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ACCESS NEWSLETTER

Arctic Climate Change
Economy and Society

Issue No. 6
December 2013

ACCESS Highlights

For the first time ever, an ice class 1A bulk carrier "Nordic Orion" 225 m long from the Nordic Bulk Carriers A/S Danish company, is using the North West Passage in September 2013 as a transit trade lane when transporting 75 000 tons of coal from Vancouver, Canada to the port of Pori in Finland.

This newsletter is produced three times each year by a consortium of 27 partner organizations from 10 European countries in the 4-year Arctic Climate Change, Economy and Society (ACCESS) project. ACCESS is supported within the Ocean of Tomorrow call of the Seventh Framework Programme. Objectives of the ACCESS Newsletter are to facilitate international, interdisciplinary and inclusive information sharing of our research highlights about natural and human impact associated with sustainable development in the Arctic Ocean in the context of climate change.

SEVENTH FRAMEWORK PROGRAMME

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Editorial

For the ACCESS newsletter N°6, we selected seven presentations dealing with all the ACCESS WPs in order to highlight some of the major results obtained during the first half of the ACCESS project. Regarding the WP1 (climate change in the Arctic), we are presenting two results among many others to characterize climate change in the Arctic from an oceanographic and meteorological point of view. The influence of the Atlantic water penetrating into the Arctic Ocean via the Barents Sea and the Fram Strait is based on dedicated analysis undertaken at the AARI in Saint Petersburg (Russia). The impact on Arctic sea-ice of Atlantic water carrying on heat and salt in the Arctic Ocean in the so -called Atlantic sector of the Arctic Ocean is demonstrated and sustained by several publications. From a meteorological point of view, the number of Freezing Degrees Days and Melting Degrees Days is a clear result illustrating the warming of the Arctic Atmosphere over the past 30 years explaining part of the sea ice thinning and retreating observed during the same period.

Following these two presentations regarding ACCESS WP1 (climate change), we selected three presentations for Maritime transport (ACCESS WP2). One presentation concerns the Northern Sea Route navigation conditions over a recent past and its evolution in the context of the actual climate change. This study was accomplished at AARI (Saint Petersburg Russia). A second presentation concerns the spectacular crossing of the North West Passage by the Nordic Orion, a cargo ship ran by the ACCESS partner Nordic Bulk Carrier from Denmark. A third presentation concerns Arctic Tourism and a presentation by the Economic and Social Research Institute ESRI about the evolution of Arctic tourism in the context of climate change and future scenarios.

Regarding ACCESS WP3 (Arctic Fisheries) we selected a presentation by the Beijer Institute in Sweden and NOFIMA in Norway reviewing current aquaculture activity in the Arctic region as well as future implications from climate change. The dominance of salmon farming in Norway is striking. The growing evolution of aquaculture in the context of climate change is clearly stated although factors of uncertainties are large in particular for what concern diseases in farmed fish population.

Regarding ACCESS WP4 (mineral resources extraction and exploitation in the Arctic Ocean) we selected a contribution from IMPaC and HSVA (Germany) that carried out an assessment of existing and required rescue systems suitable to work with fixed and moving (floating) platforms in the Arctic. In the context of this study, there is a dedicated application to the NSR complementing the NSR study presented by AARI and described previously.

We would like to emphasize the fact that all the contributions concerning maritime transportation, Arctic Fisheries, and exploitation of mineral resources, include a strong socio economic component.

This ACCESS Newsletter N°6 is a short sample of various results and activities spread all over the wide spectrum of ACCESS tasks obtained during the first two years of the ACCESS project (i.e. mid way to the whole 4 years project).

