Neft's other offshore reserves are still at the exploration stage. Gazprom Neft-Sakhalin holds licenses for four plots on the Arctic shelf: Severo-Vrangelevskiy (East Siberian and Chukchi seas), Kheisoveisky (Barents Sea), Dolginsky and Severo-Zapadniy (Pechora Sea). Inititally, the Dolginsky field, with 200 million TOE of reserves, was expected to enter the commercial phase sooner than its other fields. However, Gazprom Neft successfully lobbied for changes to the Dolginsky license, as it was dissatisfied with the results after drilling an exploration well: consequently, the start of production was postponed from 2019 to 2031[25].

Rosneft, having become the queen of the Arctic seas[26], started to conduct active geological exploration in cooperation with its international partners – ExxonMobil, ENI and Equinor – with whom it signed strategic agreements in 2011-2012 with the goal of developing both offshore oil and gas in the Arctic seas and hard-to-recover onshore reserves. "Our strategic advantage is the huge conventional onshore oil reserves in regions with developed infrastructure. Our strategic prospects are the immense reserves of offshore oil and gas", Sechin noted in 2017, outlining his Rosneft 2022 Strategy[27]. Still, Rosneft seems to prefer offshore reserves. The company is quite optimistic about its prospects for hydrocarbon production in the Arctic seas: according to its website, "experts estimate that by 2050, offshore production in the Arctic will account for 20 to 30 percent of all Russian oil production."[28] Clearly, since Rosneft seeks to position itself as a global major[29], and being the "queen of the Arctic" is an important component of this image, its Arctic plans also have a strong political aspect.

In August 2014, Rosneft and ExxonMobil started drilling the $700 million Universitetskaya-1 well, the northernmost offshore well in Russia, using the West Alpha drilling platform provided by the Norwegian company North Atlantic Drilling. The scale of the project was truly impressive: the Universitetskaya structure covers 1,200 square kilometers and has resources of more than 1.3 billion TOE. The project garnered a lot of attention, as optimistic estimates placed the potential of the Kara oil and gas province well above the Gulf of Mexico, Brazil's continental shelf, or the continental shelf of Alaska and Canada[30]. In October, the partners announced the discovery of the Pobeda (Victory) field with recoverable reserves of 130 million tons of oil and 499 billion cubic meters of C1+C2 natural gas. However, their victory celebration was premature.

25 Gazprom Neft to push offshore oil production to 2031 (2015) // RBC. November 15, 2015 // https://www.rbc.ru/business/15/11/2015/5645a9429a7947c868dcadf9, accessed 12.12.2019.

26 Rosneft owns licenses for 19 plots on the continental shelf of Russia's West Arctic seas – in the Barents, Pechora, and Kara seas, with total recoverable resources of 16.3 billion TOE. Five fields were discovered in the licensed areas (Pobeda in the Kara Sea, North-Gulyaevskoye, Medynskoye-sea, Varandey-sea and Pomorskoye in the Pechora Sea). In addition, in 2013-2015, it acquired licenses for 9 plots in Russia's East Arctic: in the Laptev Sea, the East Siberian Sea, and the Chukchi Sea, with recoverable oil and gas resources of 18.2 billion TOE.

27 I. Sechin (2017) Rosneft-2022: strategy for the future // Izvestia. June 27, 2017 // https://iz.ru/611245/igor-sechin/rosneft-2022-strategiia-budushchego, accessed 12.12.2019.

28 Offshore projects (2019) // Rosneft // https://www.rosneft.ru/business/Upstream/offshore/, accessed 12.12.2019.

29 Notably, in the report outlining Rosneft's 2022 strategy, Igor Sechin wrote: "Over the past five years, our company has grown from a regional player to a global major, the world's largest public oil company in terms of production, reserves and business scale, and the most efficient in terms of operating costs" (I. Sechin (2017) Rosneft 2022»: strategy for the future // Izvestia. June 27, 2017 // https://iz.ru/611245/igor-sechin/rosneft-2022-strategiia-budushchego, accessed 12.12.2019.

30 Rosneft and ExxonMobil started drilling in the Kara Sea (2014) // Rosneft. August 9, 2014 // https://www.rosneft.ru/press/releases/item/153553/, accessed 12.12.2019.

The Perfect Storm

Arctic optimism was replaced by realism in 2014, when Russia was hit by a double whammy of low oil prices and Western sanctions, both financial (aimed at major Russian oil companies) and sectoral, aimed against Russia's deepwater, Arctic offshore, and shale projects.

Which of these blows was more painful for the development of Arctic offshore fields? Russian experts hold different views on this issue [*Tikhonov* 2019]. See for yourself.

Offshore projects have certainly suffered from low oil prices. Generally, experts' opinions differ with respect to the exact price at which offshore Arctic oil production would be profitable. But they do agree on one thing: the price should be high. For example, Russia's Minister of Energy Alexander Novak noted in 2017 that oil production in the Arctic offshore would be profitable at the price of $70 to $100 a barrel.[31] According to Deputy Director of the Institute of Energy and Finance Alexey Belogoryev, developing offshore fields, especially Arctic ones, should be cost-effective at a price of at least $90 a barrel[32]. President of the Union of Oil and Gas Producers of Russia Gennady Shmal noted: "Both today and in the near future, all Arctic projects are still very expensive. According to my calculations, even at current oil prices, which are not that low – over $70 a barrel – none of the Arctic shelf projects would be profitable[33]."

However, since only state-owned companies – Gazprom and Rosneft – operate on the Russian Arctic shelf, they receive strong government support, which offsets some of the negative effects of low oil prices. Thanks to Rosneft's efforts, in 2012 the government provided significant tax incentives to offshore projects[34]. According to experts, this resulted in Russia having the most liberal tax regime for offshore operations in the world. However, analysts at the SKOLKOVO Business School calculated that it will be Russian state oil companies, primarily Rosneft, and not the state itself that will benefit most from these projects[35].

Rosneft, which signed an agreement with ENI on April 25, 2012 to jointly develop the Fedynsky and Central Barents fields in the Barents Sea and the Shatsky Ridge in the Black Sea, then openly admitted that it was the generous tax incentives that facilitated the agreement[36].

Gazprom Neft was also able to lobby for fiscal benefits. Notably, in 2014, Gazprom Neft head Alexander Dyukov said that the tax breaks provided for the project will ensure efficient development of the Prirazlomnoye field, even if prices fall to $ 80

31 Novak named the price of oil at which production on the Arctic shelf would be profitable (2017) // Vedomosti. March 29, 2017 // https://www.vedomosti.ru/business/news/2017/03/29/683204-novak, accessed 12.12.2019.

32 Private companies will be allowed into the Arctic (2016) // RBC. December 26, 2016 // https://www.rbc.ru/newspaper/2016/12/27/585fd0129a79475d1768ff08, accessed 12.12.2019.

33 Oil production projects in the Arctic offshore remain unprofitable (2018) // TASS. September 4, 2018 // https://tass.ru/ekonomika/5521572?utm_source=rfinance, accessed 12.12.2019.

34 All offshore projects were divided into four categories in terms of their complexity – from 'basic' to 'Arctic'. Special mineral extraction tax (MET) rates are provided, ranging from 30% of the cost of the extracted resources for basic level projects to 5% for the most complex Arctic projects. Offshore projects in the Arctic are divided into three levels in terms of complexity: The Pechora and White seas (15% MET), the southern part of the Barents Sea (10% MET), the Northern part of the Barents Sea, the Kara Sea and the Russia's East Arctic (5% MET). Offshore project operators receive guarantees that the tax regime will remain unchanged for 5-15 years (which is especially important for such expensive projects with a long payback period), and are exempted from export duties on oil as well as import duties and VAT on imported high-tech equipment. This applies to fields where production starts in 2016.

35 The northern liberal ocean (2012) // Kommersant. September 21, 2012 // https://www.kommersant.ru/doc/2026740, accessed 12.12.2019.

36 O. Gavshina (2012) Italy's ENI invited to develop the Russian shelf // Vedomosti. April 25, 2012 // https://www.vedomosti.ru/business/articles/2012/04/26/shelf_dlya_vseh, accessed 12.12.2019.

a barrel [*Andrianov* 2015]. Further events showed that he had been overly optimistic with respect to oil prices, but realistic in assessing the value of state support. For example, the zero MET rate for the Prirazlomnoye field was extended from 2019 to 2022.[37] Since April 1, 2014, ARCO oil has been subject to a zero export tariff. As a result, the Prirazlomnoye field will probably remain viable even at low oil prices.

At the same time, anti-Russian sanctions have dealt an equally heavy blow to the development of the Arctic offshore. ExxonMobil withdrew from projects in the Kara Sea, leaving Rosneft unable to develop the Pobeda field by itself.

Still, Rosneft decided to carry on with the Arctic projects on its own and in April 2017 started drilling the Tsentralno-Olginskaya-1 well (the northernmost well in Russia) in the Laptev Sea under very challenging conditions: The Hara-Tumus Peninsula has no seaports, and the navigation season lasts there only two months of the year[38]. In June 2017, Rosneft announced the discovery of a field with 80 million tons of recoverable light and sweet oil (C1+C2)[39], which means that a new oil and gas province could be created in Russia's East Arctic. However, some experts are doubtful that Rosneft is able to organize and finance full-scale development of a field this remote and difficult to access without the help of international partners.

As part of Russia's geopolitical pivot to the East, both Rosneft and Gazprom Neft started inviting oil companies from non-Arctic States – China, India, and even Vietnam – to participate in their offshore Arctic projects, but with little to no success. For example, in 2013, some time before the sanctions, Rosneft wanted CNPC to join its project for the development of oil and gas reserves of the Pechora and Barents seas[40]. The Chinese, however, were in no hurry to start operating on Russia's Arctic shelf, apprehensive about high capital costs and the dubious profitability of these projects, as well as Rosneft's rigidity in trying to maintain control over the assets [*Milov* 2015]. So, even for the Chinese companies, usually eager to obtain access to foreign hydrocarbons and possessing substantial financial resources, offshore oil production in Russia's Arctic remains one of the less attractive investment opportunities: they find it more profitable to work in other regions of the world, with milder climates and more flexible partners. In 2017, Gazprom Neft started talks with India's ONGC and China's CNOOC about potential joint operations in the northern seas, which are yet to be completed[41].

It is the companies from non-Arctic Asian countries that are, in effect, the main beneficiaries of Western sectoral sanctions against Russia's Arctic operations, since they now have a chance to access Russia's hydrocarbon reserves on attractive terms. But are Asian oil companies capable of replacing the departed majors with their rich experience of working in Russia's Arctic offshore?

37 The Ministry of Finance to extend the mineral extraction tax holiday for the Yamal Peninsula and the Nenets Autonomous Okrug fields until 2022 (2013) // Vedomosti. September 10, 2013 // https://www.vedomosti.ru/finance/news/2013/09/10/minfin-hochet-prodlit-do-2022-g-kanikuly-po-ndpi-dlya, accessed 12.12.2019.

38 Rosneft started drilling the northernmost well on the Russian continental shelf (2017) // Rosneft. April 3, 2017 // https://www.rosneft.ru/press/releases/item/186075/, accessed 12.12.2019.

39 Rosneft discovered hydrocarbon deposits on Russia's East Arctic shelf (2017) // Rosneft. June 18, 2017 // https://www.rosneft.ru/press/releases/item/186987/, accessed 12.12.2019.

40 Rosneft and CNPC to start joint operation on the continental shelf and in East Siberia (2013) // RIA Novosti. March 22, 2013 // https://ria.ru/20130322/928606393.html, accessed 12.12.2019.

41 V. Petlevoy (2017) Gazprom Neft inviting its partners to the Arctic // Vedomosti. March 29, 2017 // https://www.vedomosti.ru/business/articles/2017/03/29/683288-gazprom-neft, accessed 12.12.2019.

The shelved shelf?

2014 turned out to be a turning point for Russia's Arctic plans, undermined by low oil prices and Western sanctions. However, top-ranking governent officials seemed to maintain an optimistic outlook, despite the obvious challenges the industry was facing.

In December 2014, Sergey Donskoy stated that Russia does not intend to change plans for the development of the Arctic. "Like the Ministry and the companies have stated before, the development of the Arctic remains our key priority." Still, the Minister added that "there are no plans to start large-scale operations on the Arctic shelf in the next five years, or more." "Most of the production will begin after 2030, and currently we're at the exploration stage," he explained[42].

"Clearly, low oil prices have quite a negative effect on the ability to attract investment for Arctic projects, for Arctic offshore development – still, our companies continue to work on the continental shelf," Alexander Novak said in 2016.[43]

And in 2017, Vladimir Putin, paraphrasing the famous line by Lomonosov, formulated his vision like this: "Russia's wealth should grow with the Arctic."[44]

In reality, however, sanctions and low prices forced both companies and the government to scale back their plans to develop hydrocarbon resources in the polar seas. In 2016, the Ministry of Energy estimated that offshore oil production in the Arctic could grow to reach 31-35 million tons by 2035, although before that the Draft Energy Strategy up to 2035 had predicted that production would reach 35-36 million tons by that date.[45] And in November 2018, Deputy energy Minister Pavel Sorokin presented very modest scenarios for the development of offshore oil production in the Russian Arctic until 2035, talking about an output of 9-11 million tons per year in 2030-2035.[46]

High costs of drilling, problems with financing, and the shortage of sea drilling rigs, auxiliary vessels and ice-breakers resulted in missed deadlines established in the licenses. As a result, in 2016, Rosneft asked the Ministry of Natural Resources for permission to delay exploration and production at its offshore fields. Rosnedra agreed to let Rosneft postpone exploration activities at 19 plots in the Arctic, Far East and southern seas for two to five years, and also allowed Gazprom and Gazprom Neft to postpone activities at 12 plots. Experts calculated at that time that because of the missed deadlines, offshore oil production in the Arctic would reach only 13 million tons by 2030, instead of the previously planned volume of 18 million tons[47].

And in 2016, the Ministry of Natural Resources and Environment imposed a temporary moratorium on issuing new offshore licenses until the obligations under existing licenses are met. Interestingly, according to Evgeny Kiselev, Deputy Minister of Natural Resources and head of the Federal Agency for Mineral Resources,

42 Ministry of Natural Resources and Environment: no changes in the course of development of the Arctic shelf (2014) // RIA "Novosti". December 10, 2014 // https://ria.ru/20141210/1037505756.html, accessed 12.12.2019.

43 Oil and gas of Russia's Arctic: small steps towards big resources (2016) // RIA Novosti. May 25, 2016 // https://ria.ru/20160525/1439399879.html, accessed 12.12.2019.

44 G. Mislivskaya (2017) Putin spoke about the program for Arctic development // Rossiyskaya Gazeta. December 14, 2017 // https://rg.ru/2017/12/14/putin-rasskazal-o-programme-osvoeniia-arktiki.html, accessed 12.12.2019.

45 L. Podobedova (2016) Russia abandons plans for intensive offshore oil and gas production // RBC. June 9, 2016 // https://www.rbc.ru/business/09/06/2016/57593ed59a79476c142e7256, accessed 12.12.2019.

46 A. Chernykh, O. Suprunenko , M. Rudenko (2019) The Arctic shelf: do we drill or do we wait? // Oil and gas hierarchy. No 2. p. 43 // http://www.ngv.ru/magazines/article/burit-na-arkticheskom-shelfe-ili-zhdat/, accessed 12.12.2019.

47 L. Podobedova (2016) Russia abandons plans for intensive offshore oil and gas production // RBC. June 9, 2016 // https://www.rbc.ru/business/09/06/2016/57593ed59a79476c142e7256, accessed 12.12.2019.

this suspension contributes to improving the environmental practices of oil companies. "You cannot launch any serious offshore work without environmentally safe technologies, because oil spills in the Arctic are not something we can accept. We hope that companies will make use of this time-out,, and that we won't have to extend it – we hope that we can instead start some of the projects in the upcoming years."[48]

However, in August 2018, the Ministry of Natural Resources and Environment opposed the lifting of the moratorium on issuing new licenses, thereby confirming, albeit indirectly, that Russia is no longer committed to intensive development of offshore hydrocarbons in the Arctic. It seems that the government's strategic priorities are shifting towards Russia's onshore hydrocarbon potential.

Offshore vs onshore

It is noteworthy that even during the period of Arctic optimism, many Russian experts remained level-headed with respect to offshore drilling in the Arctic – an approach that was later adopted by government officials in the era of Arctic realism. Analysts have long been saying that Russia's onshore hydrocarbon reserves will last for a very long time.

Back in 2012, long before the Western sanctions, WWF-Russia experts issued a study called State Subsidies to the Oil and Gas Sector in Russia: At What Cost? In it, they rightly noted that "Russia can choose one of the two ways of maintaining its role in international energy markets: *extensive development – by commissioning new fields, including in the Arctic; or intensive development – by improving oil recovery ratio at existing fields* [everywhere author's italics] and releasing appropriate volumes of hydrocarbon resources for export following a reduction in the energy intensity of the domestic economy" [*Gerasimchuk* 2012].

In 2013, senior analyst at Sberbank CIB Valery Nesterov said: "In part, we are forced to develop the Arctic: not for oil or gas production, but in order to support and modernize Russia's northern regions – and for geopolitical reasons, too, like consolidating our position on the continental shelf. *First we need to deal with onshore resources. In the next 10-15 years, hard-to-recover oil reserves on shore are going to be much easier and more efficient to develop than those in the Arctic.* There will be no rapid production in the Arctic, and the volumes will be much smaller."[49]

Indeed, there are at least three viable alternatives to Arctic offshore projects.

The first alternative to offshore oil is the development of hard-to-recover onshore reserves[50]. In 2017, hard-to-recover reserves provided some 38-39 million tons of oil (including 1.6 million tons from Bazhenov, Abalak, Khadum and Domanic formations). This contributed 7.2 percent of the total Russian production, and that share is growing. According to the General Scheme of the Russian Oil Industry Development up to 2035, hard-to-recover reserves are expected to yield some 82 million tons / year[51], which will considerably

48 A. Gorokhova (2017) The Arctic shelf: sanctions do nothing but stimulate Russia's progress // Regnum. September 13, 2017 // https://regnum.ru/news/economy/2321227.html, accessed 12.12.2019.

49 A. Razintseva (2013) Should Russia hurry with the development of the Arctic shelf // Vedomosti. March 4, 2013 // https://www.vedomosti.ru/library/articles/2013/03/04/ostorozhno_arktika, accessed 12.12.2019.

50 Hard-to-recover reserves include oil from Bazhenov, Abalak, Khadum and Domanic and Tyumen formations, as well as oil extracted from productive reservoirs with low permeability and considerable vertical thickness of net oil pay. Sometimes, high-viscosity oil is also categorized as hard-to-recover.

51 Interview of Deputy Minister of Energy Kirill Molodtsov to a Russian newspaper regarding the prospects of hard-to-recover oil production (2017) // Ministry of energy. December 13, 2017 // https://minenergo.gov.ru/node/10093, accessed 12.12.2019.

exceed the anticipated output from the offshore Arctic.

Indeed, the Bazhenov Formation, stretching across most of Western Siberia, is considered the world's largest shale formation. Its geological resources are estimated at 100-170 billion tons[52], although with a very low oil recovery rate. While Arctic offshore development requires the creation of infrastructure in harsh conditions, not suitable for permanent human habitation, the Bazhenov Formation is located in regions with the already established infrastructure. Developing these reserves has a great social significance for Russia, as the decline in oil production in Western Siberia would affect the well-being of local oil and gas towns.[53]

Russian oil companies also have long compared the viability of developing hard-to-recover reserves and the resources of the Arctic shelf. Back in 2012, Gazprom Neft experts recognized: "For a long time, the Bazhenov Formation and its resources were seen as impractical in terms of exploration and development. These days, however, tapping into the Bazhenov Formation reserves seems more attractive, compared to a number of alternative scenarios of maintaining oil production, such as *starting offshore operations to the east of the Urals*, and in the undeveloped areas of Eastern Siberia. After all, the region of the Bazhenov Formation already has all the necessary infrastructure."[54]

However, projects for the development of shale oil also fall under anti-Russian sanctions; for example, in 2014 Total withdrew from its joint venture with LUKOIL to develop the Bazhenov Formation.[55] But a number of Russian companies, such as Surgutneftegas, have accumulated impressive experience in oil production from the formation, as it has been working there since 2005.[56]

It is noteworthy that officials of the relevant ministries now also adhere to a more pragmatic position with respect to offshore drilling in the Arctic. In December 2017, Kirill Molodtsov, then-Deputy Minister of Energy, stated that "the development of Bazhenov formation, though it is more expensive and risky than the development of traditional reserves, still looks more attractive than a number of alternatives aimed at supporting oil production, such *as the Northern continental shelf to the east of the Urals* and the virgin lands of East Siberia." According to the Minister, "the region of the Bazhenov formation already has all the necessary infrastructure, so one can expect lower costs and reduced damage to the environment."[57]

The second alternative to the Arctic offshore is enhancing oil recovery ratio. This method is widely applied in the developed petroleum producing countries, and even in developing countries such as Saudi Arabia and Oman. The average oil recovery ratio in Russia is less than 25%, while in Norway and the United States it is 40-50%.[58]

52 The potential of the Bazhenov Formation has already been confirmed (2018) // Gazprom Neft. April 5, 2018 // https://www.gazprom-neft.ru/press-center/lib/1509341/, accessed 12.12.2019.

53 The Bazhenov Formation: searching for major shale oil in Upper Salym (2013) // ROGTEC. August 27, 2013 // https://rogtecmagazine.com/%D0%B1%D0%B0%D0%B6%D0%B5%D0%BD%D0%BE%D0%B2%D1%81%D0%BA%D0%B0%D1%8F-%D1%81%D0%B2%D0%B8%D1%82%D0%B0-%D0%B2-%D0%BF%D0%BE%D0%B8%D1%81%D0%BA%D0%B0%D1%85-%D0%B1%D0%BE%D0%BB%D1%8C%D1%88%D0%BE%D0%B9-%D1%81/?lang=ru, accessed 12.12.2019.

54 V. Kalinin (2012) A Formation For Oil Kings // Gazprom Neft. May 2012 // https://www.gazprom-neft.ru/press-center/sibneft-online/archive/2012-may/1103904/, accessed 12.12.2019.

55 Total may return to the joint venture with LUKOIL within three years (2015) // Vedomosti. July 8, 2015 // https://www.vedomosti.ru/business/news/2015/07/08/599772-total-mozhet-vernutsya-v-sp-s-lukoilom-v-techenie-treh-let, accessed 12.12.2019.

56 Let's go to the formation (2014) // Oil and Gas Russia, July 2014.

57 A. Vozdvizhenskaya (2017) Let's loosen the deposits // Rossiyskaya Gazeta. December 12, 2017 // https://rg.ru/2017/12/12/minenergo-v-rf-k-2035-godu-vdvoe-uvelichitsia-dobycha-trudnoj-nefti.html, accessed 12.12.2019.

In their forecast of global energy development until 2030, LUKOIL analysts write: "Increasing the oil recovery factor to 44% would ensure growth of Russian recoverable reserves by about 4 billion tons" [Main Trends of the Global Oil Market Development up to 2030 2016]. For comparison: recoverable reserves of the Prirazlomnoye field are estimated at 70 million tons of oil.

According to the Ministry of Economic Development, a mere 1 percentage point increase in the oil recovery ratio in Russia would let it produce an additional 20 million tons of oil each year [Forecast of Social and Economic Development of the Russian Federation, 2018], which is roughly what the Arctic offshore is projected to yield by 2035. In addition, just as developing hard-to-recover reserves, raising the rate of oil recovery will extend the life of the mature fields in Western Siberia, which would help resolve the problem of declining old oil towns built in Western Siberia near the aging giants, thus mitigating potential social tension.

The third alternative to Arctic offshore development is small and medium-sized non-integrated oil companies (some 250 firms operating in Russia) that work on small or depleted fields which are not of interest to big businesses. Currently, these smaller companies produce about 14 million tons / year of oil. (For comparison: in the United States, roughly 9,000 independent oil and gas companies produce 54% of oil and 85% of natural gas in the country[59].) Skolkovo Energy Center experts note that the US and Norwegian tax and licensing policies are aimed at fostering the development of independent companies. In the United States, it was these companies that developed and pioneered the technologies behind the shale revolution, while in Norway, a large number of operator companies contributed to efficient offshore oil production. Skolkovo experts say that that if Russian independent companies are granted certain benefits, their production could increase up to 42 million tons / year by 2030 [Does the Russian independent oil sector have a future, 2014]. This figure, again, is higher than the volume that the Arctic continental shelf is expected to produce.

At the moment, the first alternative to offshore development in the Arctic seems to be the most popular with the government. According to the new head of the Ministry of Natural Resources and Environment Dmitry Kobylkin, it is too early to talk about offshore oil production in the Arctic. "We have enough oil in West Siberia, but those are hard-to recover reserves. The Bazhenov Formation, for example, requires a lot of work. It already has the infrastructure, so there are many opportunities there."[60]

In fact, the government has long been taking measures to increase the investment attractiveness of hard-to-recover reserves. Back in 2013, the mineral extraction tax for the development of Bazhenov, Abalak, Khadum and Domanic formations was reduced to zero – moreover, these tax breaks are to remain in force for 10-15 years.[61] And in 2018, the Ministry of Natural Resources and Environment proposed amendments to the Law on the Subsurface with the aim of stimulating the production of hard-to-recover oil. These incen-

58 O. Matveeva (2017) Chemistry and deep extraction // Kommersant, Chemical industry. June 15, 2017 // https://www.kommersant.ru/doc/3325258, accessed 12.12.2019.

59 Who Are America's Independent Producers? // IPAA // https://www.ipaa.org/independent-producers/, accessed 12.12.2019.

60 The Ministry of Natural Resources and Environment: "It is too early to talk about offshore oil production in the Arctic" (2018) // The Oil and Gas hierarchy. 17 August 2018 // http://www.ngv.ru/news/mpr_govorit_ob_arkticheskom_shelfe_poka_rano/, accessed 12.12.2019.

61 A. Sotnikova, L. Podobedova (2014) Rosneft is interested in 'difficult' oil // RBC. October 1, 2014 // https://www.rbc.ru/newspaper/2014/10/01/56bda4999a7947299f72c87b, accessed 12.12.2019.

tives will open "a new stage in the development of the West Siberian oil and gas province," the Ministry said, citing Dmitry Kobylkin. According to his estimates, in this region, the Bazhenov Formation alone will provide growth in recoverable reserves by 1 billion tons of oil.[62]

At the same time, the government continues to set strategic goals to promote all three onshore alternatives to the Arctic shelf, obviously trying to stimulate the industry's transition from extensive to intensive development. The draft Energy Strategy of Russia until 2035 sets the following as a priority: "Modernization and development of the industry on the basis of state-of-the-art technologies, primarily of domestic origin, in order to: *increase design oil recovery ratio from 28% to 40%* (excluding the development of hard-to-recover reserves); *increase the share of hard-to-recover resources up to 17% of the total oil production* (current share is roughly 8%)" [Draft Energy Strategy of Russia, 2017]. The amendments to the General Scheme of the Russian Oil Industry Development up to 2035 state that it is "*necessary to increase the average current oil recovery ratio from 0.248 in 2015 to at least 0.28 by 2020 and at least 0.36 by 2035. It is also necessary to increase the share of independent (and smaller) companies in the production of oil with gas condensate from 3.8% in 2015 to at least 5% by 2020 and at least 8% by 2035*" [General Scheme of the Russian Oil Industry Development, 2011]. (However, pessimistically speaking, these strategic goals have been set for a long time, ever since the 1990s, yet little has been done to implement them.)

In general, these three options are simpler, cheaper, and more environmentally friendly than developing the Arctic offshore. They are politically less attractive for Russia's image as an energy power, but they are more socially oriented and economically viable.

This explains why the experts of the Analytical Center for the Government of the Russian Federation have been saying that, "given the long-term forecasts of domestic and foreign demand for oil and gas, and considering the available resources and plans for production in continental Russia, it appears that, *until 2035, there will be no need for large-scale offshore production of hydrocarbons in Russia's Arctic*" [*Amiragyan* 2016].

In the current era of Arctic realism, the launch of offshore fields in the Arctic is postponed or put on hold. This is good news, since Russian oil companies and related industries are getting a break, which the country can use to overcome a serious challenge that prevents Russia from engaging in environmentally safe operations in the Arctic.

Only human after all

Much has been written about the financial, technological, environmental and infrastructure problems of developing offshore Arctic hydrocarbons. But another challenge lies in the acute shortage of qualified workforce capable of producing and transporting Arctic oil in an environmentally safe way. This deficit is felt worldwide, in fact, but in Russia it is further exacerbated by a number of objective factors: under socialism, oil companies did not promote environmental awareness among their personnel in any significant way, never teaching their workforce the principles of sustainable development. Moreover,

62 The Ministry of Natural Resources believes it is premature to lift the moratorium on issuing Arctic offshore licenses (2018) // Pro-Arctic. August 20, 2018 // http://pro-arctic.ru/20/08/2018/news/33463, accessed 12.12.2019.

during the 1990s, Russian civilian shipbuilding and maritime industry lost much of their human potential. And this lack of trained specialists is more difficult to overcome than the lack of modern technologies, since the latter can be purchased on the market, whereas teaching an employee how to use it correctly (and in an environmentally friendly manner) can only be done through close cooperation with other, more experienced partner companies.

Moreover, recent events show that the human factor is one of the main causes of environmental disasters. Take, for example, the oil spills at the Trebs field in April 2012. Rostekhnadzor (Russia's Federal Service for Ecological, Technological and Nuclear Supervision), which investigated the accident, concluded that, among other things, the accident was caused by personnel lacking experience in work-over of deep wells in the extreme north.[63] These spills took place on shore; can we be sure that Russian oilmen are qualified enough to safely produce oil from offshore fields in the Arctic, under much harsher conditions? Another case is the Nadezhda oil tanker that crashed off the coast of Sakhalin in November 2015, resulting in a massive spill of petroleum products. It was established that the captain of the vessel, a number of administration officials at the ports of Vanino and Nevelsk, as well as the ship owner and the charterer were responsible for the accident.[64]

Gazprom Neft has also admitted the need for qualified workforce. The company's Deputy General Director for the Development of Offshore Projects Andrey Patrushev noted that "implementation of technically challenging offshore projects requires unique competencies and expertise beyond the scope of regular training programs."[65] In fact, Russian oil companies are very aware of this shortage: For example, in order to train personnel to work in the Arctic, Gazprom Neft (in addition to its own training programs) cooperates with the Gubkin Russian State University of Oil and Gas, Norway's University of Stavanger and the Murmansk State Technical University.

Moreover, the lack of skills and expertise is compounded by the fact that, by law, only Rosneft and Gazprom have had access to new offshore fields since 2008. The problem is, they do not have sufficient experience of independent development of continental shelf resources. Rosneft's only offshore oil project has been Sakhalin-1, operated by ExxonMobil. As for Gazprom, it became the main shareholder and operator of Sakhalin-2, but only by the time the project was already fully operational. In other words, the two companies do not have sufficient experience to manage large-scale and complex projects like these. At the same time, LUKOIL has accumulated real experience of offshore hydrocarbon production: the company launched oil projects in the Caspian Sea all by itself, effectively creating the Caspian petroleum province; it produces oil in the Baltic Sea, and operates offshore fields abroad in consortia with international and national oil companies. However, despite Vagit Alekperov's persistent lobbying for equal access of private and public companies to offshore resources, LUKOIL still has not been allowed to work on the northern offshore fields. The monopoly on the Arctic shelf resources maintained by Gazprom

63 K. Dokukina (2012) Bashneft spilled some oil // Vedomosti. October 17, 2012 // https://www.vedomosti.ru/business/articles/2012/10/17/fontan_im_trebsa, accessed 12.12.2019.

64 Threats know no borders (2019) // Oil and Gas Hierarchy. No 2. P. 37 // http://www.ngv.ru/magazines/article/ugrozy-neznayut-granits/, accessed 12.12.2019.

65 We have gained unique experience of developing offshore resources (2018) // Gazprom Neft. December 13, 2018 // https://www.gazprom-neft.ru/press-center/lib/2112700/, accessed 12.12.2019.

and Rosneft severely hinders their development.

The Ministry of Economic Development is also aware of the potential consequences of insufficiently skilled manpower, which is why in its Forecast of Development until 2024 it notes: "*At the same time, there are still risks that insufficient expertise with respect to implementing offshore and other complex projects, given the restrictions on import of equipment and technologies required, may have a negative impact on the dynamics of oil production*" [Forecast of Social and Economic Development of the Russian Federation 2018].

Arctic shipping, too, lacks qualified personnel. The government has high hopes for the development of the Northern Sea Route (NSR) going from the Bering Strait to the Barents Sea, which should reduce the distance that cargo must travel from Asia to Europe (via the Strait of Malacca) by 2.5–4 thousand nautical miles, or 10-14 days, saving hundreds of thousands of dollars. The NSR could become one of Russia's major geopolitical projects, as it will serve as a Russian bridge connecting Europe and Asia. Given its economic, commercial and political significance both globally and for Russia, Vladimir Putin in his 'May Decrees' announced that by 2024, the cargo turnover of the Northern Sea Route will reach 80 million tons / year, compared to 10 million tons in 2017, mainly thanks to NOVATEK's LNG and oil produced by Gazprom Neft and Rosneft.[66] Still, a number of experts rightly point out that it will not be easy to reach such volumes of traffic[67], among other things, because of the lack of skilled specialists.

Although Russia has always been an Arctic nation and a sea nation, even the heads of relevant agencies are forced to recognize the acute shortage of professionals in the field. In 2017, the then head of Sovcomflot and Deputy Minister of transport Viktor Olersky noted: "The key issue for us now is finding people with relevant skills and experience – they are immensely valuable. *In fact, there is only a handful of sailors and officers working in the Arctic right now.* We at Sovcomflot are searching for them, bringing them together and training them."[68] The same sentiment is expressed by the head and owner of Sovfracht Dmitry Purim: "What we also need to ensure is the high quality of our personnel: pilots, icebreaker captains, port operators, etc. – *it's not just about professional knowledge and skills, but also experience of working in the Arctic*, and basic language training."[69] If Russia, being an Arctic nation, experiences such an acute shortage of qualified workforce able to work in the Arctic, then you can imagine what the situation is in non-Arctic states that plan to explore and produce the region's hydrocarbon resources.

The development of Arctic offshore petroleum assets is also strongly hindered by the dismal situation in the Russian civilian shipbuilding industry. Since the early 1990, after the collapse of the Soviet Union, the sector has been in considerable decline. The few Soviet enterprises that had started producing equipment for offshore drilling by the end of the 1980s, went nearly bankrupt in the early 1990s. Many skilled workers left the industry in search of gainful employment, and as a result, Russia faced

66 E. Kryuchkova, A. Vedeneeva (2019) The Arctic was moved to the Far East // Kommersant. January 19, 2019 // https://www.kommersant.ru/doc/3859135, accessed 12.12.2019.

67 Widening the Northern Sea Route (2019) // Kommersant. April 10, 2019 // https://www.kommersant.ru/doc/3938883, accessed 12.12.2019.

68 Internationalization of the Northern Sea Route can only be good in terms of transit (2017) // Kommersant. November 17, 2017 // https://www.kommersant.ru/doc/3468678, accessed 12.12.2019.

69 The Arctic is a high-risk zone, and nothing is certain (2017) // Kommersant. October 20, 2017 // https://www.kommersant.ru/doc/3442065, accessed 12.12.2019.

an acute shortage of qualified professionals and advanced technologies of civilian shipbuilding. For a long time, Russian oil and gas companies had to order ships from abroad. Speaking of this problem, United Shipbuilding Corporation (USC) President Alexey Rakhmanov noted:"Generally speaking, working in the civilian market is itself a huge financial risk. For many decades, Russia's domestic shipbuilding has been stalling: at first because the Soviet leadership thought it necessary to support other COMECON nations, then for economic reasons. *As a result, now building a commercial vessel, especially a prototype, is sailing in uncharted waters.*"[70]

This is what led to the creation of the Zvezda Shipbuilding Complex in the Far East, which, according to experts, should revive Russian civil shipbuilding. The Zvezda 'super-wharf' attracts both Western and Eastern partners to use shared technologies and train personnel. For example, Zvezda and Samsung Heavy Industries recently signed an agreement to create a joint venture to manage shuttle tanker construction projects. Samsung will not only provide Zvezda with technical specifications and documents, but will also train Russian workers at Samsung's own shipyard and organize internship programs. This type of cooperation, including personnel training, is very valuable for Zvezda, since Samsung has extensive experience in designing and building Arctic shuttle tankers.

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Thus, by postponing large-scale offshore projects in the Arctic, Russia bought time to train the workforce, teach it proper environmental awareness and develop a different mindset in order to move away from the old Soviet slogan of 'conquering the Arctic' and towards the principle formulated by Alexander Makarov, Director of the Russia's Federal Service for Hydrometeorology and Environmental Monitoring: "The Arctic is a region of extremes – it cannot be conquered, and it does not forgive mistakes. We must learn to live and work there."[71]

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70 A. Vedeneeva (2018) Shipbuilding business is very complicated and dangerous // Kommersant. December 20, 2018 // https://www.kommersant.ru/doc/3835729, accessed 12.12.2019.

71 The Arctic cannot be conquered (2018) // Ogonyok. No 39. October 15, 2018. P. 16 // https://www.kommersant.ru/doc/3751798, accessed 12.12.2019.

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National Peculiarities

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Development of Transit Potential of the Northern Sea Route

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ABSTRACT. *The Article defines the sectoral structure of the Northern Sea transport corridor, the set of the transport tasks provided by them - the international transit, import and export operations, and considers internal transportation. It is shown that in relation to the water area of the sector of the Northern Sea Route, both international and internal transportation (big cabotage and intersectoral transportation) can be referred to as transit. Transit transportation across the Northern Sea Route between countries in 2010-2018 has been analyzed. The Article also defines transit dynamics and commodity structure. Dynamics of transit transportation of main types of freights are considered: bulk freights (oil products, gas condensate), bulk cargoes (iron ore, coal). The dynamics of Russia's internal transit transportation across the Northern Sea Route have been analyzed. The article also analyzes the dynamics of transportation of frozen fish, the possible transit of which may prompt the creation of a year-round container line between the ports of Petropavlovsk-Kamchatsky, Murmansk, Arkhangelsk, and St. Petersburg. The author summarizes the results of the development of transit transportations in 2010-2018 and identifies the factors defining the demand for transit shipments of various cargoes. The Article also provides an assessment of the development prospects of transit freight traffic by international shipping companies (Maersk). The conclusion is that supporting national investment projects should be a priority when improving navigation along the Northern Sea Route – transportation of mineral resources and supporting mining companies. At the same time, creating a steady transportation system for Arctic mineral resources calls for the development of icebreaking, navigation, and hydrometeorological support. This will reduce risks associated with Arctic navigation and increase the appeal of the Arctic sea transport system as a whole. The Article identifies the following necessary conditions for the development of navigation in the Northern Sea Route: expanding the domestic Arctic linear icebreaker fleet; cen-*

tral planning of sea freight transportation and coordination of actions of participants, which could increase the appeal of the Northern Sea Route, including its role for transit.

KEYWORDS: *Northern Sea transport corridor, Northern Sea Route, international transit, internal transit, container transportation, navigation restrictions, cargo base, ice breakers, prospects*

The development of Arctic shipping, particularly in the waters of the Northern Sea Route, currently aims at national strategic and systemic projects, dealing with the exploitation of natural resources of the Arctic Zone of the Russian Federation.

The development of mineral resources is the first motivation for the development of Arctic shipping not only in Russia but also in other Arctic countries, such as Canada, Denmark, the USA, and Norway.

One of the directions of the Northern Sea Route's development is connected with the establishment of a competitive international trading artery to ensure cargo flow between the markets of the North Pacific and the North Atlantic.

The transit potential of the Northern Sea Route, especially in the context of global warming, is highly appraised in Arctic strategies of Arctic and non-Arctic countries alike [Arctic Strategic Outlook 2019; China's Arctic Policy 2019].

Many authors see China as having a special role in the development of Arctic transit cargo traffic. [*Kryukov* 2018; *Kheifetz* 2018].

The future of transit along the Northern Sea Route has attracted mixed criticisms. Some authors value highly the prospects for such development, explaining that this will provide for a shorter route between the ports of Southeast Asia and Europe [*Todorov* 2017; *Bolsunovskaya*, *Boyarko* 2014; *Pavlov, Selin* 2016; *Polovinkin, Fomichev* 2012]. It is also often emphasized that "Russia has more to gain from such expansion. This applies to the freight of Russian vessels, fees for the passage of foreign ships, icebreaker fees, etc. "[*Kheifets* 2018]. However, it must be noted that charges for passage along the Northern Sea Route are against the basic principles of the UN Convention on the Law of the Sea.

Some authors are skeptical about the possibility of significant growth of such transit [*Komkov*, *Selin*, *Tsukerman*, *Goryachevskaya* 2016; *Kuvatov*, *Kozmovsky*, *Shatalova* 2014; *Lukin* 2015].

According to "Atomflot" experts, the main reason for the weak development of transit shipping is the lack of a large cargo base, and "given the limited number of icebreakers, future transit will only be possible against large guaranteed consignments and a clear schedule of routes" [*Ruksha, Belkin, Smirnov, Arutyunyan* 2015].

The subsidiary role of the Northern Sea Route in the system of international transit is most clearly defined in the following way [*Selin, Kozmenko* 2015, p. 110]: "Thus, at present the Northern Sea Route as an international transit artery remains on stand-by of the international transport system, falling short of an operating link."

The current state of development of the Northern Sea Route infrastructure shows that transit voyages, both domestic and international, will be irregular and provide limited cargo flow (according to the Ministry of Transport of Russia, in 2024 international and internal transit will not exceed 1 million tons).

The article aims to analyze the peculiarities of transit shipping development in the Arctic in recent years and to identify the primary tasks to grasp its transit potential fully.

Transit transportation along the Northern Sea Route in the total freight traffic of the Northern Sea transport corridor

The analysis of the transit traffic in the waters of the Northern Sea transport corridor requires understanding of its role in the general structure of the Northern Sea transport corridor, which accommodates the entire bulk of cargo shipments in the Arctic areas of Russia.

The Northern Sea transport corridor (NSTC) is a historically established national transport link of the Russian Federation, which includes ports and shipping routes along the Arctic seas and rivers flowing into the Barents, White and Pechora seas to the west, the Northern Sea Route (*Kara, Laptev, East Siberian, and Chukchi seas*) in the central part, and the Bering Sea to the east.

The Northern Sea transport corridor (NSTC) may be divided into three sectors [*Grigoryev* (1) 2017]:

1) the Pomorsky sector includes the Barents, Pechora and White Seas;
2) the Northern Sea Route covers the water area of the Northern Sea Route as defined by Federal Law no 525-FZ of December 27, 2018, and includes the waters of the Kara Sea, the Laptev Sea, the East Siberian, and Chukchi Seas;
3) the Kamchatka sector includes the Bering Sea and the North Pacific Ocean.

To the west, NSTC is limited by the maritime demarcation line between the Russian Federation and the Kingdom of Norway in the Barents Sea, according to Federal Law no 57-FZ of April 5, 2011 "On ratification of the Treaty between the Russian Federation and the Kingdom of Norway on the delimitation of maritime spaces and cooperation in the Barents Sea and the Arctic Ocean."

The eastern boundary of NSTC is the maritime delimitation line between the USSR and the United States, as delineated by the Agreement on the Maritime Boundary, signed in 1990. At the signing ceremony, the Parties agreed on its provisional application from June 15, 1990, in accordance with the 1969 Vienna Convention on the Law of Treaties (Article 25, "Provisional application"). The Agreement was ratified by the US Congress on September 18, 1990, but has yet to be ratified by the Russian Parliament.

The internal borders of the NSTC sectors are defined by the Federal Law of 28.07.2012 no 132-FZ "On amending certain legislative acts of the Russian Federation concerning state regulation of commercial navigation along the Northern Sea Route." The law lays down the boundaries of the Northern Sea Route as follows: "The Northern Sea Route is a water space adjacent to the northern coast of the Russian Federation, covering inland sea waters, the territorial sea, contiguous zone and exclusive economic zone of the Russian Federation and bound to the east by the maritime delimitation line with the United States of America and the parallel of Cape Dezhnev in the Bering Strait, to the west – by the meridian of the Cape Zhelaniya to the Novaya Zemlya archipelago, and by the eastern shoreline of the Novaya Zemlya archipelago and the western borders of the Matochkin, Kara, and Yugorski Straits. "

The northern border of NSTC is the outward line of the exclusive economic zone of the Russian Federation in the Arctic Ocean.

The southern border of NSTC is defined by the location of seaports on the northern rivers flowing into the outlying seas of the Arctic Ocean, the inner

White Sea. It is also conditionally accepted in the Pacific Ocean at the latitude of Petropavlovsk-Kamchatsky, located on the border of the Bering and Okhotsk seas, with the Register of Sea Ports of the Russian Sea Fleet defining the Petropavlovsk-Kamchatsky seaport as follows: "Russia, Kamchatka Krai, the Pacific Ocean, Okhotsk, and Bering Sea, Avacha and Petropavlovsk bays" (annex to the order of the Federal Agency for Maritime and River Transport, Russia, ("Rosmorrechflot") of May 30, 2011, no AD181-r).

The central sector of NSTC is the Northern Sea Route, linking the western and eastern sectors. It is characterized by the most difficult navigating conditions associated with the formation of ice cover for over six months per year, and the period of navigation not exceeding three months per year in certain ports (Khatanga, Tiksi, Anadyr, etc.)

Such irregular climate begs the question if Article 234 "Ice-covered areas" of the United Nations Convention on the Law of the Sea (UNCLOS, concluded in Montego Bay on 10.12.1982, as of 23.07.1994) applies to the Northern Sea Route: " Coastal States have the right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas within the limits of the exclusive economic zone, where particularly severe climatic conditions and the presence of ice covering such areas for most of the year create obstructions or exceptional hazards to navigation, and pollution of the marine environment could cause major harm to or irreversible disturbance of the ecological balance." In fact, the observed level of ice cover permits allows for the application of Article 234 to the areas of the Pechora Sea, the north-east of the Barents Sea, and the north of the Pacific Ocean.

Transport problems of the Northern Sea transport corridor

The NSTC maritime transport system will solve the following tasks [*Grigoryev* (1) 2017]:

1. International transit:
   a. Asia-Europe (east to west);
   b. European countries - APR countries (west to east);
   c. North American countries - APR countries (west to east);
2. Import-export operations:
   a. Pacific Direction;
   b. Atlantic direction;
3. Domestic:
   a. large coastal shipping (long-range cabotage);
   b. small coastal shipping (petite cabotage):
      i. Cross-sectoral transport;
      ii: Intra-sectoral transport.

International transit (that is, without entering the ports of the Russian Federation along the way) ensures transfer of goods between the ports of the northern Pacific and the northern Atlantic, linking the markets of the Asia-Pacific region (Asia and the Pacific coast of North America) and Europe. In addition to the traditional east-west (Asia/North America – Europe) and west-east (Europe – Asia), the NSTC has started to service transportation from the east coast of North America to Asia from west to east (for instance, in 2018 through NSTC, two runs conducted by bulk carriers loaded with iron-ore concentrate from Arctic Canada to Japan and Taiwan).

Import and export operations largely deal with the transfer of oil, gas and mining products, as well as supplying equipment and materials for extractive industries. The ports of the Pomorsky sector (Murmansk, Kandalaksha, Arkhangelsk) provide the main transshipment of car-

go in the Arctic basin, going to or arriving from the European and Asian parts of the country. Recently, the NSTC also serviced several international shipments to Kazakhstan, such as a shipment of a large cargo from South Korea for the Pavlodar Oil Refinery. The main share of cargo flow goes to the west, but since 2018, the transportation of liquefied natural gas (LNG) of the "Yamal LNG" project to the APR market has begun (including four shipments by Yamalmax LNG carriers.)

Domestic transportation includes both large and small coastal shipping (cabotage). Long-range cabotage ensures the freight traffic between ports of different seas with passage through territorial waters of foreign states (for example, from the Kamchatka sector of NSTC to the Russian ports in the Baltic Sea). Small cabotage ensures the cargo traffic between the ports of adjacent waters of the Arctic and Pacific oceans (cross-sectoral transport), or between the ports of the Arctic and Pacific Oceans within the borders of the Pomorsky sector, the Northern Sea Route sector and the Kamchatka sector (intra-sectoral transport).

The freight traffic of NSTC provides for multimodal transportation by rail, road, air, river, and sea transport. The key role is given to the sea and river ports, both within (Murmansk, Arkhangelsk, Varanday, Sabetta, Dixon, Dudinka, Tiksi, Pevek), and outside NSTC: that is, including St. Petersburg, Vladivostok, etc. [*Grigoryev* (1) 2017]

Transit transport along the Northern Sea Route

Transshipment is the transportation of cargo and passengers from one place to another through intermediate territories. Since the Northern Sea Route is the central part of NSTC, all of the following will be considered "transshipments": the transport between foreign ports (international transit) and the internal long-range cabo-

Fig. 1. Transit routes in the waters of the Northern Sea Route

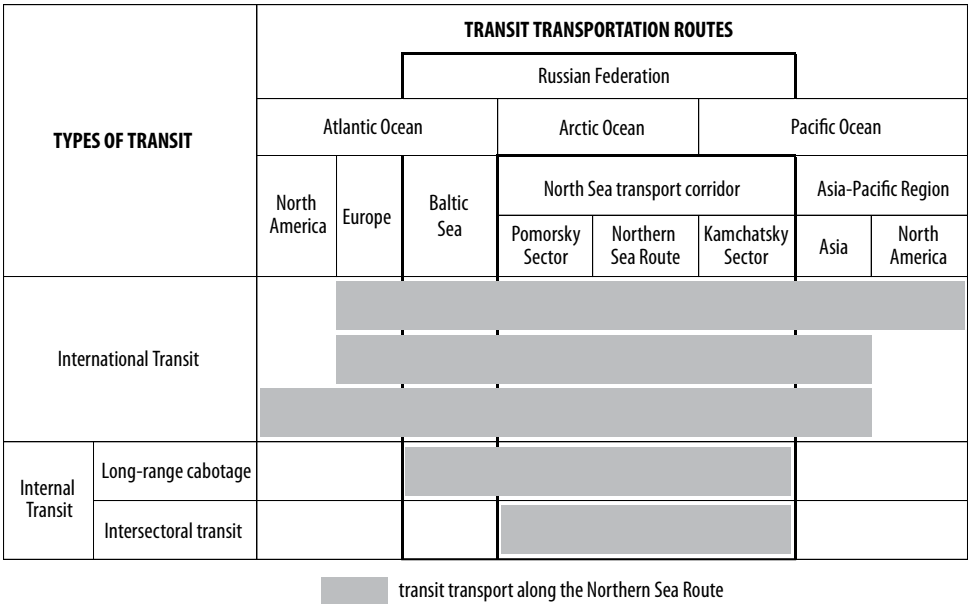

Table 1 Transit transportation along the Northern Sea Route between the countries in 2010-2018

Country of origin	Destination Country																	Total, thousands of tons
		Europe										Asia						
	Russia	Finland	Netherlands	Germany	France	Sweden	UK	Denmark	Poland	Germany and the Netherlands	Norway	China	South Korea	Japan	Thailand	Malaysia	Singapore	
Russia	465											1 018	728	36	182	61	44	**2 535**
Canada		300		72								72		72				**517**
Norway												104	76	217				**396**
Netherlands												64						**64**
Finland												63						**63**
Finland and Denmark												31						**31**
Germany														30				**30**
Sweden													17					**17**
Germany and Norway														13				**13**
UK	5																	**5**
Estonia												4						**4**
Iceland														3				**3**
South Korea		199	387	33	69													**688**
China	1		94	13		35	14	18	3	3	0							**182**
Japan						32												**32**
Vietnam							15		0									**15**
Total	**471**	**500**	**481**	**118**	**69**	**68**	**28**	**18**	**3**	**3**	**0**	**1 356**	**821**	**370**	**182**	**61**	**44**	**4 594**

tage (between the Pacific and Baltic ports) and cross-sectoral between the ports of the Kamchatka and Pomor sectors of NSTC (Fig. 1). This is precisely how the Administration of the Northern Sea Route of the Ministry of Transport of Russia views such transportation.

International transit includes three routes (transportation between the countries of the Asia-Pacific region and Europe in the eastern and western directions, as well as transportation between North America and Asia from west to east). Intra-Russian transit transport includes shipment of goods between the ports of the NSTC Kamchatka sector to the ports of the Baltic Sea (long-range cabotage) and transportation between the ports of the Pomorsky and Kamchatka sectors of NSTC (petite cabotage).

A large share of freight traffic is international transit, with the share of intra-Russian transit during the period under review amounting to 10%. The most substantial volume of cargo was transported from Russia to China (22%) and South Korea (16%) (Table 1).

Let us consider the contribution of various cargo flows to the development of transit traffic along the Northern Sea Route. The key data source for this analysis is the statistics provided by the Federal State Budgetary Institution "Northern Sea Route Administration," established in March 2013. The analysis of transit traffic covered the period 2010-2018, and for the internal Russian transit, it covered 2011-2018.

The increase in transit traffic that had begun in 2010 reached its peak by 2012, with the transportation of 1267 thousand tons of freight. That year, transit accounted for 34% of the total cargo traffic along the Northern Sea Route (Table 2). In general, freight was chiefly transported from west to east. Here and further on, freight volumes are indicated in thousands of tons.

During the period under review, four and a half million tons of transit cargo were transported, with 83% of all shipments accounting for four types of freight: bulk oil products and gas condensate, bulk ore and coal (Table 2).

Table 2. Transit dynamics along the Northern Sea Route, thousands of tons

Destination of transportation	Years								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
East-West		65	343	445	89	21	170	39	215
West-East	113	758	924	732	185	19	44	156	276
Total	113	823	1 267	1 176	274	40	215	194	491
Share of transit in the whole cargo flow	5%	27%	34%	30%	7%	1%	3%	2%	2%
Share of East-West transportation	0%	8%	27%	38%	32%	52%	79%	20%	44%
Share of West-East transportation	100%	92%	73%	62%	68%	48%	21%	80%	56%

Table 3. The commodity pattern of the Northern Sea Route transits in 2010-2018

Cargo	Weight, thousands of tons	Share in transportation
Oil products	1 345	29%
Gas condensates	1 277	28%
Iron ore	763	17%
Coal	405	9%
Liquefied Natural Gas (LNG)	209	5%
Paper and cellulose pulp	123	3%
Equipment	120	3%
Break-bulk cargo	71	2%
Non-ferrous metals	59	1%
Frozen goods	54	1%
Oil	44	1%
Containers	33	1%
Steel	30	1%
Fluorspar	25	1%
Ships on deck	19	0,4%
Timber	15	0,3%
Total	**4 594**	**100%**

Dynamics of transit traffic of main types of cargo

BULK LOADS

Oil Products

Transit transportation of oil products was carried out both in the western and eastern directions in 2011-2013, 2018, and in the eastern direction only in 2014, and 2016-2017. In 2015, oil products were not moved (Table 3). In total, 1345 thousand tons of oil products were shipped.

Transportation of oil products reached the maximum value in 2013 when 650 thousand tons were transported in both directions. At the same time, some of the cross-freight was carried out by the same tankers, which allowed to avoid passage in ballast; in the western direction, the supply of aviation kerosene prevailed.

A significant price differential drove the transportation of oil products in the markets of Europe and the Asia-Pacific region. As the prices stabilized, the shipments lost sense for the economy.

Gas condensate

Transit transportation of gas condensate in the eastern direction began in 2010 and lasted for four years (Table 4). In total, 1277 tons of gas condensate were transported.

The Company "NOVATEK" supplied gas condensate to the port of Vitino in the White Sea by rail before exporting it through Murmansk. The first run from Murmansk in 2010 was carried out by the Aframax Arc5 ice-class oil tanker "SKF Baltica" with a deadweight of 117 thousand tons, owned by the company "Sovcomflot," under the flag of Liberia. The tanker carried out the transit in 22 days, passing through the traditional way along the Northern Sea Route through the Sannikov Strait to the Chinese port of Ningbo. When fully loaded, the tanker has a draft of 15.4 m, with the Sannikov Strait depth restrictions at 12.5 meters. Therefore, the tanker was significantly underloaded. With a total deadweight of 117 thousand tons, they loaded 70 thousand tons of gas condensate, which allowed to reduce the draft to a safe margin. Along the Northern Sea Route from the Novaya Zemlya Archipelago to the Dezhnev Cape, the tanker was accompanied by two nuclear icebreakers - "Russia" and "50 Let Pobedy" ("*50 Years of Victory*").

In 2011, Sovcomflot conducted the second pilot run carrying gas condensate from Murmansk to Thailand, with a larger-size Suezmax tanker "Vladimir Tikhonov" (ice class Arc 4) under the flag of Liberia. The icebreaker was also provided with two nuclear icebreakers – "50 Let Pobedy" and "Yamal." The run was intended to identify a deep-water route north of the Novosibirsk Islands, bypassing the Sannikov Strait. The ship was likewise significantly underloaded: with the tanker's deadweight of 163 thousand tons, when fully loaded, the draft is 16.5 meters. They loaded 121 thousand tons of LNG, which allowed to reduce the draft of the vessel to ensure the safety of navigation in the poorly studied water.

In 2011-2013, gas condensate was transported by foreign cargo ships with a deadweight of about 75 thousand tons, belonging mainly to Arctic ice-class Arc 4, both with and without icebreaker support. The cargo volumes ranged from 57 to 61

Table 4. Dynamics of transit transportation of oil products, thousands of tons

Destination of transportation	Years							
	2011	2012	2013	2014	2015	2016	2017	2018
East-West	65	238	313					94
West-East	21	64	337	185		8	15	5
Total	86	302	650	185		8	15	99

Table 5. Dynamics of gas condensate transit, thousands of tons

Years								
2010	2011	2012	2013	2014	2015	2016	2017	2018
70	601	487	120					

thousand tons. Shipments were made to China, South Korea, Thailand, and Malaysia.

The transportation gradually decreased in volumes and ceased in 2013 due to the exhaustion of the cargo base. In 2013, NOVATEK put into operation the "Complex for fractionating and transshipment of stable gas condensate" in Ust-Luga in the Baltic Sea, which allowed both to export stable gas condensate and to process it (to naphtha, kerosene, diesel fraction and fuel oil) and to ship processed products for export by sea.

BULK CARGOES

Iron ore

Transit transportation of iron ore (iron ore concentrate) in the eastern direction was carried out in 2010-2013 and resumed in 2018 (Table 5). In total, 763 thousand tons of iron ore were transported during the reviewed period.

The first shipment of iron ore concentrate along the Northern Sea Route was organized by two companies - Tschudi Shipping Company and Prominvest SA in 2010. The MV Nordic Barents bulker, belonging to the Arctic ice-class Arc 4 and owned by the Danish shipping company Nordic Bulk carriers, with a deadweight of 43 thousand tons, transported 41 thousand tons of iron ore concentrate from Kirkenes to China [*Grigoryev* 2016].

2011 marked the beginning of EuroChem iron ore concentrate shipments from the Kovdorsky Mining and Processing Plant through the port of Murmansk to China by the bulk carriers of the Murmansk Shipping Company "Mikhail Kutuzov," "Dmitry Pozharsky," and also Sanco Line's "Sanco Odyssey" to the Chinese ports of Jingang and Beilun.

In 2012, the shipments were carried out by "Nordic Odyssey" and "Nordic Orion," carriers of the Arctic ice-class Arc 4, belonging to "Nordic Bulk carriers." Each bulk ship carried out two runs to China; three were made to the port of Huanghua.

In 2013, the same two bulk vessels of "Nordic Bulk carriers" operated one route to China (the ports of Lanshan and Qingdao), and one shipment was made by the bulker "NS Yakutia" of the Arctic Ice Class Ice3. After that, the transportation of iron ore ceased.

Transporting iron ore concentrate is also attractive due to the price difference between European and Asian markets. The reason for the termination of the transit traffic is the decrease in the price of iron ore concentrate in China, which made shipments ineffective. In addition, market participants note the low quality of iron ore concentrate associated with high sulfur content.

In 2018, the bulkers "Nordic Olympic" and "Nordic Oshima" of the company "Nordic Bulk carriers" made two runs from Arctic Canada (Milne Inlet) with a cargo of iron ore concentrate to Tobata (Japan) and Kaohsiung (Taiwan). Notably, instead of taking a short route through the North-West bypassing Greenland, the ships went along NSTC. The Canadian

Table 6. Iron ore transit dynamics, thousands of tons

Destination of transportation	Years								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
West-East (Europe – Asia)	43	110	262	203					
West-East (North America – Asia)									144

bulkers opted for the North-East passage (NSTC) instead of the North-West due to the route's safety and stability.

Coal

International transit of coal since the beginning of general transit traffic along the Northern Sea Route since 2011 was conducted in 2012, 2013, 2014, 2016, 2017, and 2018. Transportation was single. In 2012-2016. Cargo lots averaged 74.5 thousand tons, in 2018 - 16.2 thousand tons The maximum traffic was reached in 2016 - 155 thousand tons (table in total, 405 thousand tons of coal were transported during the period under review.

All shipments were carried out from east to west. In 2012, 2013, 2014, and 2016, they transported coal from Vancouver (Canada). In 2012 and 2013, to Hamburg (Germany), then to Finland (in 2014 in Pori, in 2016 in Raah). In 2018, the transportation was carried out from Japan (the port of Sakaide) to Sweden (the port of Oxelosund) (Table 7).

The transportation was carried out by the experienced Nordic Bulk carriers (Nordic Odyssey and Nordic Oshima), as well as Oldendorff carriers GmbH & CO Kg (Gretke Oldendorff and "Georg Oldendorff," ice-class Ice2 with 80 thousand tons deadweight) and ESL Shipping Oy ("Haaga" and "Viikki," Ice class Arc 4, deadweight of 24–26 thousand tons) (Table 8).

All deliveries were carried out in a single run (that is, the bulkers only navigated the Northern Sea Route once, with the exception of the Baltic Odyssey voyages in 2012) Initially, the ship delivered the EuroChem iron-ore concentrate (IOC) from Murmansk to China, after which it returned to the ballast. The next loaded route was also made from Murmansk to the Chinese port of Huanghua, but after that, the ship returned through NSTC carrying Canadian coal. This is a good example of competent logistical solutions to ensure the loading of ships during return voyages along NSTC.

Table 7. Coal transit traffic dynamics, thousands of tons

Years						
2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
72	74	72		155		32

Table 8. Coal transit routes

Судно	Navigation along the Northern Sea Route							
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Nordic Odyssey		Vancouver – Hamburg						
Nordic Oshima				Vancouver – Pori				
Gretke Oldendorf						Vancouver – Raahe		
Georg Oldendorf								
Haaga								Sakaide – Oxelosund
Viikki								

Dynamics of intra-Russian transit traffic along the Northern Sea Route

The volumes of transit traffic between the Russian ports along the Northern Sea Route are very limited (Table 8). Moreover, in the last four years, Russian freight traffic has been practically absent.

The volume of Russian transit was due to the transportation of oil products, mainly from west to east, which depended on different prices for bunkering fuel in the western and eastern ports of Russia.

In 2014, the transportation of oil products amounted to 185 thousand tons, 70% of which were covered by a single project – the shipment by the bunkering company "Tranzit DV" of the bunker fuel oil from the Baltic Sea – from Vysotsk (88 thousand tons) and Ust-Luga (44 thousand tons) to Slavyanka (Vladivostok region). This was efficient due to a significant price difference in the western and eastern parts of Russia. As prices leveled in 2015, these shipments likewise lost their economic viability.

Recent development plans for transit freight, including the creation of a year-round container line, have been connected to shipments of frozen fish along the Northern Sea Route from east to west. The administration of Kamchatka Krai, Murmansk, Arkhangelsk, and, more recently, Leningrad Oblasts, have been interested in creating a transarctic bridge for the supply of frozen fish from the far East to the central part of Russia, bypassing the railway.

Let us consider the traffic dynamics. The largest amount of fish was transported in 2011 (over 24 thousand tons by three shipments from Petropavlovsk-Kamchatsky and one from Vladivostok with an average size of 6 thousand tons) but not to the nearest western port of Murmansk. They were transported to St. Petersburg, as the subsequent delivery to Moscow costs half the price from St. Petersburg than from Murmansk. In 2012, a batch of 8 thousand tons was shipped via the same route; in 2013 and 2014, shipments of fish were not carried out. In 2015, three counter-shipments were carried out,

Table 9. Dynamics of transit traffic between Russian port, thousands of tons

Destination of transportation	Cargo	2011	2012	2013	2014	2015	2016	2017	2018
West-East	Break-bulk cargo	1					4		
	Oil products	21	64	36	185		8	15	5
	Ships on deck			3					
	Total	23	64	39	185		13	15	5
East-West	Frozen goods	25	8			5	2	5	3
	Oil products		38	20					
	Ships on deck				16				
	Total		47	20	16	5	2	5	3
Total		47	111	59	202	5	14	20	8

albeit in small batches. First, the vessel of Winter Bay of Dalriada Ltd delivered frozen fish and meat from Norway to Osaka, and then, on their way back, fish from Nakhodka to St. Petersburg (less than 2 thousand tons both ways). The vessel "Harmony" of the CJSC "Yuzhmorrybflot" delivered the cargo of fish from Nakhodka to Murmansk but had to make a return journey in ballast. The shipped batch did not exceed 3 thousand tons. In 2016, 1.8 thousand tons of fish were transported from Petropavlovsk-Kamchatsky to St. Petersburg by the ship "Winter Bay" of the ice-class Ice1. In 2017, "Winter Bay" delivered 1.8 thousand tons of fish from Petropavlovsk-Kamchatsky to St. Petersburg; vessel "Garmonia," belonging to CJSC "Yuzhmorrybflot," delivered 3 thousand tons of frozen fish from the village of Ossora (Kamchatka peninsula) to Arkhangelsk. In 2018, the vessel "Progress" of the ice-class Arc 4 CJSC "Yuzhmorrybflot" delivered 2.8 thousand tons of frozen fish from Anadyr to Arkhangelsk. In 2018, as part of a test voyage of "Venta Maersk" from the far East, 17,000 tons of fish in containers were delivered to St. Petersburg, which, due to the peculiarities of the cargo flow statistics in the Northern Sea Route water area, was reflected as "container transportation." The details are shown below.

To summarize the results of transit traffic in 2010-2018, the following conclusions can be made [*Grigoryev* (1) 2017 (with additions)].

- The most attractive project of seasonal transportation of gas condensate to the Asia-Pacific region died due to the diversion of the cargo to the port of Ust-Lug.
- Iron ore concentrate transportation ceased due to the leveling of prices on raw materials on European and Asian markets;transportation of oil products terminated due to the same reason.
- Transit of coal began due to the availability of vessels for cargo pickups on their return voyages. The same supported petroleum transit. Otherwise (passing in ballast), the cost of the voyage would essentially double, leaving economical transit out of the question.
- Transit transport can only be attractive in the context of a price difference between the Atlantic and Asian markets, which would justify the possible costs of Arctic transport.
- Transit in frozen fish from the east to the west of Russia could not be established.
- Even though virtually absent now, the transit traffic helped identify a possible way for heavily loaded vessels along the Northern Sea Route north of the Novosibirsk Islands. It also confirmed the possibility of shipments by vessels of sufficient ice classes without ice-breaking escort, under favorable conditions.
- The passage of large-tonnage vessels in ballast may have been made more complicated, due to the 2014 transition to calculating ice-breakers fees based on the vessel's gross capacity, and not on the actual cargo.

Prospects of transit traffic growth in the total cargo flow along the Northern Sea Route

The "Plan of the Infrastructure Development of the Northern Sea Route," submitted to the government by the State Corporation "Rosatom," provides for the organization of year-round navigation along the Northern Sea Route in the period 2025-2030. Such navigation will mostly be connected to exporting PJSC NOVATEK's liquefied natural gas to the Asia-Pacific region, from the Yamal and Gidan peninsulas. Therefore, a competitive international and national transport corridor on the basis of the Northern Sea Route will be

formed in 2030-2035, after the completion of the nuclear icebreakers' fleet, the conclusion of hydrographic works on high-latitude routes, and the preparation of emergency and rescue teams.

Thus, Russian strategic planning documents estimate that year-round transit will be active by 2030. Before that, transit traffic will be seasonal.

Notably, the Analytical center under the Government of the Russian Federation gives a rather modest forecast of international transit cargo flow along the Northern Sea Route (April 2019). According to the pessimistic scenario, in 2030, it will amount to 0.2 million tons, while the optimistic one puts it at 1.8 million tons.

Despite numerous declarations of domestic intentions to develop container transit cargo flow, there are no concrete achievements. The development of the container line "from Petropavlovsk-Kamchatsky to St. Petersburg" resulted in a single voyage of "Severmorput" in 2019, which shipped 5 thousand tons of frozen fish and one and a half thousand tons of other container cargoes to the Baltic.

At the same time, in the 2019 summer-autumn navigation, a new domestic driver for the development of transit cargo flow appeared: the supply of crude oil by Aframax sized vessels, belonging to Sovcomflot, from Murmansk and Primorsk to the ports of China. Only time will tell how sustainable this project will be.

Prospect estimates of transit cargo flow development by foreign shipping companies

As stated above, the year 2030 is considered as the deadline to solve the problems, currently limiting the transit potential of the Northern Sea Route. These include insufficient ice-breaker security, hydrographic and rescue services, bunkering, the Lack of ports-shelters, and repair bases [*Hansenet et al.* 2016, etc.].

In this regard, it is essential to assess the current conditions of transit shipping in the Northern Sea Route by the leading shipping companies, the largest of which is the Maersk container shipping company.

In August-September 2018, the company conducted a test voyage of the container carrier Venta Maersk with a deadweight of 40 thousand tons, belonging to Arctic ice-class Arc4 of "Maersk Line," one of the leading container carriers, along the route: Busan (South Korea) - Bremerhaven (Germany) - St. Petersburg (Russia). According to the post-sea report, the ship left Busan on August 28, entered the Northern Sea Route area on September 6, and from September 9-11, was escorted by the nuclear icebreaker "50 years of Victory". On September 14, the ship left the Northern Sea Route, arriving in Bremerhaven on September 22, and in St. Petersburg - on September 28. Thus, the total transit took 35 days, including eight days along the Northern Sea Route.

According to the company, the total weight of the cargo was 32.7 thousand tons (1199 containers, with 660 containers unloaded in St. Petersburg, including 650 refrigerated containers with fish (17 thousand tons); 539 containers were unloaded in Bremerhaven, 12 out of which were refrigerated.

The run was intended to determine the conditions of commercial navigation along the Northern Sea Route. As a result of the passage, the company made the following recommendations:

- The entire Northern Sea Route should be covered by official electronic navigation maps, designed based on modern hydrographic research available through standard cartographic channels.
- A simplified version of the Northern Sea Route Administration's website should be created, accounting for

the weak Internet signal. It is desirable that the website provides daily updates on the locations of all vessels and include information on their ice class, main engine power, and draft.
- Information is Required on the maximum permissible precipitation in the waters of the main Straits and on the recommended route, the actual water level in the main straits and ports.
- Contact information is required for communication with the icebreaker and more data is needed about the icebreaker's technical features.

According to the company, "the financial indicators of the experimental passage of "Venta Maersk" (income and costs) do not justify launching a regular service along the Northern Sea Route at the moment. Only a significant increase in the volume and profitability of cargo base, which would cover additional investments in improvement of the ship's technical characteristics for full compliance with the requirements of the Polar Code, can make such transfers possible. "

In our opinion and despite the company's conclusion that they "do not currently consider the Northern Sea Route as a commercially reasonable alternative to other routes," the recommendations are crucial for the development of navigation in NSTC, including more than just transit along the Northern Sea Route.

Conclusion

Ensuring the transportation of mineral resources and supporting mining enterprises isthe priority of the development of navigation in the Northern Sea Route.

Establishing a sustainable system for the transport of Arctic mineral resources further requires developing icebreakers, navigational, and hydrometeorological support. This will reduce the risks of Arctic shipping and increase the attractiveness of the marine Arctic transport as a whole [*Grigoryev* (3) 2017].

Importantly, "the expansion of the international contingent of sailors capable of supporting year-round Arctic navigation, advancing international cooperation within the framework of projects on the export of mineral resources increases the safety of Arctic navigation and also predetermines the use of personnel and skills of shipping companies to develop of other transport operations, especially in connection with international transit along the Northern Sea transport corridor, the central part of which is the Northern Sea Route "[*Grigoryev* (2) 2017].

Creation of a transportation system of liquefied natural gas from the Kara to the Bering Sea along the Northern Sea Route in the course of enhanced or year-round navigation will allow regular trade and industrial, almost linear, navigation. This will allow creating a system of support of transit vessels in the composition of regular caravans.

The critical conditions for the development of navigation along the Northern Sea Route are:

- the fleet expansion of Arctic linear nuclear and diesel (like Icebreaker9 and Icebreaker8) icebreakers;

central planning of maritime cargo transportation and coordination of the activities of the participants. This could improve the appeal of the Northern Sea Route, including for transit transport.

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Opportunities and Challenges of Jointly Building of the Polar Silk Road: China's Perspective

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ABSTRACT. *Dramatic changes, mainly caused by global warming and globalization in recent decades, have been evident in the Arctic. The peace and stability of the Arctic, scientific research in the region, potential business opportunities and international governance have sparked widespread attention and debates around the globe. The joint establishment of the Polar Silk Road (PSR) is tantamount to international cooperation initiative between Russia, China and the related Arctic countries, which is intended to achieve common development and joint governance of the Arctic through knowledge accumulation, helps to promote interconnectivity and sustainable development in the region. As a part of China's Arctic policy and cooperation between Eurasian Economic Union (EAEU) and the Belt and Road Initiative (BRI), China focuses on the coordination of national interests and strategies of relevant states regarding development of Arctic sea routes and infrastructure, prioritizes knowledge accumulation and scientific research as the guiding principle for cooperation, promotes green technology solutions and humanistic concerns, and recognizes the PSR cooperation as a new growth pole for China-Russia pragmatic cooperation. However, due to fragile natural environment and political, economic and social sensitivities of the Arctic, significant interference of global and regional geopolitics, potential challenges of global environmental politics, Acknowledgement and capacity gaps between participants, economic and technological uncertainties are major challenges for feasibility and efficiency of cooperation, requiring more in-depth scientific research, comprehensive assessments and*

regular coordination and communication between all stakeholders.

KEY WORDS: *The Polar Silk Road, China-Russia Arctic cooperation, Foreign Policy, International Relations*

Over the past few decades, climate change and globalization have dramatically transformed the Arctic. As a result of global warming, the Arctic sea ice has been melting rapidly, potentially easing access to natural resources and opening up new maritime routes in the region. According to latest research, even if global temperature rises by less than 2 degrees Celsius above pre-industrial levels, the Arctic could see a sea ice–free summer at least once a decade[1]. These changes have increased global attention on potential usage, research, and peace and stability in the region. Among all new commercial opportunities, utilization of the Northeast Passage (NEP) – a maritime route along the Norwegian and Russian Arctic which 37 percent shorter[2] than traditional routes through the Suez Canal– is one of the most dynamic topic.

China is defining itself as an important stakeholder in Arctic affairs and geographically a "Near-Arctic State", one of the continental States that are closest to the Arctic Circle[3], which reflects the fact that China has many interlinks with the changing region. For instance, sitting downstream from the Arctic's climate system, northern China's climate, biological and environmental systems are directly affected by changes in the Arctic, Chinese experts have been active in the research projects of several groups under the Arctic Council, China's funds, markets and proficiency relating to infrastructure construction and resource exploitation are highly valued by some Arctic countries. In particular, Chinese shipping companies are pioneering on pilot voyages via Northern Sea Route – constitutes major part of NEP– to connect two major production and consumer markets of Asia and Europe. With developing practices of cooperation, the significance of the newly proposed idea of the PSR to the Arctic region in political, economic and social patterns, its priorities and difficulties of cooperation, and responsibilities of governments, enterprises and citizens in construction of the PSR have become emerging topics of international debate and discussion.

1. China's conception of jointly building the PSR

The idea of joint establishment of the PSR was first appeared in the Chinese government's document on the international cooperation on the Maritime Silk Road[4], which gradually developed during the practice of the Belt and Road initiative, and was fully explained in the White Paper on China's Arctic Policy published by Information office of State Department in early 2018. The idea at beginning has been expressed in mixed definition, including the Ice Silk Road[5], Silk Road on

1 Global Warming of 1.5 °C. IPCC. Special Report. Available at: https://www.ipcc.ch/sr15/, accessed 12.12.2019.

2 Albert Buixadé Farré, Scott R. Stephenson, Linling Chen and others (2014) Commercial Arctic Shipping through the Northeast Passage: Routes, Resources, Governance, Technology, and Infrastructure. *Polar Geography*, vol. 37, no 4, pp. 298–324. Available at: https://www.tandfonline.com/doi/abs/10.1080/1088937X.2014.965769, accessed 12.12.2019.

3 China's Arctic Policy (2018). *State Council Information Office of China*, January 26, 2018. Available at: http://www.scio.gov.cn/zfbps/32832/Document/1618243/1618243.htm, accessed 12.12.2019.

4 Full Text: Vision for Maritime Cooperation under the Belt and Road Initiative (2017). *Xinhuanet*, June 20, 2017. Available at: http://www.xinhuanet.com/english/2017-06/20/c_136380414.htm, accessed 12.12.2019.

5 Xi's Visit Witnesses Stronger China-Russia Ties (2017). *China Plus*, July 5, 2017. Available at: http://chinaplus.cri.cn/news/politics/11/20170705/7787.html, accessed 12.12.2019

Ice[6] when President Xi Jinping met with Russian leader, and Finland[7]. Based on above mentioned policy and pragmatic practices, China has formulated its own understanding of the PSR.

First of all, jointly building the PSR is an international initiative which refers to specific region, involving the cooperation in Arctic's major shipping routes and coastal areas. It focuses on Arctic's geopolitical, economic and social connections to the world by joint efforts by Arctic nations, international organizations and other stakeholders for Arctic governance. According to the conditions for the development and utilization of Arctic shipping routes, the PSR is currently more concentrated in the development of the NEP, connecting East Asian countries with European partners.

*Secondly, the PSR reflects the common policy orientations of Arctic states and other stakeholders towards to new opportunities of the Artic, i*n particular for commercial opportunities of development of the Arctic sea routes, while countering enormous ecological and environment challenges with the increase of human activities. The possibility of commercial use of Arctic shipping routes may significantly shorten the traditional voyage, further enrich the international shipping network, and promote economic and trade relationship of relevant countries and region as whole. The PSR should not be a *patented product* of a individual country, but a new platform for policy coordination and science, industrial, social collaboration among various countries. China advocates multilateral cooperation to jointly build the PSR and focus on the forward-looking investments, focusing on the infrastructure construction and green development to achieve a balance between development and protection of the Arctic. China's participation to the PSR is also a proactive response to the expectations of some countries, regarding China's relative advantages in capital, technology and talent on the development and utilization of the Arctic.

Thirdly, the PSR serves one of the most pragmatic platform of bilateral and multilateral cooperation between Arctic and Non-Arctic states. Although China's perception of changes in the Arctic is direct and rapid, as a Non-Arctic coastal state located beyond the Arctic circle, bilateral or multilateral cooperation based on respect of the sovereignty, sovereign rights, and jurisdiction enjoyed by the Arctic States in this region, respect the relevant marine management policies and willingness of Arctic coastal states are important prerequisite for jointly building the PSR. In practice, China attaches great importance to bilateral cooperation with the Arctic countries, conducts bilateral consultations on Arctic affairs with all Arctic countries, and established regular dialogue mechanisms with all Arctic states. In 2012, China and Iceland signed the Framework Agreement on Arctic Cooperation, which was the first intergovernmental agreement on Arctic issues between China and an Arctic State. In addition, China, Japan, South Korea and other countries have carried out discussions on Arctic shipping issues, promoting the establishment of equal mutual trust and mutually beneficial cooperation among potential shipping route users and investors, China also supports platforms such as "The Arctic: Territory of Dialogue", "The Arctic Circle", "Arctic Frontiers", "The China-Nordic Arctic Re-

6 Xi Stresses Commitment to Good China-Russia Relations (2017). *Xinhuanet*, November 1, 2017. Available at: http://www.xinhuanet.com/english/2017-11/01/c_136720942.htm, accessed 12.12.2019.

7 China, Finland Vow to Write New Chapter in Bilateral Ties (2019). *Ministry of Foreign Affairs of China*, January 14, 2019. Available at: https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1629472.shtml, accessed 12.12.2019.

search Center", in promoting exchanges and cooperation among the stakeholders, to explore a new model of Arctic international cooperation involving multi-stakeholders.

Last but not least, the PSR is an integral part of China's Arctic policy and an extension of the Belt and Road Initiative. As the major global trade partner and a potential user, cooperation on Arctic shipping routes are undoubtedly becoming one of the policy priorities of China. Starting from 2013, Chinese companies have begun to explore the commercial opportunities associated with Arctic shipping routes. The COSCO shipping continued to carry out frequent navigation via NEP, successfully finishing 10 voyages in 2018 along, and has dispatched 15 ships to complete 22 voyages since 2013.[8] This policy orientation has been demonstrated by the Vision for Maritime Cooperation under the Belt and Road Initiative and the Arctic Policy issued by the China, where clearly proposed the construction of the "blue economic passage is also envisioned leading up to Europe via the Arctic Ocean"[9]. The construction of the blue economic passage and eventually the PSR is not only concentrated on maritime interconnection, but also to promote the free flow of marine knowledge, culture, technology and talents, advocates peaceful, green, innovative and win-win maritime cooperation and deepens global significance and humanitarian care of the BRI.

2. China's policy orientations towards to the PSR

In general, China's policy goals on the Arctic are: to understand, protect, develop and participate in the governance of the Arctic, so as to safeguard the common interests of all countries and the international community in the Arctic, and promote sustainable development of the Arctic.[10] Unfortunately, many of China's moves relating to the Arctic have been met with suspicion in light of its population size and its status as one of the largest consumers of oil and natural gas products. The "China threat" has become a hot topic that is highlighted in the media worldwide, its increased prominence in the region has prompted concerns from Arctic states over its long-term strategic objectives, including possible military deployment,[11] deliberately compared China's activities in the Arctic with Russia's increased military deployment in its Arctic region. Regarding the PSR itself, it is also discussed in scholarly arguments that Northern Sea Route (NSR) has been renamed to the PSR[12], which have completely misinterpreted China's policy orientations towards to the PSR.

Emphases on docking of national interests and strategies of relevant states. In response to the opportunities and challenges brought about by the Arctic changes, relevant countries have introduced and updated their development strategies, covering various aspects of Arctic shipping. For in-

8 2018 Arctic Voyages of COSCO Shipping Completed Successfully. COSCO *Shipping Specialized Carriers*, October 27, 2018. Available at: http://www.coscol.cn/News/detail.aspx?id=11857, accessed 12.12.2019 (in Chinese).

9 Full Text: Vision for Maritime Cooperation under the Belt and Road Initiative. *Xinhuanet*, June 20, 2017. Available at: http://www.xinhuanet.com/english/2017-06/20/c_136380414.htm, accessed 12.12.2019.

10 Full Text: China's Arctic Policy. *State Council Information Office of China*, January 26, 2018. Available at: http://www.scio.gov.cn/zfbps/32832/Document/1618243/1618243.htm, accessed 12.12.2019.

11 China Unveils Vision for 'Polar Silk Road' across Arctic. *Reuters*, January 26, 2018. Available at: https://www.reuters.com/article/us-china-arctic/china-unveils-vision-for-polar-silk-road-across-arctic-idUSKBN1FF0J8, accessed 12.12.2019.

12 Groffman N. (2018) Why China-Russia Relations Are Warming up in the Arctic. *South China Morning Post*, February 17, 2018. Available at: https://www.scmp.com/week-asia/geopolitics/article/2133039/why-china-russia-relations-are-warming-arctic, accessed 12.12.2019.

stance, one of the principle of the Icelandic Arctic Strategy is "make full use of employment opportunities created by changes in the Arctic region"[13], especially focuses on opening up new Arctic shipping routes which connect the North Atlantic, the Arctic Ocean and the Pacific. Sweden is calling for efficient, multilateral cooperation on the Arctic, "aiming to prevent and limit the negative environmental impact potentially caused by the opening–up of new shipping routes and sea areas in the Arctic" and "contribute to safer and greener shipping "[14]. One of the priorities of the Finland's Arctic strategy is "continue to maintain Finland's position as a leading expert in the Arctic maritime industry and shipping and keep Finnish companies closely involved in development projects in Arctic sea areas"[15]. Coastal states of the Arctic ocean are more focused on utilization of new shipping route and update of related transport infrastructures, especially when Russia has defined "use of the Northern Sea Route as a national single transport communication of the Russian Federation in the Arctic" as one of its national interests in the Arctic[16].

In the process of participating in the Arctic affairs, China follows the basic principles of "respect, cooperation, win-win result and sustainability"[17], which suggests that whether bilateral or multilateral cooperation between China and Arctic countries is included in the framework of the BRI initiative, the Chinese government respects the willingness of Arctic partners, and will rely on the development and utilization of the Arctic sea route with all interested countries, especially Arctic states.

Hence, many Arctic countries see the PSR also as an opportunity and gave positive responses. Finish President Sauli Niinisto believes that "the Polar Silk Road is not only a plan for more roads, railways and shipping routes, but also a vision for promoting understanding among different peoples".[18] Iceland's Foreign Minister, Mr. Thordarson underlined that his "government follows carefully and with interest the Belt and Road Initiative, including the "Silk Road on Ice", which is focused on opening up new shipping routes through the Arctic."[19] Russian President Vladimir Putin has expressed that Russia is consistently upgrading maritime, railway and road infrastructure, investing significant resources into improvements to the NEP in order for it to "become a global competitive transport artery", and more importantly to calling for "completely reconfigure transportation on the Eurasian continent", by putting "infrastructure projects within the EAEU and the One Belt, One Road initiative in conjunction with the Northeast Passage"[20].

13 A Parliamentary Resolution on Iceland's Arctic Policy (2011). *Ministry of Foreign Affairs of Iceland*, March 28, 2011. Available at: http://library.arcticportal.org/1889/1/A-Parliamentary-Resolution-on-ICE-Arctic-Policy-approved-by-Althingi.pdf, accessed 12.12.2019.
14 Sweden's Strategy for the Arctic Region (2011). *Ministry of Foreign Affairs of Sweden*. Available at: https://www.government.se/49b746/contentassets/85de9103bbbe4373b55eddd7f71608da/swedens-strategy-for-the-arctic-region, accessed 12.12.2019.
15 Finland's Strategy for the Arctic Region 2013, Government Resolution (2013). *Prime Minister's Office of Finland*, August 23, 2013. Available at: https://vnk.fi/documents/10616/334509/Arktinen+strategia+2013+en.pdf/6b6fb723-40ec-4c17-b286-5b5910fbecf4, accessed 12.12.2019.
16 Basics of the State Policy of the Russian Federation in the Arctic for the Period till 2020 and for a Further Perspective, adopted by the President of the Russian Federation, September 18, 2008. *ARCTIS*. Available at: http://www.arctis-search.com/Russian%2BFederation%2BPolicy%2Bfor%2Bthe%2BArctic%2Bto%2B2020, accessed 12.12.2019.
17 Full Text: China's Arctic Policy (2018). *State Council Information Office of China*, January 26, 2018. Available at: http://www.scio.gov.cn/zfbps/32832/Document/1618243/1618243.htm, accessed 12.12.2019.
18 China's Arctic Policy in Line with International Law: Finnish President (2017). *Xinhuanet*, March 7, 2017. Available at: http://www.xinhuanet.com/english/2018-03/07/c_137021608.htm, accessed 12.12.2019.
19 Thordarsson G.T. (2018) Iceland-China Relations Will Continue to Strengthen. *China Daily*, September 6, 2018. Available at: http://usa.chinadaily.com.cn/a/201809/06/WS5b90702ba31033b4f465477b.html, accessed 12.12.2019.
20 Vladimir Putin, Speech at the One Belt, One Road International Forum (2017). *President of Russia*, May 14, 2017. Available at: http://en.kremlin.ru/events/president/news/54491, accessed 12.12.2019.

Prioritizes knowledge accumulation and scientific research as the guiding principle for cooperation. The Arctic is no doubt rich in resources, but is also the region that receives the most direct impact of climate change, climate change is causing major changes in the Arctic, threatening the Arctic ecosystem, including changes in species range, permafrost loss, and destruction of the marine food chain, which demands of utilization and development in a sustainable manner are more urgent than other places. Coal, metals, oil and natural gas, fishery resources and other "Arctic golds" are stored in an fragile environment and harsh production conditions. Therefore, in addition to the exploration of Arctic resources and new shipping routes, all human activities regarding resource exploration require environmental risk, production safety risk and ecological sensitivity assessments. In this sense, the PSR should reflect common exploration of humankind for accumulate knowledge, responsible action and joint response to global challenges, to understand how climate change and human activities pose obstacles to the migration and reproduction of Arctic species, and how environmental pollution such as oil spills can affect fragile marine ecology. The acquisition of knowledge and the response based on scientific researches are necessary for the development the PSR.

Currently, one of the biggest challenges in the year-round operation of Arctic shipping routes is limited monitoring and forecasting knowledge of sea-ice conditions, frequent navigation with limited hydrological data. China is aimed to joint research and data sharing on feasibility and operational safety of the PSR with interested parties. This can occur under various frameworks including the International Arctic Science Committee, Arctic Council working groups, the University of the Arctic, and the Agreement on Enhancing International Arctic Scientific Cooperation, also through bilateral cooperation. Formulating and implementing mandatory environmental standards and technical requirements based on a solid scientific basis is essential to the PSR. Navigation security in the Arctic shipping routes is one of China's priorities of concerns, which has been conducted comprehensive studies and hydrographic surveys with the aim to improving the navigation, security and logistical capacities in the Arctic region. China abides by the Polar Code, and supports the IMO in playing an active role in formulating navigational rules for Arctic shipping.

Besides conducting research on climate change trends and ecological assessments, innovation in both the natural and social sciences can be promoted by strengthening research on Arctic politics, economics, law, society, history, culture, and the management of human activities. In addition, sustainable development in the Arctic will need to balance development and protection at the international level and catalyze bilateral and multilateral cooperation across various sectors—e.g., the economy, environment, health, and infrastructure. To this end, Arctic states, non-Arctic states, and nonstate actors should coordinate their long-term policies on technical standards and investment of the PSR. Plans for cooperation should address the preservation of ecology and biodiversity, prevention of marine pollution in Arctic sea routes, reduction in marine acidification, and promotion of sustainable fisheries.

Promotes green technology solutions and humanistic concerns. Technology serves humanity. The exceptionality of the PSR and Arctic region as whole raising the demand of green economy and green solutions, require both "economic development road map" and the "green technology progress map". Although the economic benefits driven by the opening up of shipping routes will increase the economic development rate, but extreme weather con-

dition such as low temperatures, magnetic storms will pose a threat to equipment and personnel safety. The core area of Arctic technological innovation need to focus on communications, navigation, infrastructure and logistics, in particular on various scientific monitoring and detection technologies, engineering techniques suitable for Arctic environment, shipbuilding and navigation, resource utilization technologies in permafrost regions and fragile environments.

China attaches importance to both land based and marine based cooperation of the PSR, promotes the interaction between the inland economy and the marine economy through infrastructure connectivity, also encourages the development of technology and equipment that pays attention to environmental protection capabilities and innovative elements in the construction of Arctic infrastructure, focuses on sustainable energy system, including wind power, ocean tidal energy, geothermal energy and hydropower, strengthening clean energy cooperation with Arctic countries, exploring the supply and utilization of geothermal and wind energy, achieving low-carbon development.

Promoting interconnectivity of the Arctic is an important indicator for innovative solutions of the PSR. To achieve a balance between development and protection, China is committed to green solutions of infrastructure construction and digital connection in the region. Norway is actively considering the possibility of greater involvement by Chinese Arctic shipping stakeholders,[21] the Arctic Corridor project – railway project that would connect the city of Rovaniemi in northern Finland with the Norwegian port of Kirkenes- could be well-suited for cooperation under the PSR framework, parties concerned have come to China to discuss the possibility to cooperate with Chinese companies and the project has a brochure in Chinese.[22] In addition, Chinese government and enterprises are involved in Arctic cooperation in submarine cable construction. The Ministry of Industry and Information Technology of China and China Telecom are working with the Finland on trans-Arctic submarine cable project- a 10,500 kilometer fiber-optic maritime cable link across the Arctic Circle- and will be joined by Russian, Japanese and Norwegian partners[23].

The Arctic is also home to four million people, including indigenous populations and other residents highly dependent on the Arctic ecosystem. Accelerated ice melting eases access to resources, aiding the economic development of indigenous communities, but increased offshore and onshore commercial activities endanger the traditions and lifestyles of indigenous peoples, who want to preserve the environment and develop it using traditional knowledge. The development of the PSR needs to focus on the UN 2030 Sustainable Development Goals and elimination of digital gaps, by developing effective and convenient transportation and communication system, accelerating infrastructure and digital network construction, promoting people's well-being and economic development, and helping to meet the Arctic local social development education and health , language and cultural needs.

21 Liang Youchang, Zhang Shuhui (2018) Norway's Arctic Town Envisions Gateway on Polar Silk Road with Link to China. *Xinhuanet*, March 10, 2018. Available at: http://www.xinhuanet.com/english/2018-03/10/c_137029993.htm, accessed 12.12.2019.

22 Arctic Railway Rovaniemi-Kirkenes. *Arctic Corridor*. Available at: http://arcticcorridor.fi/wp-content/uploads/jkrautatiekiinascr02.pdf, accessed 12.12.2019 (in Chinese).

23 Buchanan E. (2018) Sea Cables in a Thawing Arctic. *The Interpreter*, February 1, 2018. Available at: https://www.lowyinstitute.org/the-interpreter/sea-cables-thawing-arctic, accessed 12.12.2019.

3. The PSR: new growth pole of China-Russia cooperation

At present, Sino-Russian relations are at their best in history. The high-level exchanges between the two countries have formed a common practice of mutual exchanges between the heads of state, and established regular exchange meetings and cooperation mechanisms between the prime minister, the parliamentary cooperation committee, and energy, investment, humanities, economy, trade, local, law enforcement, and strategic security. The Sino-Russian Arctic cooperation in this context also has an important realistic basis.

Consistency and complementarity of interest demands. Promoting the comprehensive social and economic development in the Russian Arctic region, promoting the development of science and technology related to the Arctic, building modern information and communication facilities, protecting the ecological security of the Arctic and border security are main interests of Russia for its international cooperation in the Arctic. These reflect not only the rising value of the Arctic in terms of strategy, economy, scientific research, environmental protection, sea routes and resources in recent years, but also a strategic orientation made by Russia in the context of the globalization and the coexistence among major powers, aimed for improvement of its importance to global economy and modernization of energy industry. In China's view, issues such as the climate change, environment, scientific research, utilization of shipping routes, resource exploration and exploitation, security, and global governance in the Arctic are "vital to the existence and development of all countries and humanity, and directly affect the interests of non-Arctic States including China",[24] which forms an unity of acknowledge on the significance, goals and values of Sino-Russian Arctic cooperation.

From Russian point of view, the focus of Sino-Russian Arctic cooperation is an opportunity to solve the *bottleneck* problem in terms of funds, technologies and resources for Arctic development, sees China as one of the most promising energy market and shipping consumer. As the largest Arctic country in terms of geography and population, Russia is the most important partner for China in the Arctic affairs. Participation in Arctic sea routes, infrastructure investment and energy projects fall within the scope of plans for deepening pragmatic cooperation between China and Russia and the framework of the BRI maritime cooperation, two countries have overlaps and complementary interests for Arctic cooperation.

Feasibility of achieving all-level cooperation. At the political level, the two governments and leaders have reached mutual trust in the Arctic cooperation. For instance, authorities of two countries have held the regular dialogue on Arctic affairs since 2013, and incorporated the contents of Arctic sea routes cooperation in the joint statement. In 2015, leaders signed the *Joint Statement of the People's Republic of China and the Russian Federation on the Construction of the Silk Road Economic Belt and the Construction of the Eurasian Economic Union* in Moscow, officially proposing the goal of "docking cooperation", and in the same year in the Joint Communiqué of the 20th Regular Meeting between Head of governments, proposed to strengthen the cooperation in the development and utilization of the NSR and carry out research on Arctic

24 Full Text: China's Arctic Policy (2018). *State Council Information Office of China*, January 26, 2018. Available at: http://www.scio.gov.cn/zfbps/32832/Document/1618243/1618243.htm, accessed 12.12.2019.

shipping.[25] From 2017, President Xi Jinping expressed China's willingness to cooperate with Russia on Arctic sea routes and shipping several times. At present, the transportation departments of China and Russia are negotiating the Memorandum of Understanding on Maritime Cooperation between China and Russia in Polar Waters, constantly improving the policy and legal basis for Arctic cooperation between China and Russia.[26]

At the commercial level, Chinese companies have become the *major force* in the construction of Russia's Arctic energy and transportation infrastructure projects. The National Export-Import Bank of China and the China Development Bank have provided $10.7 billion to the Yamal LNG project -one of the largest Arctic energy and infrastructure complex in Russia's Arctic region using the South Tambey Field as a resource base- with an output capacity of around 16.5 million tons per year by 2019, and expected to have a total investment of $26.9 billion. Silk Road Fund has also provided a $1.2 billion loan for the project.[27] The field's proven and probable reserves are estimated at 926 billion cubic meters, making it the largest Arctic producer of LNG.[28] In addition, NOVATEK signed in April this year with China National Oil and Gas Exploration and Development Company Ltd. (CNOCD, a wholly-owned subsidiary of China National Petroleum Corporation) a binding agreement to enter the Arctic LNG 2 project. Two months later, as part of Saint-Petersburg International Economic Forum 2019 held in June, NOVATEK has signed the Share Purchase Agreement with China National Offshore Oil Corporation (CNOOC Ltd.). Under these agreements, two Chinese companies will each acquire a 10% participation interest in Arctic LNG 2 project. The Arctic LNG 2 project envisages the construction of three LNG trains at 6.6 million tons per annum each, based on the hydrocarbon resources of the Utrenneye field, which under the Russian classification reserves totaled 13,835 million barrels of oil equivalent.[29] With the construction of the Arctic LNG 2 project, the demand for construction and transportation of Arctic LNG projects is expected to continue to increase. It is foreseeable that Chinese shipping companies will continue to be important investors to Arctic LNG projects regarding ship leasing, logistic infrastructure, shipbuilding and etc.

Regarding ports and railways infrastructure, China represents a key partner in the implementation of relevant infrastructure projects, including the construction of the Belkomur railway line and the Arkhangelsk deep-water seaport.[30] In 2015, China Poly Group Corporation as large central state-owned enterprise signed a framework agreement with Russian Interregional JSC Belkomur on the railway integrated project, which including the construction of a new railway 1252 km long, linking Central Russia to Arkhangelsk in the Arctic, and series of ports and resources development projects along the railway. In addi-

25 A Joint Communique on the Results of the 20th Regular Meeting between the Heads of the Russian and Chinese Governments (2015). *Ministry of Foreign Affairs of China*, December 17, 2015. Available at: http://www.mfa.gov.cn/chn//pds/ziliao/1179/t1325537.htm, accessed 12.12.2019 (in Chinese).

26 The Polar Silk Road Attracts the World's Attention (2018). *People's Daily*, January 28, 2018 (in Chinese).

27 Final Investment Decision Made on Yamal LNG Project (2013). *Novatek*, December 18, 2013. Available at: http://novatek.ru/en/press/releases/index.php?id_4=812, accessed 12.12.2019.

28 Further information on Yamal LNG is available at its official website: http://yamallng.ru/en/, accessed 12.12.2019.

29 NOVATEK and CNOOC Sign Share Purchase Agreement for Arctic LNG 2 Stake (2019). *Novatek*, June 7, 2019. Available at: http://www.novatek.ru/en/press/releases/index.php?id_4=3245, accessed 12.12.2019.

30 Governor Orlov Confirms China as Key Arctic Partner (2017). The Barents Observer, December 28, 2017. Available at: https://thebarentsobserver.com/en/industry-and-energy/2017/12/governor-orlov-eyes-china-key-arctic-partner, accessed 12.12.2019.

tion, the Poly Group and COSCO Shipping are considering to invest $550 million in the construction of the deep-water port of Arkhangelsk.[31] China Poly Group Corporation is reportedly set to invest $300 million in port facilities in Russia's Murmansk, a major transportation junction within the Arctic Circle, offering a positive signal that China may be taking a more active role in the development of the NSR from Northern Europe to East Asia via the Arctic.

At the scientific level, China has actively carried out Arctic scientific research cooperation with Russia in the multilateral frameworks such as the International Arctic Science Council and the Arctic Council in recent years, to strengthen scientific exchanges on the understanding of the Arctic. In order to implement the Sino-Russian agreement on cooperative research in the Arctic Ocean, the two countries launched the first Arctic joint expedition – a joint expedition of scientists on the Chukchi Sea and the Eastern Siberian Sea in the Russian Arctic Ocean exclusive economic zone - in August 2016[32], conducting a comprehensive survey on the Arctic Ocean has become a historic breakthrough in the cooperation between two countries in the Arctic.

The necessity of finding new "growth pole" for pragmatic cooperation. It is worth noting that although China-Russia pragmatic cooperation has made great achievements in recent years, however, equivalent boost of economic and trade partnership has not been fully stimulated by the high level political-security mutual trust and cooperation, bilateral trade consists relatively limited share of total foreign trade of China. With the continuous development of globalization, the world economy and the global trade pattern have undergone significant changes, exploring the new growth pole of Sino-Russian pragmatic cooperation has become an important mission for both sides. From medium and long-term perspective, the demand and pragmatic cooperation between China and Russia are no longer limited to the relationship between energy consumers and producers, the trade structure is no longer confined to traditional manufacturing and energy resources, and the form of trade is not limited to unilateral investments, it requires adaptation to the current global economic situation, and consistency with the regional environment and of domestic agendas of both countries regarding goals, priorities and capabilities.

Promoting Sino-Russian Arctic sustainable development cooperation with the joint effort on transportation infrastructure and energy projects will not only maintain traditional energy cooperation, but through Yamal LNG and other infrastructure projects which practice innovations on investment models, equity structures, profit sharing methods, will formulate common interests from multiple dimensions, develop new model of mutual beneficial cooperation with shared risks, promote "embedded" development model and win-win results.

4. Challenges remain

Although the top priority of jointly building of the PSR is to promote the protection and utilization of the Arctic, due to its special geographical location and strategic significance, environmental security requirements, vulnerability of natural conditions for operation, unpredictability eco-

31 Nilsen T. (2016) New Mega-port in Arkhangelsk with Chinese Investments. *The Barents Observer*, October 21, 2016. Available at: https://thebarentsobserver.com/en/industry-and-energy/2016/10/new-mega-port-arkhangelsk-chinese-investments, accessed 12.12.22019.

32 Xie Chuanjiao (2018) Sino-Russian Expedition Provides Arctic Data. *China Daily*, October 31, 2018. Available at: https://www.chinadaily.com.cn/a/201810/31/WS5bd9016fa310eff30328591e.html, accessed 12.12.2019.

nomic benefits, and the geopolitical cooperation or competition of the Arctic countries and relevant stakeholders are constraining prospects of cooperation.

The significant interference of global and regional geopolitics. Peace and stability in the Arctic are the basis for the cooperation on the PSR, but the jointly construction of the PSR may devolve into another arena of the geopolitical contest. As an Arctic coastal state, the United States is both a core member in Arctic affairs and an unavoidable player in sea route development. The increasingly chronic US-Russia geopolitical tensions have also impacted their Arctic cooperation to varying degrees. As one of results of the Ukrainian conflict, the United States and its European allies have launched several rounds of sanctions against Russia, the content has been extended to ban the export of technology for deep sea and Arctic resources development, as well as sanctions against Russian oil companies and banks, have affected the speed of development of the Russian Arctic development strategy. Meanwhile, Russia's accelerated military buildup in the Arctic area in recent years has created apprehension and resulted in heightened vigilance from the U.S. The Secretary of State Mike Pompeo's exaggerated accusation on Russia and China at Arctic Council Ministerial Meeting in Rovaniemi -by calling Russia's regulation over the NSR as provocative actions and a pattern of aggressive behavior, accusing China's civilian research presence in the Arctic would strengthen its military presence, including by deploying submarines to the region as a deterrent against nuclear attacks[33] – undoubtedly increases tensions in the region. It is also worth noting, that the United States has a long contested feud with Canada over sovereign claims through the Northwest Passage (NWP)[34], when Canada claims sovereignty over it, which been described as *illegitimate claim* by the U.S, creating more uncertainty to the international cooperation of the PSR.

The potential challenges of global environmental politics. Global environmental politics is game of different interest groups and values regarding method of response and resource delivery in countering global challenges such as climate, environment and ecology, which also formed a harsh public opinion environment for the construction of the PSR. On the one hand, Arctic environmental protection mainly focuses on the principle of sustainable development, considering the Arctic is a region where human society survives and develops, the necessary economic development is inevitable, but it is necessary to protect natural resources, preserve the traditional ecology of indigenous people, protect wild animals and plants, and the pollution caused by economic activities in Arctic sea areas cannot exceed the self-purification capacity of the environment. On the other hand, environmental radicalism represented by some NGO's insists the idea of prohibition of development. The Greenpeace has a strong sense of pessimism and crisis towards the future of the Arctic eco-environment, argued that resource development should be stopped in the Arctic, and material and population growth in the region should be stopped.[35] Many companies are under pressure from environmental protection NGO's on their

33 Johnson S. (2019) Pompeo: Russia Is 'Aggressive' in Arctic, China's Work There Also Needs Watching. *Reuters*, May 6, 2019. Available at: https://www.reuters.com/article/us-finland-arctic-council/pompeo-russia-is-aggressive-in-arctic-chinas-work-there-also-needs-watching-idUSKCN1SC1AY, accessed 12.12.2019.

34 Mike Pompeo Rejects Canada's Claims to Northwest Passage as 'Illegitimate' (2019). *The Guardian*, May 7, 2019. Available at: https://www.theguardian.com/us-news/2019/may/07/mike-pompeo-canada-northwest-passage-illegitimate, accessed 12.12.2019.

35 Emerging Environmental Security Issues (Monthly Security Scanning-Items Identified Between August 2002 and June 2010). *Millenniumproject*. Available at: http://www.millenniumproject.org/millennium/env-scanning.html, accessed 12.12.2019.

development activities in the Arctic.[36] For example, in 2013, members of Greenpeace took the Arctic Dawning to the Gazprom rig on the Pechora Sea oil field, obstructing exploration activities and clashed with Russian companies and governments.

Acknowledgement and capacity gaps between participants. Compared with most of the routes in the BRI, the PSR represents higher level of technology in cooperation, representing a more *roundtrip flow* of technology, capital and information. Regarding China's participation, Arctic countries have high expectations for China's infrastructure construction capabilities, technology investment and capital investment, but at the same time follow strict standards of choice. For China, jointly building the PSR would be a new experience in cooperation with developed economies, the social development goals of the developed Arctic economies -social justice, ecological balance, economic development, intergenerational equity, economic ethics, climate response- are more diverse and integrated, the decision-making mechanism of social resource allocation is also complicated, reflects great differences in the pace of procedures and decision-making from China's experiences.

Economic and technological uncertainties. The growing demand for transit shipping via the NEP is an important driving force for the construction of the PSR. As the major part of the NEP, the NSR has experienced a seasonal ice-free period in recent years and voyages have also increased significantly. The cargo volume transported via the NSR in 2018 has set a new record of 18 million tons, but transit voyages connecting East Asia and Europe are in fluctuation. In 2013, the number of transits via the NSR was 71, but it dropped to 23 and 27 in 2017 to 2018 respectively.[37]

Although Russian officials are aiming to increase attractiveness of the NSR for foreign shipping companies, by simplifying application procedure for navigation permits and introducing preferential fees for icebreaking and icebreaking pilotage, promoting its internalization and commercialization process of the NSR. However, barriers at the practical level still exist. For example, amendments are introduced into the Russian Merchant Shipping Code, suggest that pilotage, sanitary, quarantine and other controls, protection and preservation of marine environment in internal sea waters and/or in the Russian territorial sea, icebreaking and icebreaking pilotage in the water area of the NSR, marine transportation of oil, natural gas, gas condensate and coal produced in the territory of Russia and/or in the territory under its jurisdiction, storage of oil and oil products, natural gas (including LNG), gas condensate and coal, if such storage is made on board of a vessel in the NSR water area, should be made exclusively with use of vessels navigating under the Russian state flag.[38] How to maintain balance between commercial utilization and preserving Russia's exclusive rights over the NSR is essential topic of discussion.

The future significance of international transit shipping on the PSR will depend on a number of prerequisites, including international trade demand, sustainable cargo base, stable transit demand and year-round operation, more advanced navigation, monitoring, marine search and res-

36 Koivurova T., Molenaar E.J. (2014) *International Governance and Regulation of the Marine Arctic*. Available at: http://awsassets.wwf.no/downloads/gap_analysis_marine_resources_130109.pdf, accessed 12.12.2019.

37 *Statistics, Transit Statistics from 2011-2018, Northern Sea Route Information Center*. Available at: http://arctic-lio.com/category/statistics/, accessed 12.12.2019.

38 The President has signed the Federal Law on Amending the Merchant Shipping Code of the Russian Federation and Invalidating Specific Provisions of Legislative Acts of the Russian Federation (2017). *President of Russia*, December 29, 2017. Available at: http://www.en.kremlin.ru/acts/news/56546, accessed 12.12.2019.

cue infrastructures and practices. In general, the commercial attractiveness of the PSR will be affected by the improvement of navigation conditions on traditional routes, the fluctuation of international oil and gas prices, and the development of renewable energy sources. Therefore, requires more in-depth scientific research and comprehensive discussion on the pace of construction and effectiveness of the PSR.

5. Conclusion

Generally speaking, relevant countries have reached a consensus on the necessity and possibility of international cooperation on improvement of Arctic logistic connectivity and Arctic development cooperation at the macro level. However, the related political, economic, social, technical risks impose more coordination in the development focus, cooperation methods and technical standards. China's focus will be tied up to the principle of sustainability, accelerating mutual consultation between leaders and authorities of Russia, Nordic countries and others, in accordance with the multi-actors, multi-dimensional participation model and long term projects. China will promote coordination and dialogue at Arctic Council, Arctic Economic Council, Arctic Science Ministerial and other multilateral platforms, advance bilateral dialogues on the PSR with Arctic states and between high-level trilateral dialogues on Arctic issues China, Japan and the Republic of Korea, and actively support platforms such as "The Arctic: Territory of Dialogue", "The Arctic Circle", "Arctic Frontiers", "The China-Nordic Arctic Research Center", in promoting exchanges and cooperation among the stakeholders, including NGO's, comprehensively assess the geopolitical, economic and security impacts of related construction, and maintain peace, stability and sustainability in the Arctic.

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Climate Change in the Arctic: Adaptation to New Challenges

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ABSTRACT. *Global climate change in the Arctic has been unfolding more rapidly than in other parts of the world, and its impacts affect vulnerable northern ecosystems, health and well-being of the Northerners, economic sectors and infrastructure in the polar regions of the eight Arctic states. Consequences of climate change for human society are analyzed in synergy with ongoing transformations in social, economic and institutional systems in the Arctic region. Their cumulative effect exposes a variety of challenges for sustainable development of the northern communities, regions and countries; it reveals a number of uncertainties in the future pathways within the transformative context, as well as a combination of risks and opportunities for societies. It requires human responses and societal adaptations to consequences of the Arctic change. Adaptation to climate change in combination with climate change mitigation through greenhouse gas reduction turns into an important component of climate policies and measures of the Arctic states. This article presents innovative results of analysis of the major trends and features in formation of adaptive governance in the Arctic. It is based on a polycentric design, and particularly, on coordination of response actions at various levels, on interactions and networks of a variety of the Arctic stakeholders, on taking into account local environmental and socio-economic contexts, on combination of multidisciplinary and flexible approaches and packaging of governance mechanisms and instruments. The study analyses the major developments and innovations in adaptation policies and practices of the Arctic regions in N. America (Canada) and Europe (Norway). Its focus is on assessment of priorities, strategies and planning, institutions, economic instruments, climate services, application of struc-*

tural measures for disaster risk reduction. It explores possibilities of regional exchange of best practices in the Arctic, and core barriers for success in implementation of adaptation policy options. The role of the Paris agreement in formation and structuring of adaptation policies and measure of the northern regions of the Arctic states is analyzed.

KEY WORDS: *The Arctic, adaptation to climate change, adaptive governance, institutional coordination, climate policy and measures, climate services, partnerships of stakeholders, Paris agreement, disaster risk reduction, sustainable development*

Consequences of Climate Change

Currently, international discussion on the prospects for implementing the Paris climate agreement focuses primarily on anthropogenic greenhouse gas (GHG) emission reductions that are essential to prevent global climate change. Adaptation to consequences of climate change is often overlooked, but remains an equally important segment in international regulations and in domestic policies. While there is a wide variety of both uncertainties and alternative otions available to the international community in climate change mitigation and transfer to low-carbon development, the challenge to adapt to the actual and future impacts of a changing climate is obvious.

Adaptation of society and reducing its vulnerability to impacts of global climate change is especially important for the Arctic region: compared to other parts of the planet, the warming is occurring twice as fast here; research shows that this trend will continue in the long term [Climate Change 2014; Russian Federal Service for Hydrometeorology and Environmental Monitoring Second Assessment Report 2014; Adaptation Actions for a Changing Arctic. Perspectives from the Barents Area 2017; Adaptation Actions for a Changing Arctic. Perspectives from the Bering-Chukchi-Beaufort Region 2017]. There is evidence showing that Arctic climate is becoming ever more variable and unstable – with increase in the frequency and intensity of natural disasters, including floods, ice jams, wildfires, storms, gales and blizzards, avalanches and landslides, formation of icebergs. Extreme natural hazards threaten the safety, health and well-being of people living in the Arctic and pose risks to economic development in the polar regions, affecting exploration and extraction of natural resources, sea and land transportation, infrastructure, housing and agriculture. This, combined with the effects of slowly creeping natural processes (permafrost thaw, changes in land and marine ice cover, sea level rise, northward movement of invasive plant and animal species, pests and infectious diseases, etc.), will make Arctic communities much more vulnerable and lead to potentially severe economic losses [*Bengston, Nikitina* 2017; Russian Federal Service for Hydrometeorology and Environmental Monitoring Second Assessment Report 2014]. Consequences will vary depending on the natural environment and the specifics of socio-economic development of the Arctic territories. Adapting to climate change is not only turning into a new priority issue on the sustainable development agenda in the Arctic both on national and international levels, but is also becoming a daily challenge for the northerners.

For several years in a row, natural disasters and extreme weather events have been among the top in the ranking of global risks presented annually by the international Global Risks report [The Global Risks 2019, p. 6]. As of today, there are no aggregate estimates of damage from natural disasters in the Arctic macro-region, and the national data available are not sufficiently systematized. For example, according to the 2017 report of Russia's EMERCOM, the damage from emer-

gencies (natural, man-made, and epidemics) in three Russian northern regions (Komi Republic, Nenets Autonomous Okrug, and Krasnoyarsk Krai) was estimated at about 775 million rubles (7 percent of total domestic damage from emergencies); by 2030, the RF environmental ministry forecasts that the annual damage from extreme weather in highly vulnerable Arctic regions of Russia could reach 4-5 percent of GRP[1], about three times higher than the national average[2]. Russian scientists estimate that by the year 2100, the damage from permafrost degradation due to global climate change could amount to 1.1-1.2 percent of the world's GDP; for Russia, specifically, by 2030, the annual damage (resulting from climate change in the Arctic) to constructions and housing alone would constitute around 200 billion rubles, or 2.5 percent of the GRP of Russia's Arctic [*Porfiriev, Voronina, Semikashev, Terentyev* 2017, p. 16]. According to international assessments, the global economic damage from natural disasters in 2017 amounted to $334 billion[3], while the World Bank's estimate was at $520 billion.[4] In the past two decades, 77 percent of natural disasters were caused by hydrometeorological factors, and the resulting economic damage had been at about $2,245 billion.[5]

An important characteristic of the Arctic territories with a low density of population is that natural disasters are a threat to human safety in populated areas of cities and villages, and are associated with risks to infrastructure and industrial facilities. In the Arctic wilderness, they are considered part of the natural cycle and usually do not call for any protective actions. However, the remoteness and isolation of many Arctic settlements make them particularly vulnerable and complicate search and rescue operations. In cases of emergencies, local resources and capacities are extremely limited: for example, emergency services in Greenland's municipalities located far from the capital have only a few teams of sled dogs.[6] In June 2017, three coastal villages were hit by a massive tsunami caused by landslides in the Nuugaatsiaq fjord (11 houses were swept away into the water, several people died). Limited local resources, remote location of the settlements, a lack of roads and difficulties in access from the sea delayed rescue operations in a situation when timing was critical.

Climate change is by far not the only factor of transformations in the Arctic. It is, however, closely interconnected with socio-economic, technological and institutional dynamics, and changes in international law – which are, in turn, driven by global and local challenges. This is why the consequences of climate change for society are increasingly often considered in conjunction with the impact of the Arctic transformations on socio-economic, institutional, and legal systems [Adaptation Actions for a Changing Arctic. Perspectives from the Barents Area 2017; Adaptation Actions for a Changing Arctic. Perspectives from the Bering-Chukchi-Beaufort Region 2017; *Lazhentsev* 2016; *Tatarkin, Zakharchuk, Loginov* 2015]. Their synergy has a multiplier effect on the sustainable development of the northern regions of the eight Arctic states. In the process

1 Gross regional product.

2 Davydova A. (2017) Russia to assess damage from upcoming bad weather // Kommersant. February 7, 2017 // https://www.kommersant.ru/doc/3212233, accessed 12.12.2019.

3 Wallemacq P. (2018) Natural Disasters 2017. Lower Mortality, Higher Cost, Brussels, p. 2.

4 Results Brief – Climate Insurance (2017) // The World Bank, December 1, 2017 https://www.worldbank.org/en/results/2017/12/01/climate-insurance, accessed 12.12.2019.

5 Wallemacq P. (2018) Economic Losses, Poverty & Disasters 1998–2017, Brussels, Geneva, p. 33.

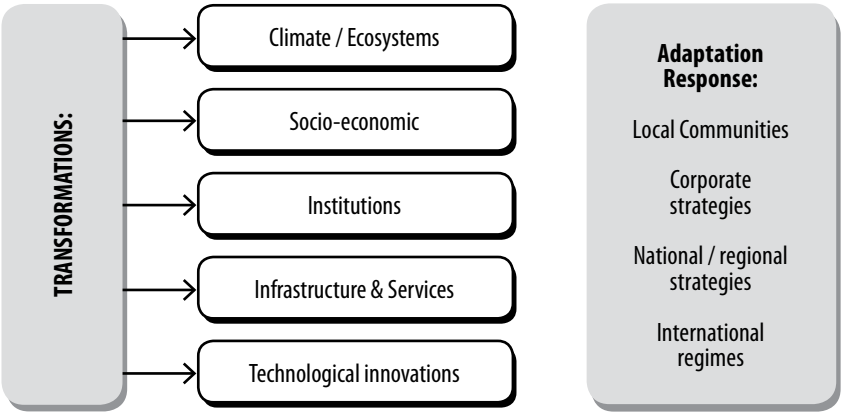
6 Veselov I.A. (2012) The First Legally Binding Agreement on the Arctic // Arkticheskie Vedomosti/The Arctic Herald. No 1. p. 54 // https://issuu.com/arctic-herald/docs/arctic-herald-1-full, accessed 12.12.2019.

of societal adaptation to the consequences of current and future climate change, it is essential to take into account the potential impact of all aspects of systemic transformations (Fig. 1), and when choosing a response to emerging risks/benefits from global warming, one should look broader and beyond just the climate component [*Leksin, Porfiriev* 2017]. It is important to consider the entire range of intertwining factors, as they determine the capacity of the northern regions and their stakeholders for responce actions to climate challenges [*Nikitina* 2013].

The consequences of climate change and the need to adapt to them have been increasingly often explored by researchers in the context of diversity of drivers towards transformations since the environmental and socio-economic changes are taking place simultaneously, affecting one another and forming complex causalities. The processes are closely interlinked, as are the adaptive responses to their effects. The issues of adaptation are often assessed within an interdisciplinary context [Adaptation Actions for a Changing Arctic. Perspectives from the Barents Area 2017; Adaptation Actions for a Changing Arctic. Perspectives from the Bering-Chukchi-Beaufort Region 2017], and application of a wide range of coordinated administrative, legal, institutional, political, socio-economic, scientific, technical and financial instruments is suggested within formation of adaptive governance system. When analyzing the chain of relationships between the drivers of change and the responses to their cumulative impacts, the role and weight of each is determined individually [*Adger, Arnell, Tompkins* 2005] depending on the local context. For example, the invasion of polar bears into the villages of Novaya Zemlya in the winter of 2019 is not only associated with the wild species habitat shift due to global warming, but also, and most importantly, with the fact that man-made food waste dumps turned out to be extremely attractive to these animals. Therefore, in this case, the solution to the problem lies not in trapping and transporting the endangered predators to remote areas, but in applying modern practices of sorting, storage and disposal of household waste – with the participation of the local population, as is done in most polar communities.

In practice, during decision-making process, when one ranks the role of cli-

Fig. 1. Synergy of Arctic Change



mate change, comparing it with the effects of other transformations taking place in the Arctic, it often appears that climate factors are not among the top priorities, and that preference is be given to other, more urgent problems. For example, according to a recent ranking of the key drivers of change (7) in the Barents region for a 30–50-year perspective[7] based on a survey conducted among experts and local stakeholders, climate change holds the fifth place. The drivers that ranked highest in terms of their priority were: economic changes and lifestyle transformations, political and institutional dynamics, and technological innovations [Adaptation Actions for a Changing Arctic. Perspectives from the Barents Area 2017]. Our analysis of current adaptation practices in the northern regions of Arctic countries shows that for many local governments the issues of climate change are not of a priority in contrast to education, jobs, pensions, healthcare, local transportation, infrastructure, and ensuring the safety of the population. Financial resources are allocated accordingly. While in the corporate strategies, the mining companies operating in the north increasingly consider the role of climate change, the dynamics of global commodity markets remain the dominant factor [*Nikitina* 2018]. So, in many cases, the ultimate decision with regard to adaptation options is dictated not by climate change concerns, but by other, more powerful factors. Such specifics is to be taken into consideration when designing futures adaptation strategies.

In the Arctic, the effects of global climate change are associated with a combination of possible risks and benefits [*Bengston, Nikitina* 2017]; according to most recent international assessments, most of climate change consequences pose considerable risks to the society (*IPCC, AMAP, SWIPA*). Among widely discussed advantages is the decline in the extent of the Arctic sea ice and the resulting better access to previously inaccessible areas, which, in turn, should present new opportunities for economic development. Changes in the Arctic sea ice are associated with the exploration of oil and gas of the continental shelf, the development of Arctic shipping and potential maritime transit routes between Europe and Asia, as well as of the relevant service infrastructure and tourism, including cruise ship tourism. Some point out the possible benefits of globalization for the sustainable development of the north, including new opportunities for investments, business, small and medium-size enterprises, job creation and socio-economic development. However, there is also a combination of factors that might limit making use of these new advantages in practice. These include the high risks and costs of extracting and transporting resources in harsh polar conditions, volatility of the global markets of energy and mineral commodities, the development of alternative energy sources, gaps in effective technologies for emergency oil spills mitigation, the tightening of environmental regulations and restrictions in the Arctic, insufficient climate services, unpreparedness of the Arctic infrastructure and services for a rapid expansion of economic activity in the region, as well as extreme weather conditions and the problem of icing on ships and offshore platforms. A detailed assessment of a set of all possible risks and opportunities and their interactions is a basis for selection of available adaptation options.

7 Factors of change: 1) climate, 2) socio-economic, 3) institutions and policies, 4) human potential, 5) technological innovation, 6) demographic dynamics, 7) ecology.

Adaptation: 'Living with risk'?

Adaptation is the process of adjustment to actual or expected climate and its effects, in order to either lessen or avoid harm or exploit beneficial opportunities for sustainable development [Climate Change 2014, p. 76]. Ensuring safety and security of the population and critical infrastructure is the top priority in the Arctic context. 'Living with risk' is an everyday reality and a lifestyle under severe polar conditions; in the future, this trend is likely to consolidate, while adaptation actions to diversify.

To be of a success, the adaptation process in the Arctic requires wise governance: most failures in responses to modern climate challenges are due to failures in selection of governance options. A typical example is dealing with emergencies and ensuring the safety of the population and infrastructure during floods in the basins of northern rivers. Past experience shows that the problem cannot be solved exclusively by emergency rescue teams acting quickly and professionally. An effective response requires a package of integrated institutional and governance solutions towards natural disaster risk reduction,ensuring (a) preparedness, (b) search and rescue, (c) recovery after the event, and (d) risk prevention. Rescue operations are carried out in combination with coordinated efforts by administrative structures. The latter involves interacting with the affected local population, regular disaster alerts and the evacuation, preventing cases of looting in flooded areas, and rehabilitation actions. It also includes efforts to minimize risks by ensuring that the hydrotechnical infrastructure is reliable and in operating condition, that its construction was completed in full compliance with safety standards, that riverbeds are regularly cleaned up, etc.

Currently, the issue on the agenda is to form an *adaptive govrrnance* system that is characterized by a polycentric approach [*Ostrom* 2007] – namely, by the coordinated governance schemes that involve (a) a set of mechanisms and instruments at various levels (local, regional, national, international), (b) key stakeholders taking part in adaptation (the state, local governments, businesses, the population, nonprofit organizations, funds, etc.), (c) high flexibility of institutional structures under the uncertainty of future change and its impacts. Partnerships that coordinate actions across different levels and between actors to achieve common goals are becoming an integral part of adaptative governance. This model is already started to be employed in adaptation practices of the Arctic countries. Due to dynamic environmental and socio-economic transformations in the Arctic, the emerging adaptive governance systems are likely to be flexible enough to adjust to the uncertainties of the new challenges [*Young* 2017] and ensure that institutions are manoeuvrable enough and complex interdisciplinary solutions are able to deal with a variety of surprises from transformations. Adaptative governance presupposes taking into account the local context of the polar regions, their natural, socio-economic circumstances, adaptation capacities, and sustainable development priorities [*Pahl-Wostl, Lebel, Knieper, Nikitina* 2012, p. 25]; that said, the assessment of needs and priorities of the local stakeholders are extremely important in this errand. It is slightly possible that universal recipe for adaptation would be a perfect panacea to fit all northern provinces and communities of the eight Arctic countries: each should take into account the local context as much as possible. Only then can they be truly useful. Naturally, adapting the local population and economic sectors to extreme polar conditions has been and remains a 'traditional' way of their survival. There is a great deal of knowledge and a variety of practices accumulated over the years that are to

be taken into account in decision-making. A combination of formal institutional regimes with informal practices that the local population relies on in emergency situations can greatly reduce risks [*Corell, Kim J. D., Kim Y. H., Moe, VabderZwaag, Young* 2018, p. 165].

Formation of adaptive governance system in the Arctic states involves a combination of regulatory mechanisms, economic and institutional tools, and structural measures. *Strategic planning* is at the core of the system. Most countries have either enacted strategies for adaptation to climate change, or adaptation is incorparated into climate action plans. For example, there are special adaptation programs developed in the polar regions (Canada's First Nation Adaptation program). Some Arctic territories implement regional adaptation action plans (Alaska in the United States, Tromso in Norway); a number of regions have joint programs with neighboring territories (Canada's collaborative strategy for adaptation and partnership between the governments of Yukon, Nunavut, and Northwest Territories). Both Alaska and northern provinces of Canada have introduced adaptation plans for individual settlements.

A characteristic feature of adaptive governance in all northern regions is the use of *structural measures*[8] that are particularly useful for reducing disaster risks [*Birkmann, Teichman 2010*]. This practice has diverse applications. For instance, in Alaska, there is extensive engineering work carried out to strengthen the coastal settlements. In Svalbard, after a series of avalanches resulting in human losses mountain slopes near settlements in avalanche-prone areas were reinforced. In Canada, roads and runways are treated with innovative surface materials; thermosiphon foundations for buildings and roads are used to stabilize the active permafrost layer. Flood protection through structural measures is a key element of adaptation in the northern parts of Finland and Sweden. Flood damage prevention plans have been developed for major river basins and include spatial planning measures, technical codes and regulations, construction permits, compliance monitoring, upgrades of hydraulic structures and regular flood control works [*Tennberg, Vuojala-Magga, Vola, Sinevaara-Niskanen, Turunen* 2017]; all practical measures are in line with the requirements of the *EU Water Framework Directive* and the *EU Floods Directive*. Prevention of risks in areas with relatively high population density requires additional engineering measures, including protective constructions, reinforced infrastructure, strengthening the foundations of buildings, and banning construction in the regularly flooded river valleys. Strict monitoring of land use, construction and settlement standards in flood-prone areas helps reduce damage. Prevention of emergencies through structural measures is one of the priorities for the economic sectors, including transportation and infrastructure, pipelines, power networks and in construction. According to *Zurich Insurance Group*, the cost of addressing the consequences of natural disasters, especially floods, is usually 9 times higher than the cost of preventing them[9].

The practice of using *economic tools* in the Arctic regions adaptation actions

8 Structural measures for disaster risk reduction include a set of engeneering, construction and technology tools for enhancing safety and stability of infrastructure; for example, in flood mitigation they involve dams, flood levies, ocean wave barriers, permafrost thaw- and erosion-resistant construction and evacuation shelters // http://www.preventionweb.net/terminology/view/505, accessed 12.12.2019.
9 Szoenyl M. (2018) Flood Resilience Alliance 2.0: A Look at Five Years of Supporting Communities Building Resilience against Floods // Zurich Insurance Company, March 7, 2018 // https://www.zurich.com/en/knowledge/articles/2018/07/flood-resilience-alliance-2, accessed 12.12.2019.

shows a lot of promise. These include *inter alia* subsidizing local agricultural products as, for example, in Alaska, northern provinces of Canada, and Chukotka. Many regions use economic tools to stimulate the production of traditional products by individual farms or launch initiatives to expand the range of products of reindeer herding and hunting. Authorities support job creation in new markets of local services and small businesses in tourism sector. Insurance and reinsurance in case of natural disasters are expanding; climate factors are taken into account when developing insurance products. For example, in Norway, which has comparatively developed system of natural disaster risk insurance, there was a public-private partnership established in 2018 between the Directorate for Civil Protection and Emergency Planning, the Ministry of Finance and the insurance sector to help minimize disaster-related damage[10]. In 2017, the coverage by insurance companies for cases related to damage from floods and other natural disasters amounted to about $168 million.[11]

The creation of a new market of infrastructure services in the Arctic is another important innovation. Among its segments - provision of *climate services* to consumers in the polar regions and establishing specialized climate services centers. An international EC research project *Blue-Action*[12] is currently analyzing the prospects for the regional market of climate services, and performs inventory of stakeholders needs for those services [*Kuznetsov, Nikitin, Baronina* 2019, p. 65]. For example, one of the goals is to provide climate services to adapt fisheries strategies depending on the modeling of ocean surface temperatures. Another objective is to develop reliable ways of informing the owners of ski resorts in northern countries about the expected rates of snow accumulation in the upcoming season. In the Arctic, the formation of a regional emergency preparedness system has started, which includes search and rescue operations at sea, as well as joint operations in case of emergency oil spills. The first steps in this direction were taken within the framework of the Arctic Council, following the signing of the relevant regional agreements.[13] A number of bilateral programs are being implemented by the Arctic countries in response to possible risks of climate change and the expansion of economic activity in the region.

However, there is a number of obstacles for success of adaptation actions in the Arctic. Among them is the lack of *financial* resources in the northern regions and municipalities to cover the costs of detailed assessment of the local effects of climate change and carry out response measures. These actions are often funded from whatever is left after all other costs are accounted for – unlike socio-economic programs which often receive priority funding. In some cases, corporate strategies (for example, social responsibility and sustainable development) executed by companies operating in the North directly or indirectly support local adaptation projects. But the issue of limited funding available for adaptation is typical not only for the North – it is a general current trend in climate financing. A similar problem can be observed within the European Union. For example, under the climate

10 The purpose of the partnership is to create a joint data bank on natural disasters, disaster-related damage, climate change assessments, and insurance for citizens to support the work of local governments in disaster risk and damage reduction.

11 Cook R. (2018) Civil Protection and Finance Sector Join Forces in Norway // PreventionWeb, February 26, 2018 // https://www.preventionweb.net/news/view/57227, accessed 12.12.2019.

12 Blue Action. Climate Service Case Studies Booklet, 2018. Blue-Action: Arctic Impact on Weather and Climate, European Commission, Horizon-2020 Program // https://www.blue-action.eu, accessed 12.12.2019.

13 Agreement on cooperation on Aeronautical and Maritime Search and Rescue in the Arctic, 2011; Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic, 2013.

financing[14] of the EU Multiannual Financial Framework 2014-2020, the bulk of the funds are allocated for the transition to low-carbon development and reduction of GHG emissions, while adaptation[15] receives only a relatively small proportion of all funding[16]. In mid-2010s, there was also a disparity in resource mobilization at the global level: in 2014, as little as 16 percent of all funding was directed to adaptation, while 84 percent had to do with GHG emission reductions[17]. Other limitations for adaptation include institutional aspects of adaptive governace systems in the Arctic countries, such as the lack of a clear *division of responsibility* between agencies and offices, gaps in coordination, overlapping tasks and activities, and deficit of *control and verification* over the execution of adaptation plans. Finally, some of the major obstacles have to do with *limited information*, *uncertainties in scientific models* of climate change, inability to predict long-term societal effects of climate change and inadequate taking into account the local context along with the rich traditional experience and knowledge about climate change impacts on their well-being. All of the above creates barriers to decision-making and selection of effective responses to the Arctic challenges.

The Paris Agreement

Adaptation to global climate change is becoming an important new area of international law and regulations. Until recently, adaptation was not a priority of climate policy, and adaptation actions were fragmented. Currently, the main climate change international regime is the 1992 United Nations Framework Convention on Climate Change (UNFCCC) with its protocols - the 1997 Kyoto Protocol and the Paris Agreement replacing the latter since 2020.[18] The core feature of the Paris Agreement is that, in addition to measures aimed at *GHG emissions reduction*, it also regulates *adaptation to climate change*. Now these are the two main areas of climate change international regulation, including in the Arctic region.

The Paris Agreement establishes a long-term global goal of carrying out policy and measures to enhance adaptive capacity, strengthen resilience and reduce vulnerability, with a view to contributing to sustainable development (Article 7., item 1). It describes adaptation as a global challenge "faced by all with local, subnational, national, regional and international dimensions, and a key component to the long-term global response to climate change to protect people, livelihoods and ecosystems"; adaptation measures take into consideration the individual characteristics of countries and regions, and "vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems" (Article 7,

14 Up to 20 percent of the European budget expenditures are expected to be earmarked for climate action.

15 Adaptation measures are integrated into the EU policies regulating individual sectors; the process is carried out using the European funds system (structural and investment funds, regional development funds, social funds, agricultural funds, maritime and fisheries fund, etc.). Adaptation is also integrated into the financing system; the European Investment Bank and the European Bank for Reconstruction and Development provide loans for the cause; the Horizon 2020 program funds research on adaptation.

16 Climate Action. Financing Adaptation // European Commission // https://ec.europa.eu/climate/policies/adaptation/financing_en, accessed 12.12.2019.

17 D. Waskow, Jennifer Morgan J. (2015) Paris Agreement: Turning Point for a Climate Solution // World Resources Institute, December 12, 2015 // https://www.wri.org/blog/2015/12/paris-agreement-turning-point-climate-solution, accessed 12.12.2019.

18 As of today, all Arctic countries had ratified the Paris Agreement; in 2017, the United States announced its intention to withdraw its ratification from the Paris Agreement.

items 2, 5)[19]. The main provisions of the agreement are in line with the adaptation priorities of the northern regions and the Arctic agenda: its goals dealing with climate challenges for the most vulnerable population groups and territories are particularly important for the Arctic regions. The need to strengthen the resilience of local populations, including indigenous people highly sensitive to impacts of climate change, whose lives, households and daily activities are dependent on nature and are vulnerable to extreme natural disasters – is a key focus of this international agreement.

The role of the Paris Agreement in strengthening the adaptation capacity in the Arctic is to set a common format and promote for the Arctic provinces to better structure their approaches and climate actions. It serves as a driver for the development of adaptation policies, for selection of the most effective adaptation instruments depending on the local context. In compliance with its provisions the member states develop national adaptation plans, implement appropriate policies and measures, and constantly improve their design. The Paris Agreement provides for dynamic adaptation planning and selection of optimal options within five-year cycles introduced by the agreement. It also proposes flexible regulatory mechanisms based on periodic assessment of national adaptation policies: every five years, the results of adaptation activities are evaluated and action plans are formulated for the next period.

The northern regions take part in the implementation of national commitments under the global climate regime, including their contributions to national communications and regular reporting on meeting their climate goals and actions undertaken. Impacts of climate change and responses in particularly vulnerable areas are then assessed, followed by international exchange of good practices. For the Arctic regions, in particular, highly relevant are the provisions of the Paris Agreement dealing with the prevention of damage and losses from natural disasters, including early warning systems, emergency preparedness, rescue and evacuation of affected population, rehabilitation of territories, as well as risk assessment and risk management. These measures are part of the regional climate policies currently developed by most Arctic countries. As obligations of the member states envisage the submission of climate reports, the international standards define a common format and procedures for the national inventory of adaptation measures taken. The 'climate adaptation' section of national communications by the Arctic countries to the UNFCCC secretariat contains the following data: (1) assessment of the risks and consequences of climate change for territories, economic sectors, and populations; (2) policies; (3) strategies; (4) programs; (5) adaptation mechanisms, instruments and measures; (6) climate services provided to consumers; (7) results of scientific research; (8) meeting the adaptation plans and assessment of issues encountered; (9) international cooperation; (10) assistance to developing countries. All eight Arctic countries regularly report on their inventory of climate actions, including adaptation. Their most recent national reports were submitted in 2017[20] and contain information and assessments for their polar regions.

19 The Paris Agreement. The United Nations Framework Convention on Climate Change. 12.12.2015 FCCC/CP/2015/L. 9

20 All 8 countries of the Arctic region are included in Annex 1 (43 members, including the EU) of the UNFCCC; since 1994, they have submitted 7 national reports on climate change.

When developing their strategies of climate action, the Arctic countries take into account the specific feautures of their northern regions. There is a certain imbalance between the anthropogenic input of these regions to global warming, on the one hand, and the extent of observed climate change impacts within these territories, on the other. The role of the northern provinces of the Arctic countries in national GHG emissions is modest, as none of them are major emitters. For example, in the US and Canada, ranking accordingly 2nd (14.3 percent) and 10th (1.5 percent) in global emissions – the share of their polar regions in national emissions output is insignificant. According to Canada's latest national communication on climate change, the total share of its three northern provinces (Yukon, Northwest Territories, and Nunavut) in domestic CO_2 emissions in 2015 was only 0.3 percent of the national total [Canada's Seventh National Communication 2017, p. 48]. Alaska's share in US emissions in 2015 accounted for 0.63 percent, and it ranks 40th among other US states[21]. According to the GHG emission inventory from the northern regions of the Arctic countries, the main sources here are industries, including oil/gas energy production, transport, and also households. Share of emission sources from wastes and agriculture in the overall emissions profile of the northern territories are relatively small (in Alaska – about 1 percent for each source). Due to such regional specifics, the adaptation actions might be of a priority over mitigation measures wthin the climate policy of the northern territories. Assessment of local context and adaptation challenges of the northern stakeholders, their interests, needs and action is essential for selection of effective adaptation mechanisms and tools in the North.

The formation of a new international regime on global climate change is currently among top priorities on the international agenda, especially among the EU states. However, in recent years, there has been an increasing risk that political factors may hinder the implementation of global climate goals and adaptation actions. For example, in the summer 2017 Donald Trump announced his intention[22] to withdraw from the Paris Agreement by revoking the US ratification. It provoked extremely negative stance in Europe and elsewhere, and was also strongly criticized by many of the US politicians, citizens, business circles and the scientific community. The governors of several US states responded by forming the United States Climate Alliance, committed to implementing actions to meeting the Paris goals . Despite the US administration's decision to withdraw from the agreement, local authorities and states have been consistently taking climate actions: a significant number of the US cities, states, and companies support meeting the GHG emission reduction targets. Alaska is among them, and has developed its own strategy for climate change mitigation and adaptation. It includes an action plan for reducing GHG emissions, participating in the North American carbon trading system and in climate change adaptation[23].

21 Greenhouse Gas Emissions Inventory 1990–2015 (2018) // Alaska Department of Environmental Conservation, January 30, 2018 // http://dec.alaska.gov/air/anpms/projects-reports/greenhouse-gas-inventory, accessed 12.12.2019; Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2015 (2017) // EPA, April 2017 // https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2015, accessed 12.12.2019.

22 According to Article 28 of the Paris Agreement, withdrawal of a party from the agreement must be carried out by giving written notification to the depositary not earlier than 3 years after the agreement enters into force for the relevant party; formal withdrawal of the United States can take place in 2020, but during the 'interim' period the country must comply with its obligations.

23 Alaska Climate Change Action Plan Recommendations to the Governor. September 2018. Climate Action for Alaska // http://climatechange.gov.alaska.gov, accessed 12.12.2019.

Adaptation in Arctic Countries

In the past decade, Arctic countries have started to develop policies and measures aimed at adapting to the effects of climate change. They are characterized by a number of common features and regional specifics. In the sections below, we present an analysis of North American (Canada) and Western European (Norway) experiences and practices of adaptation to climate change. The analysis focuses on the main trends in formation of domestic adaptive governance, including the development of policies and measures at various levels, institutional organization and coordination, the role of stakeholders, as well as the approaches and priorities of adaptation in the Arctic.

Analysis of adaptation practices by the Arctic countries over the past decade indicates that they have started designing a system of mechanisms and instruments for adaptive governance that combines traditional methods for enhancing resilience of societie with innovative tools. These tools include: (1) assessment of risks and consequences for individual territories and stakeholders; (2) state regulations, adoption of legislation, construction standards and norms; (3) measures to prevent and reduce hydrometeorological risks, protect the population and critical infrastructure in case of natural disasters; (4) strategies and programs, territorial planning that accounts for climate factors; (5) institutional structures; (6) economic tools; (7) new types of products, services, marketing; (8) coordination, partnerships, cooperation; (9) scientific research and monitoring; (10) innovations in technology and engineering.

CANADA

Approaches and results of adaptation in the northern provinces of Canada are of particular interest. Warming of climate in Canada, which is especially fast in the northern regions, is associated with risks to the local communities and health of the northerners, as well as to economic sectors.. Canada's top priorities in these territories include ensuring safety and well-being of its citizens, preventing damage to critical infrastructure, and providing climate services. Policymaking, strategic planning and carrying out of adaptation measures take place at the level of provinces, including its three arctic provinces – Yukon, Nunavut, the Northwest territories (NWT), as well as by the northern municipalities and with support from the federal level.

To implement the Paris Agreement ratified by Canada in 2016, the Pan-Canadian Framework on Clean Growth and Climate Change was adopted, which aims to (1) strengthen resilience to climate risks and (2) promote low-carbon development. In 2017, a five-year plan for financing the adaptation and development of 'green infrastructure' was approved, including creation of the Disaster Mitigation and Adaptation Fund, and programs for strengthening critical infrastructure. Domestic strategies are formed with due regard for specific features of the Arctic territories and with participation of local stakeholders. Arctic provinces, territories, and associations of indigenous people are involved in developing strategies and implementing specific measures – territorial planning, infrastructure innovation, mapping, and risk assessment. Many companies operating in the north are now integrating climate change into their corporate strategies and investment programs in order to strengthen their sustainability and competitiveness. The banking sector now factors the climate change in the risk reports. For example, the *Toronto-Dominion Bank* and the *Royal Bank of Canada* are among 14 international banks participating in the UNEP Finance Initiative to help financial institutions improve their climate risk assessment systems.

There is a fairly coherent institutional system of coordination and strategic planning being formed on many levels, which deals with adaptation policies and measures and involves, among other items, the interaction between stakeholders. The focus is on the sustainable development of the northern territories and coastal areas. This type of coordination is among the first examples in the government regulatory system in Canada. At the federal level, regular funding for adaptation programs formally started in 1998 with support of research and assessments of climate change and its impacts; their results were used to develop investment programs, coordinated among provinces, municipalities, and indigenous communities. The Ministry of Natural Resources launched the Adaptation Platform to bolster partnerships between stakeholders. The Standards Council has been implementing two new programs – Standards to Support Resilience in Infrastructure and the Northern Infrastructure Standardization Initiative – aimed at developing norms and standards for weather and climate data-sets and climate change modeling in the regions. Currently, Canada is in the process of preparing the Northern Adaptation Strategy, the purpose of which is to coordinate investment and practical actions in the North. Strategic planning is based on detailed assessments of the climate change impacts in the provinces and coastal areas, and also of possible risks and opportunities for the specific economic sectors and indigenous communities[24]. Recently, a study launched in cooperation with the Arctic provinces (NWT and Nunavut) assessed the vulnerability of the engineering infrastructure of three polar airports (Churchill, Inuvik, Cambridge Bay). The Yukon government is developing new methods for assessing the financial consequences of permafrost thawing, and is conducting engineering work to construct and maintain infrastructure.

Key priorities of Canada's adaptation strategy include further development of polar research and innovative technologies. A special legislation on scientific research in the Arctic was enacted, as well as a work program for 2014-2019.[25] Climate services is an emerging sector, which involves the development of information products and services aimed at the needs of the end users. In 2017, the center for Climate Services was established to provide consumers with climate data and results of simulations. At the same time, northern provinces are actively developing a much-needed regional climate service system. For example, Yukon's priorities include conducting monitoring and assessment programs to select investment options for infrastructure development and enchance safety of local population during natural disasters. Local stakeholders are provided with a regular access to special forecasts and information about the risks of flooding.

All Arctic provinces and territories independently or jointly with the federal authorities implement adaptation measures. These include provincial adaptation strategies, funding of research and technological development, risk assessments, disaster prevention, land use and settlement spatial planning, investments into critical infrastructure, refining of building codes, etc. The goal of the current Yukon climate strategy is to ensure that local settlements are resilient to the effects of climate

24 From Impacts to Adaptation: Canada in a Changing Climate, 2014; Canada's Marine Coasts in a Changing Climate, 2016; Climate Risks and Adaptation Practices for the Canadian Transportation Sector, 2017.

25 Canadian High Arctic Research Act, 2015; Polar Knowledge Canada's Pan-northern Science and Technology Program Priorities for 2014–2019.

change. In 2015, a report on the implementation of the five-year action plan on climate change was prepared[26]. The Northwest Territories is developing a framework regional climate strategy that combines climate adaptation and climate mitigation measures. The province of Nunavut has focused on strengthening its adaptive capacity, population safety, as well as economic and infrastructure development. In land-use planning, standard assessment methods are used in combination with traditional knowledge on the environment and climate of the polar regions. In recent years, the climate change Secretariat in the government of Nunavut has implemented a series of adaptation projects, including the organization of a permafrost databank and a center for climate risk information. The Canadian system of adaptive governance at the federal and provincial levels is complemented by the coordination of adaptation projects of the northern municipalities, realised as part of the Municipal Adaptation Action Plan. Associations of indigenous peoples play an active role in Canada's climate adaptation system.

In recent years, Canada has seen an increase in climate change adaptation financing. For example, in 2016, the federal government increased funding for these programs up to $245 million (scientific research, healthcare, indigenous people of the north, economic sectors, building polar codes, adaptation by municipalities); in 2017, the adaptation budget was supplemented[27] by an additional $260 million for a five-year period[28]. Starting from 2017, climate projects face an increase in funding for 'green infrastructure' ($21.9 billion)[29], including for the implementation of bilateral agreements with the Canadian provinces and territories ($9.2 billion) and for support of infrastructure projects of the Disaster Mitigation and Adaptation Fund ($2 billion) [Canada's Seventh National Communication 2017, p. 193]. In 2016, Canada's climate assistance to developing countries through multilateral and bilateral channels amounted to $242 million: most of the funds were allocated to adaptation programs in comparison to the projects aimed at GHG emissions reductions[30].

NORWAY

In Norway, the main features of its emerging adaptive governance system are similar to those of other Scandinavian countries (Finland, Sweden). The development of a national adaptation policy is in the competence of executive ministries and agencies, while the implementation of practical measures is delegated to local municipalities, since they are responsible for local socio-economic development, for functioning of infrastructure, and for territorial planning. Coordinating the actions of municipalities is formally entrusted to regional structures, primarily to regional governors. In 2017, the Norwegian Parliament, the Storting, approved the Climate Change Act, containing norms to regulate adaptation and climate change mitigation. The national climate adaptation policy is based on the White Paper 'Adaptation to climate change in Norway', adopt-

26 Yukon Government. 2015 Climate Change Action Plan Progress Report, Whitehorse.

27 Programs aimed at helping the communities of the north by strengthening infrastructure sustainability, improving disaster risk prevention, providing climate services, and boosting infrastructure innovation.

28 Building a Strong Middle Class. Budget 2017 (2017) // Government of Canada // https://www.budget.gc.ca/2017/docs/plan/budget-2017-en.pdf, accessed 12.12.2019.

29 Additionally, it is planned to allocate $5 billion to green infrastructure programs through the Canada Infrastructure Bank.

30 In the period between 2015 and 2016, annual funding for international assistance to adaptation programs was approximately 15 times higher than that provided for measures to reduce emissions; there was an increase in assistance for adaptation, from $36.1 million in 2015 up to $45.5 million in 2016 [Canada's Seventh National Communication 2017, pp. 213, 236].

ed by the Norwegian Parliament in 2013; it defines the key challenges and actions in response to climate change risks[31]. This started the creation of a system of adaptive governance at the national level and in the Arctic regions – Troms, Finnmark, Nurland, and in Svalbard. Municipalities continue to work on integrating adaptation measures in their strategic planning.

Norway, which positions itself as one of the safest and most prosperous countries in the world, defines climate change adaptation as one of its national priorities – namely, aimed to ensure security by reducing risks, preventing and protecting against natural hazards. Among the key risks in its northern regions are the increase in the frequency and intensity of storms, floods, avalanches, erosion and landslides, sea level rise, changes in precipitation and sea temperature. The recently adopted White Paper 'Risk in a Safe and Secure Society' considers the consequences of climate change as one the major threats to Norway's security. Due to specific priorities of Norway, the main focus of adaptation is on planning territorial development and land use, ensuring the preparedness of municipalities for natural disasters and emergencies, and strengthening the civil security systems[32].

The national climate change adaptation strategy of Norway involves an integrated assessment of possible risks and benefits, as well as a set of potential responses cross-cutting various levels, economic sectors and stakeholder groups. It stresses the responsibility of each stakeholder – both private and public – for assessing risks and taking actions to reduce or prevent a disaster. The scope of responsibility and details on practical measures are specified in a series of acts adopted by the Norwegian Parliament according to concrete directions and sectors, i.e. protection from natural disasters, floods and landslides, ensuring health and quality of life, forestry, agriculture, reindeer husbandry and transportation networks. Relevant amendments were made to legislation on land use, natural resources, water, forestry, agriculture, infrastructure, insurance, and food security.

Partnerships and coordination of responses to climate challenges are at the core of Norway's national system. The Ministry of Environment and Climate is responsible for implementing adaptation policies and measures; the Environment Agency is responsible for inter–agency coordination and interactions between economic sectors and stakeholders. Since one of the priority tasks is to ensure safety in emergency situations, interaction has been established between relevant specialized agencies. Public protection measures, planning of concerted action in emergencies, prevention and reduction of natural disaster risks are all carried out in tandem by the Directorate for Civil Protection and the Ministry of Justice and Public Security. The Ministry of Energy is responsible for reducing risks from floods, avalanches and landslides, and coordinates its actions with the executive body, the Water Resources and Energy Directorate. The latter helps municipalities with risk mapping, disaster prevention, territorial planning, funding and expertise in implementing structural measures and engineering and construction of protection facilities. The governors of the polar regions are responsible for coordinating and supervising the actions of municipalities with regard to adaptation. This goes for risk assessment, monitoring the application of building codes, road construction standards, and organ-

31 Norwegian Ministry of the Environment, 2013. Climate Change in Norway – Meld St.33 (2012–2013) Report to the Storting (White Paper), Ministry of the Environment, Oslo.

32 Norway's Seventh's National Communication under the Framework Convention on Climate Change, 2017. Norwegian Ministry of Climate and Environment, Oslo, Norway, p. 117.

isation of disaster alerts, protection, and rescue in emergency situations. For example, the Governor of Svalbard is responsible for making decisions and organizing rescue operations in case of emergencies; a team of professional rescuers and a fleet of rescue equipment are available for prompt deployment. In Norway, the responsibility for adaptation efforts in most cases lies with the local authorities, which is why, when assessing risks and vulnerabilities of specific territories and developing appropriate response measures, they are required to take into account the climate factor[33].

The practical insights accumulated in a course of implementation of of Norway's adaptation policies and measures present an interesting evidence.. For example, the climate change factor is included into the methodology for mapping and assessing the flood risks parameters. These methods are a part of the dam safety manual, which has recently been used in inventory of potentially insecure dams; decisions on land use, urban and settlement planning and necessary protective measures are verified against its norms and standards. There are detailed guidelines on flood and landslide risks reduction in the areas of small mountain rivers. A system for sea level monitoring has been established, which provides information and operational data on emergency situations related to coastal flooding. A national warning system for extreme weather events, floods, avalanches and landslides is being created for the transport sector. The Norwegian coastal administration is assessing the risks and vulnerabilities of coastal areas in order to adapt existing infrastructure projects to impacts of climate change. Like in Canada, much attention has been paid to the development of climate services. In 2013, the Norwegian Climate Service Center was established to provide services to municipalities and industries. In 2015, the center developed a review report on the climate of Norway until 2100, and started preparing disaggregated estimates and climate profiles for individual areas.

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Experience, insights and the innovative institutional approaches utilized by the Arctic countries in developing adaptation policies and measures are particularly relevant for the contemporary Russia. Russia's national strategy for climate change adaptation has been adopted at the end of 2019. It becomes an integral part of the national climate doctrine and the corresponding national action plan. It is expected to consolidate coordination between Russia's northern regions in implementing their climate change adaptation policies and measures in the Arctic. Its main focus is to assess a combination of risks and benefits from climate change, develop a methodology for calculating potential costs and damage to regions and economic sectors and risks for the northerners, and to develop a package of innovative measures and scenarios for climate change adaption. Russia's approach to adaptation aims to minimize and prevent negative consequences, and involve Russian regions and businesses in implementing adaptation programs that are particularly important for sustainable development of Russia's Arctic areas. These trends are in line with the ongoing efforts to tie together activities carried out within the frameworks of the core national projects and government programs, the corporate investment strategies in the North, and programs for the development of the

33 Norwegian Ministry of the Environment, 2010. Society's Vulnerability and Adaptation Needs to Consequences of Climate Change. Official Norwegian Report, NOU. Ministry of Climate and Environment, Oslo, Norway, 2010, p. 10.

Arctic regions, the pillar zones and urban areas. A new national strategy for the development of Russia's Arctic until the year 2035 is being prepared, as well as a bill that would create a system of preferences for the investors in the Arctic territories. Taking into account the best foreign practices and climate change adaptation insights from across the Arctic is a promising challenge for the northern regions. This, combined with international exchange of innovative approaches to climate change assessments and of research results on climate variability in polar regions, accumulated by the world-famous Russian scientific school of climatology, would promote for strengthening international cooperation in climate adaptation in the Arctic. In 2021, Russia will assume presidency of the Arctic Council, and would likely to focus on the climate adaptation issues and transformative change in the Arctic, making it one of the priorities of the perspective international cooperation agenda for the region.

Russia signed the Paris Agreement in 2016, and ratified it in 2019. In terms of climate adaptation policies, Russia holds a relatively strong international position and its adaptation profile demonstrates a number of significant advantages. In this area, Russia accumulated considerable experience and a set of innovative practices, including the emergency early warning systems, methods of emergency search and rescue, structural measures in natural disasters mitigation, and integrated climate risk assessment and management are applied. Its track record in adaptation to climate change impacts that are extremely diversified due to its vast territories and a variety of environmental contexts, including those in its Arctic regions, and insights from adaptation practices in the north are among important drivers for wider regional exchange and further development of international cooperation within the Arctic climate change agenda.

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