IASS WORKING PAPER

Institute for Advanced Sustainability Studies (IASS)

Potsdam, April 2014

Engaging Stakeholders in Interdependent Arctic and Global Change

Developing the SMART Research Project

Dr. Kathrin Keil, Thilo Wiertz and Prof. Ilan Chabay

IASS POTSDAM

Abstract

* *The authors would like to thank Christian Stöhr, Achim Maas, Axel Lauer, Carolina Cavazos Guerra and Vilena Valeyeva for their valuable comments to this working paper.*

SMART
Sustainable Modes of Arctic Resource-driven Transformations

Working paper based on the international workshop "Arctic Horizon 2030", held at the Institute for Advanced Sustainability Studies (IASS) in Potsdam, Germany, on December 9th–10th, 2013.

The rapid environmental changes occurring in the Arctic and the effects and challenges they precipitate require a thorough understanding of the key trends and critical junctures in ecological as well as socio-political processes now and for decades to come. Stakeholders from academia, civil society, industry and politics came together at the IASS to identify and discuss such trends and their often uncertain effects on the ecological, economic and social conditions in the Arctic. Participants from Russia, Norway, Canada, Sweden, the Netherlands and Germany joined IASS researchers in discussing the range of transformations occurring in the Arctic, feedback loops between Arctic and non-Arctic regions, and how the changes are affected by and concern local and distant stakeholders. These discussions fed into the evolving **SMART research project** (**S**ustainable **M**odes of **A**rctic **R**esource-driven **T**ransformations), which focuses on sustainable Arctic transformations and will be developed in close and continuous collaboration with stakeholders. The following core take-away messages from the workshop form the basis for the further development of the SMART research project:

- **Ecological and environmental change** in the Arctic is strongly driven by climate change and has complex implications for social and political transformations, both within Arctic regions and communities and beyond.

- Developments in Arctic regions (ongoing and expected) are interlinked with and determined by economic, technological, legal and political systems that extend beyond the Arctic, indicating **interconnection of regional and global systems within the Arctic.**

- Different regions within the Arctic, ranging from large regions such as the Eurasian and the North American Arctic down to small communities, are characterized and affected by varied social, environmental, and economic conditions. **This diversity of the Arctic** needs to be considered in the development of sustainable transformation pathways.

- **Russia and Norway** and especially the Barents and Kara Seas are main areas for short- to mid-term economic activities in the Arctic, especially regarding oil and gas exploration and ex ploitation and related transport activities.

- Domestic and international **governance instruments and institutions** both reflect and drive social and ecological change and can function as vehicles for sustainable transformations.

- The **engagement of stake- and rights-holders** in a transdisciplinary research framework should be under-taken under explicit consideration of (i) who should be engaged and why, (ii) how engagement will be structured and organized, (iii) the roles and contributions of stakeholders to the research process, and (iv) the expectations of researchers and stakeholders regarding the value and use of outcomes of the research project for stake- and rights-holders.

Content

Introduction

Anthropogenic climate change and air pollution are rapidly transforming the Arctic terrestrial and maritime landscape, primarily driven by consumption behavior in industrialized regions beyond the Arctic's southern borders. In turn, environmental change in the Arctic, such as the melting of sea-ice, has implications for non-Arctic regions.

Because new activities are expected to become technologically and economically feasible in newly accessible areas, especially offshore, the extraction of resources and other economic activities are likely to increase significantly in scope and impact in the near future. This also brings forth novel challenges to existing legal and governance regimes. Continuing reliance on fossil energy resources, together with increasing resource accessibility, have raised the level of interest in the Arctic by countries and companies far beyond the Arctic, with profound impacts on economic, social and political relationships.

Many of these transformations are likely to be driven by interests in extraction and increased utilization of natural resources; activities which are expected primarily in the Eurasian part of the Arctic in the mid-term future. Given Europe's dependence on Norwegian and Russian oil and especially gas, and with both countries preparing to increasingly exploit their Arctic resources, Arctic politics and environmental change are becoming more important for energy consumption in Germany and other European countries. With increasing resource extraction and related infrastructure and transport development, however, emissions of short-lived climate-forcing pollutants (SLCPs) will rise, which may further accelerate the co-transformation of Europe and the Arctic. Particularly the next decade will be critical, as major political and economic decisions will be made, even though there is much uncertainty on how Arctic landscapes will actually develop.

SMART aims to highlight the interdependency of regional and global systems within the Arctic, including meteorological, climatic, economic, technological, legal and political aspects. The proposed initial thematic focus is on Arctic oil and gas extraction and related infrastructure developments, because this is where the most significant changes in the near future are expected. The proposed geographical focus is on the Eurasian Arctic and in particular the environmental, economic, and political interaction between Norway, Russia and the European Union. This paper provides an overview of some of the key issues SMART will consider, ranging from the effects of climatic and ecological changes in the Arctic, the drivers and challenges of economic activities, the role of governance for sustainable futures in different Arctic regions, and the engagement of stake- and rights-holders throughout the research process. These issues emanate from the workshop discussions of the key trends and junctures for sustainable Arctic transformations, which are summarized below.

Summary: Key Trends and Critical Junctures for Sustainable Arctic Transformations

Ecological and environmental change in the Arctic is strongly driven by climate change and has complex implications for social and political transformations, both within Arctic regions and communities and beyond. Due to the sea-ice albedo feedback, changes in sea ice cover have implications for climatic changes around the world, also on whether patterns in Europe. Transport of black carbon to the Arctic from mid-latitudes, as well as possibly increasing Arctic-originated black carbon, has implications for sea-ice within the Arctic, although uncertainties about the most important sources of this pollution remain. While changes in sea-ice are often considered the most important ecological influence within the Arctic, changing weather conditions need to be considered, too. Climate projections indicate an increase in cyclones and the increase in moisture due to higher temperatures, which can have considerable impacts, e.g. on infrastructure.

The **diversity of Arctic regions** needs to be taken into account. This does not only adhere to differences between large regions like Eurasia and North America, but also within these regions, where different social, environmental, climatic and economic conditions prevail.

Developments in Arctic regions (ongoing and expected) are interlinked with and determined by economic, technological, legal and political systems within and beyond the Arctic, indicating **interdependency of regional and global systems within the Arctic**. This adds significant complexity and uncertainty to the future development in general and to resource development in particular, the latter arising from the various political, ecological and economic contexts in which such developments take place. For example, while average sea-ice coverage declines as a result of climate change, this change does not uniformly facilitate resource extraction. Floating ice, effects on equipment due to changes in humidity and weather, or an increased variability of sea-ice are considerable risk factors for resource extraction. Some of these factors can be mitigated by changes in the governance regime, in particular with regards to a robust search and rescue regime. Beside uncertainties about environmental change, economic and political factors also are factored into the decisions of companies and investors. Economic considerations comprise, amongst others, the availability of an insurance regime that is currently largely lacking, the development of (international) commodity prices, changing demand and supply patterns, existing commitments to customers, and the development of new technologies, e.g. for subsea extraction. Restrictions on ecological services, priority shifts, or extraction taxes are political factors that will influence activities.

Changing governance structures, domestic and international, are a driver of social and ecological change and can in principle function as **vehicles to more sustainable transformations**. Governance can, for example, set limits to economic activities, but also facilitate planning or information exchange between stake- and rights-holders. Private actors have already started cooperating with regards to environmental risk management. A particular challenge exists for countries where a compartmentalization of Arctic issues across different policy fields and agencies may inhibit the move to sustainable policies and a strong and consistent domestic commitment to sustainability is sometimes lacking. The question how governance can operate effectively across different scales is crucial, in particular when considering the cultural, political, and economic diversity of Arctic regions. Against this diversity it is equally important to acknowledge the conditions for sustainable transformations in various different contexts, and also the potentially conflicting interests and views on sustainability of stake- and rights-holders. Crucially, transformative research needs to account for marginalized positions in current discussions and identify the different spaces and institutional contexts (or lack thereof) in which 'sustainability' is and can be negotiated.

Reasons to **engage stake- and rights-holders** in a transdisciplinary research framework can be motivated by legal requirements, ethical concerns, and an increase of the legitimacy or the quality of knowledge production. Depending on particular research questions and the stage of the research process, different reasons may apply and ask for different methods of engagement. Accordingly, stake- and rights-holders can take different roles in the process, for example by helping with monitoring and reporting or by bringing in a particular kind of expertise. Generally, those who are affected shall have an influence on the matters that are subject to analysis and evaluation, the methods that are chosen and how data is used and interpreted. Stake- and rights-holders are thus involved in monitoring of the research process and according evaluation and reporting, they are catalysts for corrections and alterations 'on the way', and ultimately involved in formulating the results of the research. Thus, throughout the process, the research design needs to stay flexible enough to be able to react to expectations of the project partners. Not least, the added value of the research effort for rights- and stakeholders, and for their effort to get engaged, has to be shared and understood by all involved.

Any transdisciplinary research approach has to be sensitive to different capacities of stake- and rights-holders to engage. Constraints might for example arise from the political context (e.g. situation of NGOs in Russia), resource limitations (time, finance, personal), experience and prior knowledge or language. This also requires a sensitivity to power relations, e.g. with regards to the question of who speaks authoritatively for which group or the way that the research project itself becomes entangled in a specific socio-political context by giving a voice to certain groups or concerns. Also, imbalances in power and capacity between different actors are a serious challenge that must be addressed in facilitating meaningful exchange of knowledge for mutual learning in open dialogues.

The researchers involved in the project have to reflect on their own role (and influence) on the research process and its eventual outcome, for example through the emphasis on sustainability issues in the Arctic and the reflection, questioning, and possibly also criticism of sustainability understandings. In other words, researchers have to understand themselves as taking a position between a neutral observer standing 'outside' the empirical process and an agent influencing the object under study through his/her involvement. Such role could take the form of "social change agent" or catalyst for change. Nonetheless, the aim is to have the stakeholders participate in the design of the research agenda, thus to address their views of the issues and collaborate in building tools for decision making that are useful to them at multiple scales and levels.

From the stake- and rights-holder engagement follows that **science communication** has to be an integral task of SMART. This includes the communication of the societal relevance and knowledge gain of the research and the limitations of the scientific models and scenarios used. Researchers have the task to use accessible, understandable, non-scientific and everyday language to clarify the results and underlying assumptions of their work to stakeholders not familiar with the process and language of research, including that of natural science. Crucially, this includes stating that model and scenario results indicate a plausible or possible result, rather than a prediction or a causally certain effect. It is also important to consider how to make scientific work and results more 'user-friendly', such as along the lines of the IPCC report's summary for policy-makers. This includes communicating explicitly about the research process and not only research results, because this discloses underlying assumptions, simplifications and possible omissions, and thus determines the research's relevance for stakeholders. Finally, the possible consequences of the research, such as in terms of risks, need to be communicated and processed in forms appropriate for different stake- and rights-holder groups.

1. Climatic and Ecological Changes in the Arctic and their Effects beyond the Region

Ongoing research shows that the observed trend in the decline of sea ice has the potential to change large-scale atmospheric circulation due to changes in the dynamics of the Arctic atmosphere. Arctic heating anomalies due to low sea ice concentrations favor the formation of a heat dome above the Arctic resulting in more Arctic cyclones and a stronger Siberian high, possibly influencing European weather patterns. Sea ice loss is most pronounced in the Norwegian and Russian Arctic regions, while more summer sea ice remains on the North American side of the Arctic (figure 1).

Changes in the pressure and temperature patterns associated with less sea ice could also contribute to shifts to a negative phase in the North Atlantic Oscillation (NAO)[1]. A negative NAO leads to less warm air reaching Europe and thus to a decrease in northern European temperatures. Such research model results have to be understood in terms of statistical *likelihoods* and *trends* and not as empirical forecasting.

It is thus necessary to understand such research as being able to make statements about *potential and plausible ranges of change*, providing knowledge about the boundaries of possible outcomes. Natural science thus gives indications as to which scenarios within which boundaries of uncertainty should be considered in responding to potential or expected changes.

median 1981–2010

Figure 1: Arctic sea ice extent in August 2013

This map shows the sea ice extent in the Arctic in August 2013, illustrating the large ice-free areas especially north of Norway and western Russia in comparison to the Canadian Archipelago.

Source: National Snow and Ice Data Center (NSIDC), Arctic Sea Ice News & Analysis, available at http://nsidc.org/arctic-seaicenews/2013/08/, accessed 17 February 2014.

[1] *The NAO is a large-scale pattern of natural climate variability that has important impacts on the weather and climate of the North Atlantic region and surrounding continents, especially Europe. The NAO index is calculated according to the difference of atmospheric pressure at sea level between the Icelandic low and the Azores high. It varies from year to year, but also exhibits a tendency to remain in one phase for intervals lasting several years.*

Arctic sea ice changes are also sensitive to SLCP (short-lived climate-forcing pollutant) emissions. Black carbon[2] plays a significant role because of its potential to enhance ice melting by absorbing sunlight through its dark surface (albedo effect). Research models try to assess if black carbon emissions originating from within the Arctic region have a stronger impact on ice melting than emissions transported from lower latitudes. Model results indicate that Arctic surface temperatures are particularly sensitive to inner Arctic emissions of black carbon compared to black carbon transported to the Arctic from mid-latitudes. The same amount of black carbon emitted within the Arctic would have an effect five times higher than that from black carbon coming from the mid-latitudes. This is due to the fact that mid-latitude black carbon emissions[3] that are transported to the Arctic, especially during wintertime, mostly stay higher up in the atmosphere and do not reach the Arctic surface. In comparison, black carbon emitted within the Arctic region, mostly produced by gas–flaring, stays closer to ground and ends up warming snow and ice covers.

In absolute terms, however, emissions from mid-latitudes are by far the largest source of black carbon in the Arctic. Arctic emissions have to be scaled up significantly in order to show a discernable effect on surface temperatures in the research models. However, Arctic emission data are not perfect; it is for example likely that Russian Arctic emissions are underestimated in model projections due to limited data availability. An important source of black carbon within the Arctic is gas flaring, which could increase in the future given the planned economic activities, especially oil and gas extraction in the western Eurasian Arctic.

[2] *Black Carbon (BC) is a Short-Lived Climate-forcing Pollutant (SLCP) formed from the incomplete combustion of fossil fuels, biofuels and biomass. It is the most strongly light-absorbing component in the atmosphere playing a significant role in the Earth's climate system. BC influences the climate by: 1) absorbing solar radiation contributing to atmospheric heating and dimming at the surface, 2) reducing surface albedo when deposited on snow and ice, and 3) interacting with clouds by altering cloud properties.*

[3] *Global black carbon emissions are mostly originated in Asia, specifically from industrial coal, biofuel cooking and forest burning, but also from Europe and North America.*

2. Arctic Resource Development: Drivers, Challenges and Concerns

2.1 Geographical and thematic focus

In the decades to come, resource development and significant investments in infrastructure are expected predominantly in the Norwegian and western Russian Arctic regions. Developments in these areas are environmentally, economically, and politically intertwined with the European Union specifically as a result of EU countries being major consumers of Russian and Norwegian oil and gas resources. For decades Russia and Norway have been active in developing Arctic oil and gas resources, so far mostly onshore, and both countries are highly dependent upon the resulting export revenues. In Russia, Arctic oil and gas is further relevant to satisfying domestic demand. Onshore, exploitation activities are increasingly moving north to coastal areas, such as the planned Yamal LNG Project. But offshore exploration and exploitation is also on the rise – especially in the Barents and Kara Seas (figure 2) – to make up for mature onshore fields. To supply these fields on the northern coasts and offshore in Arctic waters, maritime traffic is expected to increase significantly. This illustrates that different economic activities ongoing and planned in the Arctic are interconnected. For example, the Northern Sea Route (NSR) and more broadly the Northeast Passage[4] are predominantly considered as potential transportation routes to support hydrocarbon development in Russian Arctic waters and only secondarily as transit routes for maritime trade.

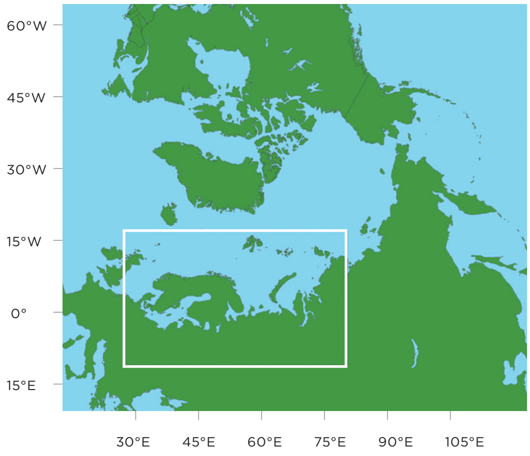

Figure 2: Geographical focus area: Norway and northwest Russia and adjacent waters (Barents and Kara Seas)

© Carolina Cavazos Guerra

[4] The Northeast Passage *is a set of routes from northwest Europe around North Cape and along the north coast of Eurasia and Siberia through the Bering Strait to the Pacific. The Northern Sea Route is defined in Russian law as a set of marine routes from Kara Gate, south of Novaya Zemlaya, in the west to the Bering Strait in the east with some of the routes running along the coast and others running north of the islands of the Russian Arctic.*

High latitude onshore production is already occurring, since the relevant knowledge, expertise and technology is available. The Barents Sea in particular has already seen substantial exploration activities and is expected to be the main production area within the next 20 years using currently developed essential technologies, such as winterization.[5] The first offshore field in the Barents Sea, the Norwegian Snøhvit gas field, went into production in 2007. The first Russian oil offshore field, the Prirazlomnoye oil field in the Pechora Sea, went into production very recently in December 2013. In high north frontier areas, exploration and production activities are already on some planning agendas, but the necessary technology and infrastructure is currently either non-existent or not in place.

In order to come to a more nuanced picture of the future of Arctic economic activities, a number of local and global drivers as well as challenges and concerns have to be considered. This necessitates an understanding of such activities as part of regional and global systems that extend beyond the Arctic. As an example, resources alone are not enough to make for a profitable economic endeavor. Logistics and transport, available (and affordable) technology, human resources, political stability, favorable market conditions in the prospective markets, and not least, social and ecological concerns have to be added to the equation. Considering all these factors is needed to assess if detected and expected *resources* could become technologically recoverable and economically viable *reserves*.

2.2 Drivers

In addition to extended ice-free summer seasons, especially in the Norwegian and western Russian region, national political decisions that shape the political and financial conditions for exploration and exploitation are drivers of Arctic resource development. In Norway, the government's **regional development policies** initiated and fostered oil and gas exploration and exploitation in the North Sea during the 1970s, for example through establishing a state-controlled oil company in 1972 (Statoil) to serve as the basis for the Norwegian oil industry. Another, more recent, economic local driver of Norwegian Arctic oil and gas activity is the Snøhvit gas field offshore Hammerfest in northern Norway, which has provided economic ripple effects for the Norwegian hydrocarbon sector in terms of setting up essential infrastructure and providing conducive investment conditions and industry experience in Arctic offshore conditions. The high intensity of exploration and drilling activities in search for new discoveries in the Barents Sea is viewed as a result of these ripple effects, as well as the offshore Goliat oil field, which is planned to start production in 2014.

Similarly, in Russia a mix of political, economic and technological developments has been driving Arctic economic activities 'from the inside'. Vessels under a foreign flag are increasingly allowed to call at ports in the Russian Arctic, and an **administrative reform** in 2013–including the creation of an "Administration for the Northern Sea Route" – has facilitated the use of the NSR. **Tax reliefs** on hydrocarbon extraction and export were introduced to increase investment in high-cost Arctic development projects. Gazprom's monopoly on transporting and exporting all forms of gas from Russian fields has been eroded, at least in the case of liquefied natural gas (LNG). Since 2013 other state-owned companies, such as Rosneft, and companies that already have been allowed to build LNG terminals, such as Novatek for the Yamal LNG Project, are also allowed to export LNG. The law leaves Gazprom's monopoly on pipeline gas intact, however. Russia is also investing in drilling and transport technology – currently several new icebreakers are under construction and planned – and infrastructure along its northern coast. By 2015 ten new search and rescue (SAR) centers are planned to be operational, and updated charts for the depths along the NSR without 'white spots' has been announced for 2015–2016.

[5] *Winterization rules ensure that a vessel is prepared for operating in freezing temperature. The aim is to control the adverse effects of icing, freezing, wind chill and material properties in cold temperatures (see homepage of DNV GL at http://www.dnvgl.com/.)*

Beyond the domestic level, regional and global drivers of Russian and Norwegian oil and gas exploration and exploitation are notably the recent **Arctic governance innovations** negotiated under the auspices of the Arctic Council:

- the 2011 Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic (in force since 2011), and

- the 2013 Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic, which is not in force yet.

Expectations are also that progress on the completion of a mandatory International Code of safety for ships operating in polar waters (**Polar Code**) at the International Maritime Organization (IMO) would contribute to legal certainty around Arctic economic activities. Currently the Polar Code is expected to be operational in 2015 with implementation in 2016. On the bilateral level, the 2010 Treaty between the Kingdom of Norway and the Russian Federation concerning Maritime Delimitation and Cooperation in the Barents Sea and the Arctic Ocean solved the disputed boundary between Norway and Russia in the Barents Sea and paved the way for exploration in the formerly disputed area.

2.3 Challenges and concerns

Arctic oil and gas developments in Norway and Russia are however also faced with a number of local and global challenges, uncertainties and substantial concerns. Locally, **harsh environmental conditions** still remain. In the Barents and Kara Seas difficult ice conditions still exist during parts of the year and are subject to large fluctuations from year to year. Less ice also means new problems, such as dangerous drift ice, which together with icing is the most serious risk for operations in the high north frontier area. The recent incident of the Russian ship Academic Shokalskiy trapped in heavy pack ice in Antarctic waters in late 2013 is an illustrative example. No rescue attempts by Chinese and Australian icebreakers to break the ship free were successful. After 14 days the ship eventually broke free due to changing wind conditions, which released pressure from the heavy pack ice. Icing is indeed reinforced by higher temperatures because this means more moisture, which then freezes on installations. Ice ridges that can pile up to 6 to 8 meters high and more extreme weather conditions, such as polar lows, pose serious risks for Arctic operations. On a broader, global scale, it remains unclear how climate change will unfold and further influence Arctic economic activities.

Especially along the Russian Arctic coast very different standards exist as to the state of **infrastructure and technology**, such as for communications, emergency preparedness and search and rescue. While, as mentioned above, investments are ongoing with 10 new SAR centers along the Russian coast, they cannot be viewed sufficient given the vast dimensions of the Russian coast together with little experience in economic development in ice-covered areas. Technology for operations in the high north frontier areas is currently non-existent and there is considerably uncertainty as to the further development of subsea technologies, cold climate technologies for icing, and investments for SAR infrastructure.

These uncertainties are also linked to the **extensive timeframes** of Arctic hydrocarbon projects. From discovery to operation, it usually takes 10 to 12 years including geological surveys and exploration drilling. From today's perspective with new fields coming online, this means there is only a relatively limited time window left to prepare for an oil spill that could occur in Arctic waters. Major companies such as Rosneft, Gazprom and Lukoil plan to cooperate on oil spill prevention and response, and also plan to benefit from Norwegian experience through involvement in Norwegian licenses and cooperation initiatives such as INTSOK[6]. But it is necessary to take into account different conditions for different Arctic fields. For example, Goliat needs specific infrastructure and oil spill preparation efforts, which might not be useful for development in another field. As outlined further below, there are considerable doubts that safe (or safe enough) standards in the near future can be achieved at all.

[6] INTSOK – Norwegian Oil and Gas Partners – is a network-based organization where the partners exchange experience and knowledge of market developments internationally. The organization encourages active dialogue between oil companies, technology suppliers, service companies and governments. The organization is an effective vehicle for promoting the Norwegian offshore industry's capabilities to key clients in overseas markets and providing market information to its partners (www.intsok.com).

There is **uncertainty as to how much oil and gas actually exists** on Arctic continental shelves, where exactly it is located, and if it can be commercially developed. According to the oft-cited U.S. Geological Survey (USGS) study[7], the Arctic holds about 22% of the world's undiscovered conventional oil and natural gas resources, which amounts to about 30% of the world's undiscovered natural gas, 13% of the world's undiscovered oil and 20% of the world's undiscovered natural gas liquids (NGL). While the USGS numbers are considered the most accurate of such kind of estimates, nonetheless, they are subject to considerable uncertainty, because they are based on geological estimates and not actual finds, as the authors of the study emphasize themselves:

It is important to note that these estimates do not include technological or economic risks, so a substantial fraction of the estimated undiscovered resources might never be produced. Development will depend on market conditions, technological innovation, and the sizes of undiscovered accumulations. Moreover, these first estimates are, in many cases, based on very scant geological information, and our understanding of Arctic resources will certainly change as more data become available (Gautier et al, 2009, 1178).

In response to these uncertainties, workshop participants noted that the overall industry expectation is rather to keep the existing market alive (rather than creating a new one) by fostering new discoveries to make up for declining production in established fields. Large new fields and discoveries would not be expected and the ongoing investments were rather to be interpreted as prolonging the Arctic petroleum production era.

Norwegian and Russian Arctic economic activities also face similar factors of global influence, which will determine the pace and eventual realization of particular projects. First of all, **global oil and gas prices and export markets** – which change with fluctuating world and regional demand – play a large role in determining the viability of Arctic oil and gas projects. On top of large potential fluctuations, it is also very difficult to calculate (and predict) the respective break-even price for different regions and projects. Similarly, the price of the necessary technology and infrastructure is hard to calculate. According to workshop participants, the break-even oil price for Arctic oil production is usually set at $100/barrel, but many uncertainties for each individual project abound, such as available infrastructure to transport commodities to markets.

As a current example, Norwegian plans to bring Arctic gas to markets must take into account different demand structures. High European demand for gas would strengthen the viability of a pipeline solution for increasing export to Europe, while weak European demand and high Asian demand would foster an LNG option transporting gas by tanker to Asia. Demand structures can be influenced by political instruments, such as the European emission trading system and other measures, which would increase the price of carbon. Other influencing factors are availability or shortage of commodities elsewhere, such as the current displacement of gas in Europe by US coal (triggered by the US shale gas revolution), which reduces gas demand in Europe.

There are serious concerns that Arctic resource development will not have a positive local **socio-economic effect** in terms of revenues, employment and export opportunities, and supply. Oil development is not a labor-intensive industry and thus offers only limited opportunities for job creation. Considering the often highly dispersed population in the north, lacking specific skill sets, the temporary nature of oil and gas exploitation projects, and highly mobile workforces elsewhere, lasting benefits for the local population are rather doubtful. Especially the temporary nature of hydrocarbon projects puts a question mark as to a contribution to socio-economic sustain-

[7] *Bird, Kenneth J., Ronald R. Charpentier, Donald L. Gautier, David W. Houseknecht, Timothy R. Klett, Janet K. Pitman, Thomas E. Moore, Christopher J. Schen, Marilyn E. Tennyson, and Craig J. Wandrey. "Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle."* U.S. Department of the Interior, U.S. Geological Survey *(2008). http://pubs.usgs.gov/fs/2008/3049/fs2008-3049.pdf; also Gautier, Donald L., Kenneth J. Bird, Ronald R. Charpentier, Arthur Grantz, David W. Houseknecht, Timothy R. Klett, Thomas E. Moore, et al. "Assessment of Undiscovered Oil and Gas in the Arctic."* Science *324 (2009): 1175 – 9.*

able development, including set up and maintenance of infrastructure, financial returns, education opportunities and job opportunities. Many of the investments and initiatives announced in Arctic countries' national strategies for their Arctic region are thus expected to rather benefit industries and inhabitants in the well-developed and industrialized centers. Another concern is that a strong focus on the development of hydrocarbon resources in the Arctic takes resources and political clout away from voices advocating alternative, more sustainable economic pathways, such as the possible renewable energy potential in many places in the north.

Crucially, an elaborate insurance and liability system for Arctic shipping and Arctic oil and gas development is not existent. Insurance is essential to any economic decisions in the high risk and high cost Arctic environment and still a largely uncertain factor. Different liability rules apply from country to country. In Russia and Norway, in principle unlimited liability for investors applies, however a number of loopholes exist, such as if a case of force majeure can be proven.[8] Canada has only recently increased the liability cap for environmental and other damage from a blowout or oil spill from only $CAN 40 million in the Arctic to at least CAN$ 1 billion. However, in perspective this appears pretty low; the Deepwater Horizon blowout in the Gulf of Mexico cost more than CAN$ 40 billion!

Unclear legal regulations are also a challenge for oil and gas development. One example is Art. 234 of the United Nations Convention on the Law of the Sea (UNCLOS), which gives countries the possibility to enforce stricter rules in their exclusive economic zone "for the prevention, reduction and control of marine pollution from vessels in ice-covered areas". What exactly constitutes "ice-covered" areas is however not specified in the convention, which is a serious drawback given the changing ice conditions, especially during the summer months.

The outlined challenges linked to Arctic oil and gas developments are already indicative of multiple **ecological concerns**. Even under the most stringent control systems and with state-of-the-art technology risks to the Arctic's fragile ecosystem cannot be entirely eliminated such as pollution and physical disturbances through noise, tanker spills, pipeline leaks and other accidents. Hydrocarbons persist longer in the Arctic environment due to low temperatures, which means that the environment would recover only very slowly; this is also because a clean-up in such remote regions like the Arctic is very difficult. Techniques that have successfully been deployed for example during the Deepwater Horizon oil spill, such as skimming, burning and the application of chemical dispersants, could turn out to be ineffective or less effective in Arctic waters. Suction devices to absorb the oil could be clogged by ice, booms could freeze, and depending on the time of year daylight can be scarce, hampering clean-up efforts. The lack of infrastructure and the general remoteness of the Arctic region also contribute heavily to the difficulties of an oil spill response. Many experts are skeptical that the oil industry is prepared to deal with a large spill in difficult Arctic circumstances. The National Commission on the BP Deepwater Horizon and Offshore Drilling concluded in 2011 that appropriate clean-up capabilities are currently non-existent.

Shell's repeated efforts over the last few years to drill in Arctic waters off Alaska's coasts have demonstrated the multiple dangers linked to Arctic offshore exploration and exploitation. As just one example, Shell's drilling rig *Kulluk* ran aground off Kodiak in the Gulf of Alaska in late 2012, breaking free from a tow ship in stormy weather. Although no spill from the rig was reported, the incident shows the highly dangerous nature of such endeavors threatening environmental damage to the Arctic's ecosystems. This year's 25th anniversary of the Exxon Valdez accident in the Gulf of Alaska is a strong reminder of the danger and possible long-lasting repercussions of oil spills in Arctic conditions.[9]

[8] *"Arctic Opening: Opportunity and Risk in the High North", Chatham House-Lloyd's Risk Insight Report, Charles Emmerson and Glada Lahn, April 2012, accessible at http://www.chathamhouse.org/sites/default/files/public/Research/Energy,%20Environment%20and%20Development/0412arctic.pdf.*

[9] *"Oil From the Exxon Valdez Spill Lingers on Alaska Beaches", Jane J. Lee, National Geographic, 1 March 2014, accessible at http://news.nationalgeographic.com/news/2014/03/140301-exxon-valdez-oil-spill-alaska-beaches-ocean-science/. See also "Exxon Valdez Anniversary: 20 Years Later, Oil Remains", Christine Dell'Amore, National Geographic News, 2010, accessible at http://news.nationalgeographic.com/news/2009/03/090323-exxon-anniversary.html.*

Table 1: Overview of Drivers and Challenges of Arctic Resource Development, focus on Norway and Russia

	Drivers	Challenges and Concerns
Environment, ecology	▪ Longer ice-free summer seasons	▪ Difficult ice conditions, large fluctuations ▪ Icing ▪ Extreme weather conditions ▪ Unclear how climate change will unfold and further influence Arctic economic activities ▪ Risks to Arctic's fragile ecosystems cannot be ruled out ▪ Very difficult clean-up conditions in case of spill
Politics, governance, socio-economics	▪ Regional development policies ▪ Administrative reform (e.g. easier access to NSR) ▪ SAR and Oil Spill Agreements among Arctic states ▪ Polar Code progress ▪ Boundary delimitation	▪ Limited (if any!) positive local socio-economic effects ▪ Crowding out of alternative economic pathways ▪ Insufficient insurance and liability system ▪ Unclear global regulations, e.g. Art. 234 UNCLOS
Economics	▪ Ripple effects through existing projects, e.g. through already existing infra-structure ▪ Tax reform, economic incentives ▪ LNG liberalization	▪ Uncertainty about quantity, location and economic viability of Arctic oil and gas ▪ Maintain existing markets, no new markets expected ▪ Volatile global markets and demand structures ▪ Hard to calculate break-even point
Technology, infrastructure	▪ New icebreakers constructed/planned in Russia ▪ 10 SAR centers along Russian coast ▪ Updating of charts	▪ Different standards, significant gaps ▪ Little experience ▪ Technology for high north operations non-existent ▪ Uncertainty about investments

3. Governance for Sustainable Arctic Regions

Given the very different climatic, ecological, political, and economic conditions within the overall Arctic region, Arctic governance has to be understood as governance of different Arctic regions or settings. This is especially crucial in the case of sustainability governance, because of the diversity of Arctic landscapes, socio-economic conditions, peoples, and understandings of the sustainability concept.

Sustainable development can be conceptualized around different dimensions, such as economic sustainability (mineral and living resources, transportation, and tourism), maintenance of essential ecological services (conservation of resources and ecological systems) and social and political resilience. Sustainability governance thus has to be multi-layered to address a variety of issues on different levels. Those range from the local to the global scale with horizontal and vertical interactions. For the implementation of sustainable development, the concept has to be formulated as an *operational goal* with the aim to fulfill several tasks, including commitment, coordination, cooperation, collaboration, compliance, and control.

- A coherent **commitment** across national and local scales to sustainable development is necessary due to the primarily national and local concerns affected by sustainability governance. So far, Arctic sustainability governance does not have a coherent commitment, which is reflected in the nature of sustainable development efforts within the Arctic Council, which are only project-driven, and a high diversity among national sustainable developments commitments.

- In terms of **coordination**, i.e. agreement on common rules and work distribution, good results have already been achieved in scientific research and in third-party fora, for example with regard to issues of persistent organic pollutants and mercury pollution. Coordinated efforts for Arctic maritime traffic management are currently ongoing.

- **Cooperation**, i.e. realizing common goals under conditions of prevailing individual interests and realizing individual interests under conditions of strategic interaction, is particularly vital for Arctic sustainability governance in areas of possible conflict, such as Arctic fishing and other trans-boundary resources, intra-regional pollution, and emergency prevention, preparedness and response. Cooperation is also necessary to find ways to constructively engage influential non-Arctic actors in Arctic governance.

- **Collaboration**, i.e. who to involve and engage in Arctic governance, is particularly difficult as individual interests have to be compromised for a larger common goal. In times of increasing attention to and interest in Arctic affairs integrating a variety of actors, ranging from indigenous peoples, regulators, civil society, business and non-Arctic actors, is a daunting challenge.

  It is not only important to ensure actors' **compliance** with the rules, but also to have **controls** or assessment processes to assess the impact and effectiveness of those rules. So far, effectiveness evaluations were, if at all, only occasionally realized through national evaluations, i.e. with a focus on horizontal or state compliance and effectiveness. Potentially the new permanent secretariat of the Arctic Council could be more Arctic- and vertically-focused in this regard, especially at local levels. Assessing institutional effectiveness is, however, highly difficult due to cultural differences and the time lag between implementation efforts and actual effects on the ground.

Against this challenging governance background, various opportunities and challenges to enhance cooperation between different actors in the Arctic need to be considered. The ongoing changes in the Arctic environment, adaptation pressures, the increasing diversity of actors and implementation challenges trigger the question:

Should Arctic governance efforts focus on consolidating existing institutional arrangements or on building a new Arctic international regime?

The existing rather extensive institutional framework for the Arctic has led many to favor the former option, because of political feasibility, the general stability of the existing governance framework, and Russia's strong involvement in this framework. The Arctic Council is the prime example of this stability: consolidating Arctic environmental regimes, having sustainable development as its 'red thread', employing enhanced cooperation among Arctic (and non-Arctic) actors as the major tool, and combining a focus on research assessment with legally binding sectorial agreements.

5. Engaging Stake-and Rights-Holders

As noted earlier, at the core of SMART is the understanding that developments in Arctic regions are interlinked with and determined by economic, technological, legal, and political systems within and beyond the Arctic. Because of this interregional interconnectedness, SMART needs to consider a wide range of Arctic stakeholders, including those who do not have a strong voice. The term "Arctic stakeholder" is to be understood as "holder of a stake(s) in the Arctic". In other words, when talking about "Arctic stakeholders", "Arctic" refers to their stake in the Arctic and not their physical location in the region. Indigenous peoples usually have a special position that is based on the recognition of specific rights concerning culture, territory and participation in decision-making processes. For this reason, it is often more appropriate to refer to indigenous peoples as *rights*-holders rather than *stake*holders.

The inclusion of stake- and rights-holders throughout the research process is an integral part of SMART's transdisciplinary approach to research. Transdisciplinarity is hereby understood as a process of actively inviting the voluntary participation of societal actors in all phases of the research process, including the

- framing of research questions and topics,
- designing the research process,
- developing problem-oriented knowledge that draws from local, traditional, and formal scientific knowledge needed in solving the identified challenges and problems,
- process of collecting data and interpreting it with inclusion of the local context where appropriate and necessary,
- discussing and reviewing of research results with and by stake- and rights-holders, as part of the overall peer-review and discussion processes,
- communicating the outcomes of the research in various forms, including as new knowledge for use by stake- and rights-holders, the bases for decision making tools, and as formal scientific literature, and
- identifying new or further iterative refinement of research questions and topics.

The overall aim is hereby to achieve a transformative effect in society in the sense of incorporating the co-developed knowledge in agendas and discourses of relevant actors and institutions. Ideally, through developing a strong sense of ownership and trust, this leads to a change of attitudes of relevant actors and initiation of concrete action to solve identified problems and challenges.

Stakeholder engagement aims to ensure that research is conducted for and driven by people who affect and are affected by the transformations in the Arctic. Given the complexity that such an endeavor entails, SMART aims to provide an open, mutual learning environment in which researchers from various disciplines and stakeholders with diverse backgrounds can find a common language and mode of engagement. This kind of knowledge exchange will permit researchers to address questions and results that are not only interesting from an academic perspective, but which are also useful to stake- and rights-holders. Not least, SMART requires investing in discussions on what 'sustainability' and 'sustainable development' means to different stake- and rights-holders.

Engaging stake- and rights-holders in a research process raises a number of important issues. First, one needs to consider carefully *which* individuals, institutions or communities need to be engaged. The range of potentially relevant stakeholders is broad and might include both Arctic and non-Arctic actors from politics, intergovernmental organizations, civil society, the military, the private sector and academia (figure 3).

Figure 3: Diverse groups of rights- and stake-holders with examples

Politics ▪ National, regional, local and indigenous governments	**Intergovernmental organizations** ▪ Arctic Council
Civil society ▪ Non-indigenous Arctic population ▪ Indigenous peoples ▪ Regional and international NGOs ▪ Workers, women, youth and other underrepresented groups and communities	**Military**
Private sector ▪ Operational levels (local, national, transnational) ▪ Insurance and reinsurance ▪ International financial investors ▪ Corporate Social Responsibility activities ▪ Private sector cooperation	**Academia** ▪ Social and natural science ▪ Humanities, incl. Arts ▪ Early career scientists ▪ Outreach and communication ▪ Particular role of researchers as stakeholders

Second, it has to be established *why* certain rights- and stakeholders need to be engaged. Besides legal obligations and ethical commitments, direct benefits of stakeholder engagement for the SMART project can be expected, both in terms of knowledge production as well as decision-making outcomes. Stakeholders are often better equipped to provide practical and technical information that is adapted to the particularities of a certain region or sector. In addition to contributing to a better knowledge base from local or traditional practical and technical expertise, stakeholder engagement also contributes to the overall legitimacy of the project. Broad scope of inclusion reveals and enables discourses about potential conflicts between economic rationalities and cultural, political, security and social interests and how to address them. Not least, stakeholders can have an important role in terms of monitoring, reporting and offering policy options for consideration.