ACCESS editorial board

Work Package Progress

Work Package 1 – Climate Change and the Arctic Environment

Documenting and analysis of changing conditions in the upper water layer in the Atlantic sector of the Arctic Ocean in connection with decreasing sea-ice cover

Arctic and Antarctic Research Institute (AARI)

In order to interpret the possible ocean role in Arctic sea-ice decrease and to assess its potential consequences for the oceanographic regime, the following main lines of investigation were undertaken as part of the ACCESS WP1 task:

- Direct impact of sensible heat, stored in on the ice cover in the Atlantic Water (AW) inflow region (between Svalbard and Severnaya Zemlya Archipelago), where warm intermediate water closely neighbours the ice.
- Increased vertical heat flux from continental slope and outer shelf, where AW upwells the shelf, and vertical mixing is enhanced due to strong shear, tidal currents and shelf intrusions.
- Vertical heat flux via double diffusion convection from AW layer in the central Arctic Basin.
- Melt water effect on lateral ice erosion.

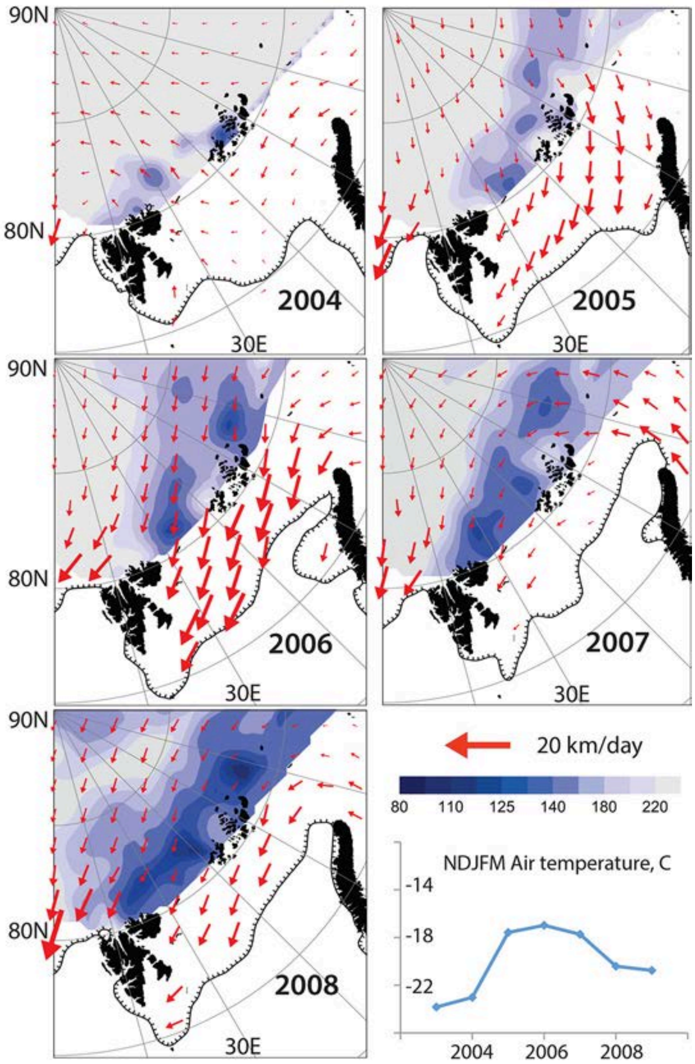

Figure 1 - Ice Thickness (colour zones) and Ice Drift (red arrows)
(Sources: Based on ICEsat data; Alekseev et al., submitted)

Major findings so far of the AARI team stemming from two years of the ACCESS project are summarised here.

- In the combined examination of oceanographic measurements and satellite observations of ice concentration and thickness, the team found evidence that AW has a direct impact on the thinning of Arctic sea-ice downstream of the Svalbard Archipelago. Surface mixed layer east of Svalbard originates directly from the upper part of inflowing AW, which cools through heat loss to the atmosphere and freshens due to mixing with melted ice water. The location of warm water pools in close proximity to the ice-covered surface in late fall and winter provides favourable conditions for AW heat contribution to ice melt. The affected area extends as far as the Severnaya Zemlya Archipelago. The AW imprints appear as local minima in sea-ice thickness; ice thickness is significantly less than that expected of first-year ice (Figure 1). