EXPLORING THE NORTHERN DIMENSION

Northern Dimension

Northern Dimension Institute | Background Paper 4 – December 2021

Towards a More Sustainable Arctic

In July 2020, the European External Action Service of the European Commission launched a public consultation on the way forward for the European Union's Arctic policy. The consultation was held to re-examine the role of the EU in Arctic affairs, to revise the priorities of the current Joint Communication on an integrated European Union policy for the Arctic and the actions thereunder, and to identify possible new policy areas to be developed. As part of its work within the NDI Think Tank Action, IIASA responded to this call addressing specific questions of this public consultation. This paper presents the submitted material and provides further reflections on the discussed matters from the Northern Dimension perspective.

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Main outcomes within the priorities of the EU Arctic policy

Climate Change: The EU member states have achieved limited success in mainstreaming climate mitigation and adaptation strategies to achieve the Paris Agreement targets (Reckien et al. 2019). Furthermore, the vulnerability of the Arctic has not been included in international climate negotiations to a sufficient degree – the EU should play a more active role in doing so (Landauer and Juhola 2019).

Sustainable Development: Environmental Impact Assessment (EA) promoted by the EU provides an effective approach to infuse environmental concerns into planning of large economic projects. The implementation of EA faces challenges including the insufficient level of details of guidelines on methodologies, data, and possible solutions to minimize negative impacts hindering the effectiveness of EA (Tokarczyk-Dorociek et al. 2019). The involvement of local communities and indigenous peoples into co-designing economic opportunities and instruments has been promoted, but the practice of so doing needs to expand significantly (Landauer and Komendantova 2018).

International Cooperation: The EU has been able to maintain cooperation in the Arctic matters, notably, through the Northern Dimension and its partnerships, as well as other mechanisms such as Interreg Nord and Interreg Northern Periphery and Arctic. However, the program area and scale of Interreg are limited and do not include all the relevant (also international) partners in the region.

Future relevance of the priorities of the EU Arctic policy

Climate change: The Arctic is facing climate change risks and impacts more than any other region in the world (IPCC 2019). Global warming changes climate and precipitation patterns, intensifies extreme weather events, changes ice conditions, alters Arctic ecosystems, affects fresh water, and puts risk on the permafrost – these are among the destabilizing factors that can lead to catastrophic consequences for the region and indeed the entire world. There is a broad scientific consensus that even in the very optimistic scenario, warming will continue at least for several decades (Meinshausen et al. 2011). Projections of the ice melting, for example, vary quite significantly (Diebold and Rudebusch 2019).

Adaptation to climate change should therefore continue to be an essential part of the EU Arctic policy. Adaption is also key to harness economic opportunities from the warming Arctic. Adaptation is often bottom up and happens at the household or community level. Local actions, however, may require a higher-level support and coordination to optimize the outcome at the regional level. Anticipatory approach rather than a reactive one

should be applied. This requires novel governance systems in the Arctic (Ford et al. 2014).

The EU climate change mitigation strategy is motivated by the general objective to safeguard the planet and the Arctic as its fragile part. The European Green Deal sets the ambitious goal to achieve climate neutrality by 2050. The success very much depends on the mobilization of both public and private finances which requires a combination of economic and non-economic instruments (Finance Watch 2019).

Sustainable development: Continued support for relevant research through the H2020 program is to be applauded. For example, recently funded projects Arctic Hubs, CHARTER, and JUSTNORTH aim to continue pushing the frontiers of our knowledge on social-ecological systems in the Arctic and to develop tools to devise sustainable solution options and to elaborate common guidelines.

Sustainable development must be a key objective in the EU Arctic policy. Programs such as LIFE, for example, should continue supporting transition to green economy, which increases growth and creates jobs by managing natural capital in a sustainable way. The aim should be to increase the efficiency of resource use and enhance socio-ecological resilience – this objective has gained a much higher importance in light of COVID-19 – and thereby improve human well-being. It is important to replace the narrative in which sustainability is a constraint for development by a narrative in which limitedness of resources provides impetus for innovation.

Blue economy is a concept that encourages the search for synergies between economic activities involving the oceans and sustainability. It provides a range of opportunities for sustainable growth, such as zero-waste production in the fishing industry as an example. A critical enabler for harvesting co-benefits is collaboration of all relevant actors in the focal sector (e.g., fishing industry) and other relevant sectors (e.g., tourism) (Saviolidis et al. 2020).

Enhancing connectivity is another critical issue for the sustainable development in the region. One possibility that has been discussed is a railroad from Rovaniemi to Kirkenes which would extend further to Murmansk (Russia). This Arctic railway would then be a part of a larger European railway system connecting the Arctic Ocean with continental Europe. Linking this railway infrastructure with maritime shipping would enable new trade routes between Asia and Europe and trigger multiplier effects (Nilsen 2017).

Finally, attention should be paid to resolving currently present significant socio-economic disbalances in power over and utilization of natural resources (Sidortsov and Sovacool 2015). Subsidiarity and active engagement of local communities in managing resources that are extracted in the place where they live will support the sustainability of resource exploitation and help enhancing social sustainability.

International cooperation: The EU has been able to maintain international cooperation in the region, often focusing on the pragmatic side of it. Despite decades of functional cooperation between Russia and the EU in the Arctic, there is a "lack of a

distinct Russian dimension in the EU's Arctic policy" (Skripnikova and Raspotnik 2019). The importance to achieve "multilateral stability" among diverse stakeholders within and beyond the Arctic is becoming critical to security with a larger number of players entering the stage (Berkman et al. 2020). The EU could take a lead in promoting partnership-building in the region based on its successful experience in playing a key role in international environmental negotiations (Laky 2019).

EU's environmental impact on the Arctic

The EU economy enjoys the supply of living and non-living natural resources from the Arctic. Consumption-oriented accounting (Peters 2008) should be adopted to allocate the environmental impacts to the final users of products and services. Through this, one could evaluate the demands on the environment vis-à-vis its productive capacity.

Life Cycle Assessment approach (Brusseau 2019) allows to evaluate the footprints of consumption. However, it is very data intense as detailed knowledge on production technology, the use of raw materials and supply chains is required for accurate assessment. Therefore, data availability is a major challenge. Problems include the lack of data, missing data, low quality of data and different, often, incompatible data formats. Partly, these problems result from the fact that data collection follows diverse national, rather than common international, standards. Several organizations, including the Global Footprint Network, are seeking to allocate resources towards obtaining more accurate estimates. International organizations of science, for example, the International Science Council, could take a lead to promote the implementation of common data standards for footprint assessment.

COVID-19 has a negative impact on data collection as epidemic control measures have reduced the amount of air- and surface-based measurements. Ways to counteract these adverse effects should be explored.

Balance between preservation and development

Infrastructure projects should undergo Social and Environmental Impact Assessments to appraise industries' "social license to operate". New projects should provide well-being benefits for local communities such as hospitals, schools, and other social services rather than a mere compensation for project deployment. Good practices, as outlined in, for example, Principles of Responsible Investment in the Arctic (WEF 2015) should be promoted.

The challenge is that on the one hand, infrastructure in the Arctic is costly and requires significant investments over long terms. On the other hand, global investors are shifting

their attention to emerging digital technologies and related businesses, hence the amount of available finance for physical investment projects is decreasing. The Northern Dimension Environmental Partnership has succeeded well in pulling together national and international sources to support sustainable development projects in the Arctic. The establishment of an Arctic Development Bank has also been suggested to strengthen the financial and institutional basis of development projects in the Arctic. The Bank could raise significant new funding, foster cooperation and contribute to the coordination of development efforts, as well as promote high international standards of environmental sustainability and a more conducive environment for risk-sharing, and provide institutional mechanisms to allow non-Arctic governments and the private sector to participate meaningfully in Arctic development (Gill and Sevigny 2015).

Addressing needs of local and indigenous communities

Traditional ways of living of indigenous peoples are sometimes in contradiction with the EU regulations; the use of marine mammals is one example (Hennig & Caddell, 2017). This example underscores the broadly accepted view that the involvement of local communities and indigenous peoples into co-designing economic opportunities and instruments is a pre-requisite for equitable and sustainable development.

Self-governance of local communities should be supported, politically and financially (Landauer and Komendantova 2018; Finger and Heininen 2019). Regulatory and legal frameworks addressing participatory governance, stakeholders and citizen engagement should be further advanced.

Higher involvement in decision making requires, however, the capacity to define the problems being faced, which in turn requires local-level knowledge and monitoring (Landauer and Juhola 2019).

Socio-economic challenges and demographic development

The EU Arctic policy should address existing inequality between various Arctic territories with different infrastructure requirements and different levels of socio-economic development. Policy should also ensure that remote and isolated communities continue to have good access to quality food, products, and services at affordable prices. Outmigration (Nilsson & Larsen 2020) and integration of indigenous peoples into the EU labor market are two major challenges to be tackled.

Furthermore, digital inequality is a big challenge. It includes not only the provision of access to high-speed internet but also a culture of using new digital technologies (Vinokurova et al. 2020). The latter can yield a significant benefit if indigenous peoples could be active participants of citizen science projects to support data collection.

More attention should be paid to the design, implementation, and monitoring actions across multiple scales of governance. Oftentimes, the lack of vertical coherence between the national and EU level policymaking has hindered implementation (Hossain 2015).

Intergovernmental and regional cooperation

Obviously, a major factor affecting cooperation in the Arctic at the moment is the crisis in geopolitical relations between Russia and "the West". Despite suspension of cooperation in economic and military areas, cooperation continues on search and rescue, fisheries, and navigation in the Arctic – among other areas (Byers 2017). The Northern Dimension as a common policy of four equal partners continues to provide a framework for practical cooperation also in the Arctic region in the spheres of environment, transport and logistics, health and social well-being, and culture.

The Arctic Council facilitates cooperation among the Arctic states in the areas of environment, indigenous peoples, and emergencies. Geopolitical and military issues are outside of its mandate. A careful approach is required to design effective channels to address these very sensitive dimensions without putting the existing cooperation at risk. A platform for an inclusive dialogue in which all parties would be considered equal partners could be useful to reduce the risk of military escalation in the region (Bouffard et al. 2020).

A few initiatives exist which aim to facilitate a bottom-up dialogue of stakeholders about the future of the Arctic, notably, the European Arctic Stakeholder Forum. This is, however, limited to the European Arctic and does not include Arctic stakeholders from Russia, Canada, the USA. Programs in science diplomacy engaging with Russia and China could help decrease tensions (Greunz and Ward 2017).

Science and technology for the benefit of the Arctic

Compared to many other regions in the world, the research capacity and the amount of research covering all aspects of the Arctic are very extensive. In a number of recent articles, scientists advocate for certain topics to be further prioritized including Arctic sustainability (Petrov et al. 2016), Arctic ecosystem functioning and related legal and regulatory questions (Kirk and Miller 2018), operational oceanographic predictions (Smith et al. 2019), indigenous peoples (Pfeifer 2018), greening of the Arctic (Myers-Smith et al. 2020), and Arctic freshwater system (Prowse et al. 2015) – the list is

certainly far from being complete. In terms of the geographical focus, Virkkala et al. (2019) suggest that more research is needed particularly in the Canadian Arctic Archipelago, northern Greenland, central and eastern Siberia.

In order to support the priorities of the EU's Arctic Policy, a radically higher emphasis should be put on transdisciplinary research that facilitates a two-way knowledge exchange between science and society/policy (Vlasova and Volkov 2016). The science communication expertise and platforms of the Northern Dimension Institute as the "science partnership" of the ND policy could be used here as a resource.

A particularly important area where innovations will be playing an important role is space-related technologies (e.g., digital security, satellites, meteorology; Heininen et al. 2020). It is important to support further research and international cooperation in this area.