Third, while stakeholder inclusion provides great opportunities, there are a substantial number of challenges as to *how* exactly engage stakeholders in the research process. It needs to be decided "how far to cast the net", i.e. who to actually engage in the process. Once this is established, there might be a lack of willingness and/or capacity on behalf of stakeholders to engage, possibly due to different interests and priorities, a lack of human, financial, or time resources, a lack of experience and access to information technologies, and constraints due to the political context. A project like SMART must therefore clearly specify what rights-and stakeholders are asked to provide when invited to engage, why such an engagement is in their interest, why certain actors are invited to engage and others are not, and how to deal with gaps in and questions of completeness of representation. In sum, concrete procedures, a timeline for the engagement process, and the formal participation opportunities need to be clearly outlined.

Conclusion and Outlook

The topics addressed in this working paper provide the basis for the further development of the SMART project. Throughout the workshop a much larger number of key trends and critical junctures for the Arctic were identified, which cannot be addressed in detail in this paper due to limited space, but which will also be relevant for the further refinement of the SMART project. The following headings provide an overview of key issues raised during the workshop.

Climate change and its impacts ▪ Uncertainty about degree and impacts of climate change ▪ Ice and permafrost trends and their impacts ▪ increase in global resource demand as a driver of climate change	**Impacts on Arctic population** ▪ Social transformations in the Arctic ▪ In- and outward migration ▪ Urbanization trend ▪ Health issues, especially mental health	**Science and its role** ▪ Increasing Arctic research activities ▪ Successful translation of science research into scenarios ▪ Role of science/scientists as stakeholders	**Impacts of a changing Arctic and role of science**
Economic activities ▪ General degree and time scale of economic activity increasing ▪ Development of transportation systems ▪ Ownership and distributional effects of economic activities	**Technology and information** ▪ Uncertain progress of science and technology ▪ Development of new technologies for resource extraction and infrastructure	**Exogenous driving factors and their interdependence** ▪ Change in (global) consumption patterns, energy demand and supply ▪ Arctic tourism, discrepancy between reality and romanticized expectations ▪ Economic risk calculations ▪ Role of exogenous and endogenous drivers and their interaction	**Economics & technology**
Political risks and tensions ▪ Potential political tensions and conflicts ▪ Political motivations of different actors ▪ Danger of relaxation of safety standards due to push for economic development ▪ Effects on coastal regions due to higher economic activities ▪ Expansion of shipping and fishing and its risks	**Decision making and ownership of political processes (I)** ▪ State compliance with ocean/environmental protection ▪ increase in public awareness ▪ Inclusion of rights- and stakeholders ▪ Role and interest of non-Arctic countries (EU, China)	**Decision making and ownership of political processes (II)** ▪ Effetiveness of Arctic Council in tackling 'small' issus ▪ Development of regulations (national and international, hard vs. soft law) ▪ Progress of setting territorial disputes ▪ Political power relations amongst Arctic coatal states	**Politics & decision-making**
	Potentials and uncertainties ▪ Challenge of decision-making under ambiguity ▪ Inclusiveness of decision-making processes ▪ Development of political situation, particularly within states ▪ Learning from history ▪ What will be next 'big issue' and driver after climate change?		

Figure 4: Key trends and critical junctures for sustainable Arctic transformations

The next steps will be the formulation of concrete research topics and questions together with stake- and rights-holders. The second "Arctic Horizon 2030" workshop, which will take place in Moscow on 9 April 2014, takes a close look at challenges in the Russian Arctic, focusing on and debating "Changes in the Russian Arctic and Global-Local Feedback Processes" with experts and stake- and rights-holders. This workshop is co-organized by the Institute for Advanced Sustainability Studies (**IASS**) and the Global Climate Forum (**GCF**) in cooperation with researchers from the Institute of World Economy and International Relations of the Russian Academy of Sciences (**IMEMO RAN**) and the Nansen International Environmental and Remote Sensing Centre (**NIERSC**) and within the European-Russian cooperation action (**EuRuCAS**) framework.

With the help of the outcome from the first and second workshop, SMART researchers will especially focus on the questions and terms related to the engagement of stakeholders in the design and implementation of concrete research topics and questions. An ongoing application for a Future Earth Fast Track Initiative of IASS together with partners[10] on "Knowledge and Learning in Arctic Coastal Governance" has at its core the surveying of the landscape of stakeholders, identifying gaps in stakeholder representations and reaching out to necessary additional stakeholders.

Abbreviations

BC – Black carbon

IMO – International Maritime Organization

LNG – Liquefied natural gas

NGL – Natural gas liquids

NSR – Northern Sea Route

SAR – Search and Rescue

SLCPs – Short-lived climate-forcing pollutants

UNCLOS – United Nations Convention on the Law of the Sea

USGS – U.S. Geological Survey

[10] The applying partners are IASS and three Future Earth projects (ESG – Earth Systems Governance, LOICZ – Land-Ocean Interactions in the Coastal Zone, and KLSC – Knowledge, Learning, and Societal Change: Finding Paths To a Sustainable Future).

IASS Working Paper
April 2014

Institute for Advanced Sustainability Studies Potsdam (IASS) e. V.

Author contact:
Kathrin Keil: kathrin.keil@iass-potsdam.de
Thilo Wiertz: thilo.wiertz@iass-potsdam.de
Ilan Chabay: ilan.chabay@iass-potsdam.de

Address:
Berliner Strasse 130
14467 Potsdam
Germany
Phone 0049 331-28822-340
www.iass-potsdam.de

E-Mail:
media@iass-potsdam.de

DOI: 10.2312/iass.2014.007

SPONSORED BY THE
Federal Ministry of Education and Research

FONA
Research for Sustainable Development
BMBF

LAND BRANDENBURG
Ministerium für Wissenschaft, Forschung und Kultur