Arctic as a complex system

Arctic region is a complex system which is subject to VUCA (Volatility, Uncertainty, Complexity, Ambiguity) challenges: sea ice coverage volatility (Serreze & Stroeve 2015), climate change projections uncertainty (Hodson et al. 2013), ecosystems complexity (Berge et al. 2014), and policy ambiguity (Tasch & Tasch 2017). Such systems are known to be particularly challenging to govern (Cook & Tõnurist 2017). One way to address VUCA problems and aid decision-making is systems thinking (Levy et al. 2018). It is capable of tackling drawbacks of disciplinary and sectoral solutions, which are often not enough to steer a system influenced by VUCA towards the desired goal. Systems thinking, combined with enhanced anticipation, provides a coherent methodology and necessary tools to support feasible solutions (Strelkovskii et al. 2019). Moreover, systems thinking supports social learning among stakeholders, i.e., learning among people and organizations to cooperatively cope with issues where they have a stake (Ridder et al. 2005).

A recent review (Erokhin et al. 2020) re-confirmed multiple uncertainties across the global and regional drivers to impact the Arctic development. Figure 1 presents an illustration of interconnections between global and regional factors (Finger and Heininen 2019) which have a major influence on shipping volumes in the Arctic. The challenges facing the Arctic are interconnected, requiring multi-dimensional systems solutions.

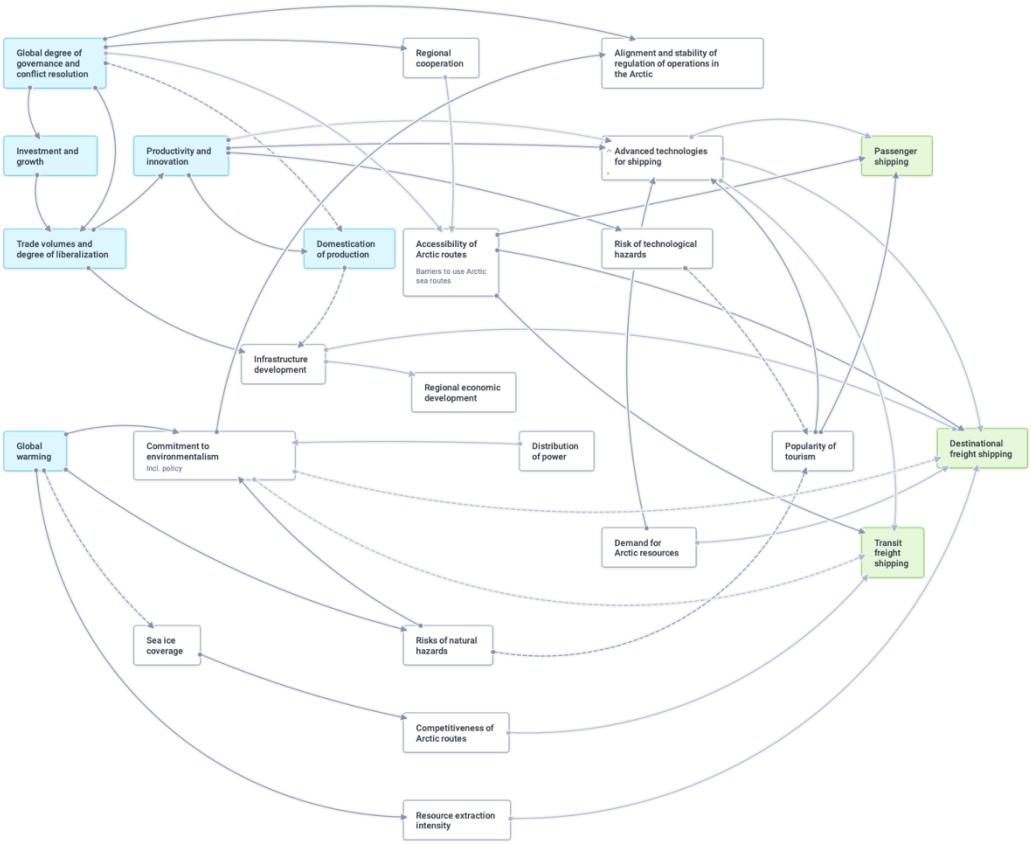

Figure 1: A sample systems map illustrating global (blue boxes) and regional (white boxes) factors influencing destination and transit freight shipping volumes in the Arctic. Arrows depict the direction of impact. Source: Authors' analysis.

To deal with the uncertainty in the major drivers which determine the development of the Arctic in the future, a foresight approach can be helpful. Foresight allows to construct and describe qualitatively different pictures of alternative, plausible futures corresponding to different possible realizations of uncertain drivers. IIASA contributes to the NDI Think Tank Action by conducting a foresight study on shipping in the Arctic. Several plausible future scenarios of how commercial shipping can develop in the Arctic until 2050 are co-constructed, and their drivers and implications across economic, environmental, governance, and technological dimensions are detailed.

Literature

Berge, J., Cottier, F., Varpe, Ø., Renaud, P. E., Falk-Petersen, S., Kwasniewski, S., ... & Bjærke, O. (2014). Arctic complexity: a case study on diel vertical migration of zooplankton. Journal of Plankton Research, 36(5), 1279-1297. https://doi.org/10.1093/plankt/fbu059

Berkman, P. A., Fiske, G., Røyset, J. A., Brigham, L. W., & Lorenzini, D. (2020). Next-Generation Arctic Marine Shipping Assessments. In Governing Arctic Regional Lessons from the Bering Strait and Barents Sea (pp. 241-268). Springer, Cham. https://doi.org/10.1007/978-3-030-25674-6_11

Bouffard, T.J., Buchanan, E., Young, M. (2020). Arctic Security and Dialogue: Assurance through Defence Diplomacy. Modern Diplomacy. https://moderndiplomacy.eu/2020/07/11/arctic-security-and-dialogue-assurance-through-defence-diplomacy/

Brusseau, M. L. (2019). Sustainable development and other solutions to pollution and global change. In Environmental and Pollution Science (pp. 585-603). Academic Press. https://doi.org/10.1016/B978-0-12-814719-1.00032-X

Byers, M. (2017). Crises and international cooperation: an Arctic case study. International relations, 31(4), 375-402. https://doi.org/10.1177/0047117817735680

Cook, J. W., & Tõnurist, P. (2017). From Transactional to Strategic: systems approaches to public service challenges. OECD Observatory of Public Sector Innovation. https://doi.org/10.1787/9789264279865-en

Diebold, F. X. and Rudebusch, G. D. (2019). Probability Assessments of an Ice-Free Arctic: Comparing Statistical and Climate Model Projections. PIER Working Paper No. 20-001. http://dx.doi.org/10.2139/ssrn.3513025

Erokhin, D. & Rovenskaya, E. (2020). Regional scenarios of the Arctic futures: A review. IIASA Working Paper. Laxenburg, Austria: WP-20-013. http://pure.iiasa.ac.at/id/eprint/16648/

Finance Watch (2019). Game-changer: Financing the European Green Deal. https://www.finance-watch.org/wp-content/uploads/2019/09/Financing-the-European-Green-Deal_Sept2019_03.pdf

Finger, M., & Heininen, L. (Eds.). (2019). The Global Arctic Handbook. Springer International Publishing. https://doi.org/10.1007/978-3-319-91995-9

Ford, J. D., McDowell, G., & Jones, J. (2014). The state of climate change adaptation in the Arctic. Environmental Research Letters, 9(10), 104005. https://doi.org/10.1088/1748-9326/9/10/104005

Gill, A., & Sevigny, D. (2015). Sustainable Northern development: the case for an Arctic development bank. https://www.cigionline.org/sites/default/files/no54.pdf

Greunz, L., & Ward, T. (2017). Summary report of the Arctic Stakeholder Forum consultation to identify key investment priorities in the Arctic and ways to better streamline future EU funding programmes for the region. Luxembourg: Publications Office of the European Union. https://op.europa.eu/en/publication-detail/-/publication/6a1be3f7-f1ca-11e7-9749-01aa75ed71a1/language-en/format-PDF/source-60752173

Heininen, L., Everett, K., Padrtova, B., & Reissell, A. (2020). Arctic Policies and Strategies-Analysis, Synthesis, and Trends. IIASA, Laxenburg, Austria. https://doi.org/10.22022/AFI/11-2019.16175

Hennig, M., & Caddell, R. (2017). On Thin Ice? Arctic Indigenous Communities, the European Union and the Sustainable Use of Marine Mammals. In The European Union and the Arctic (pp. 296-341). Brill Nijhoff. https://doi.org/10.1163/9789004349179_012

Hodson, D. L., Keeley, S. P., West, A., Ridley, J., Hawkins, E., & Hewitt, H. T. (2013). Identifying uncertainties in Arctic climate change projections. Climate dynamics, 40(11-12), 2849-2865. https://doi.org/10.1007/s00382-012-1512-z

Hossain, K. (2015). EU Engagement in the Arctic: Do the Policy Responses from the Arctic States Recognise the EU as a Legitimate Stakeholder? Arctic Review on Law and Politics, 6(2). https://doi.org/10.17585/arctic.v6.97

IPCC. (2019). Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. MassonDelmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)]. In press. https://www.ipcc.ch/srocc/chapter/summary-for-policymakers/

Kirk, E. A., & Miller, R. G. (2018). Offshore oil & gas installations in the Arctic: responding to uncertainty through science and law. Arctic Yearbook, 256-274. http://irep.ntu.ac.uk/id/eprint/34980

Laky, Z. (2019). Environment policy: General principles and basic framework. 5. https://www.europarl.europa.eu/factsheets/en/sheet/71/environment-policy-general-principles-and-basic-framework

Landauer, M., & Juhola, S. (2019). Loss and damage in the rapidly changing arctic. In Loss and Damage from Climate Change (pp. 425-447). Springer, Cham. https://doi.org/10.1007/978-3-319-72026-5_18

Landauer, M., & Komendantova, N. (2018). Participatory environmental governance of infrastructure projects affecting reindeer husbandry in the Arctic. Journal of environmental management, 223, 385-395. https://doi.org/10.1016/j.jenvman.2018.06.049

Levy, M., Lubell, M., & McRoberts, N. (2018). The structure of mental models of sustainable agriculture. Nature Sustainability, 1, 413–420. https://doi.org/10.1038/s41893-018-0116-y

Meinshausen, M., Smith, S. J., Calvin, K., Daniel, J. S., Kainuma, M. L. T., Lamarque, J. F., ... & Thomson, A. G. J. M. V. (2011). The RCP greenhouse gas concentrations and their extensions from 1765 to 2300. Climatic change, 109(1-2), 213. https://doi.org/10.1007/s10584-011-0156-z

Myers-Smith, I. H., Kerby, J. T., Phoenix, G. K., Bjerke, J. W., Epstein, H. E., Assmann, J. J., ... & Berner, L. T. (2020). Complexity revealed in the greening of the Arctic. Nature Climate Change, 10(2), 106-117. https://doi.org/10.1038/s41558-019-0688-1

Nilsen, T. (2017, December 21). Border region launches Rovaniemi - Murmansk as third Arctic railway alternative. The Independent Barents Observer AS. https://thebarentsobserver.com/en/industry-and-energy/2017/12/launches-rovaniemi-murmansk-third-arctic-railway-alternative

Nilsson, A. E., & Larsen, J. N. (2020). Making regional sense of global sustainable development indicators for the Arctic. Sustainability, 12(3), 1027. https://doi.org/10.3390/su12031027

Peters, G. P. (2008). From production-based to consumption-based national emission inventories. Ecological economics, 65(1), 13-23. https://doi.org/10.1016/j.ecolecon.2007.10.014

Petrov, A. N., BurnSilver, S., Chapin III, F. S., Fondahl, G., Graybill, J., Keil, K., ... & Schweitzer, P. (2016). Arctic sustainability research: toward a new agenda. Polar Geography, 39(3), 165-178. https://doi.org/10.1080/1088937X.2016.1217095

Pfeifer, P. (2018). From the credibility gap to capacity building: An Inuit critique of Canadian Arctic research. Northern Public Affairs, 6(1), 29-34. http://www.northernpublicaffairs.ca/index/volume-6-issue-1/from-the-credibility-gap-to-capacity-building-an-inuit-critique-of-canadian-arctic-research/

Prowse, T., Bring, A., Mård, J., Carmack, E., Holland, M., Instanes, A., ... & Wrona, F. J. (2015). Arctic Freshwater Synthesis: Summary of key emerging issues. Journal of Geophysical Research: Biogeosciences, 120(10), 1887-1893. https://doi.org/10.1002/2015JG003128

Reckien, D., Salvia, M., Pietrapertosa, F., Simoes, S. G., Olazabal, M., Hurtado, S. D. G., ... & Fokaides, P. A. (2019). Dedicated versus mainstreaming approaches in local climate plans in Europe. Renewable and Sustainable Energy Reviews, 112, 948- 959. https://doi.org/10.1016/j.rser.2019.05.014

Ridder, D., Mostert, E., Cernesson, F., & Harmony, C. T. (2005). Learning together to manage together: improving participation in water management. Germany: University of Osnabrück. https://library.wur.nl/WebQuery/hydrotheek/1812737

Saviolidis, N. M., Davíðsdóttir, B., Ilmola, L., Stepanova, A., Valman, M., & Rovenskaya, E. (2020). Realising blue growth in the fishing industry in Iceland and Norway: Industry perceptions on drivers and barriers to blue growth investments and policy implications. Marine Policy, 117, 103967. https://doi.org/10.1016/j.marpol.2020.103967

Serreze, M. C., & Stroeve, J. (2015). Arctic sea ice trends, variability and implications for seasonal ice forecasting. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 373(2045), 20140159. https://doi.org/10.1098/rsta.2014.0159

Sidortsov, R., & Sovacool, B. (2015). Left out in the cold: Energy justice and Arctic energy research. Journal of Environmental Studies and Sciences, 5(3), 302–307. https://doi.org/10.1007/s13412-015-0241-0

Skripnikova, N., & Raspotnik, A. (2019). Has Russia heard about the European Union's Arcticness? The EU's Arctic steps as seen from Russia. Polar Record, 55(6), 441- 451. https://doi.org/10.1017/S0032247420000145

Smith, G. C., Allard, R., Babin, M., Bertino, L., Chevallier, M., Corlett, G. K., ... & Hebert, D. (2019). Polar ocean observations: a critical gap in the observing system and its effect on environmental predictions from hours to a season. Frontiers in Marine Science, 6, 429. https://doi.org/10.3389/fmars.2019.00429

Strelkovskii, N., Ilmola-Sheppard, L., Komendantova, N., Martusevich, A., & Rovenskaya, E. (2019). Navigating through deep waters of uncertainty: Systems analysis approach to strategic planning of water resources and water infrastructure under high uncertainties and conflicting interests. IIASA RR-19-004. http://pure.iiasa.ac.at/id/eprint/15998/

Tasch, J., & Tasch, W. (2017). Ambiguity in an Ambiguous Region. Risk Conundrums: Solving Unsolvable Problems, 147. https://www.taylorfrancis.com/books/e/9781315665894/chapters/10.4324/9781315665894-12

Tokarczyk-Dorociak, K., Kazak, J. K., Szewrański, S., Haładyj, A., Szkudlarek, Ł., Chrobak, G., & Van Hoof, J. (2019). On the usefulness of guidelines and instructions for environmental assessment–a qualitative study of the helpfulness perceived by Polish practitioners. Impact Assessment and Project Appraisal, 37(2), 150-164. https://doi.org/10.1080/14615517.2018.1519151

Vinokurova, U., Shachina, A., & Shachin, S. (2020). Experience of research of the topic of digital inequality in the Arctic based on ideas of German sociologists and psychologists. In IOP Conference Series: Earth and Environmental Science (Vol. 539, No. 1, p. 012113). IOP Publishing. https://doi.org/10.1088/1755-1315/539/1/012113

Virkkala, A. M., Abdi, A. M., Luoto, M., & Metcalfe, D. B. (2019). Identifying multidisciplinary research gaps across Arctic terrestrial gradients. Environmental Research Letters, 14(12), 124061. https://doi.org/10.1088/1748-9326/ab4291

Vlasova, T., & Volkov, S. (2016). Towards transdisciplinarity in Arctic sustainability knowledge co-production: Socially-Oriented Observations as a participatory integrated activity. Polar Science, 10(3), 425-432. https://doi.org/10.1016/j.polar.2016.06.002

World Economic Forum (WEF). 2015. Arctic Investment Protocol. Davos: World Economic Forum. https://www.weforum.org/whitepapers/arctic-investment-protocol-guidelines-for-responsible-investment-in-the-arctic

Co-funded by
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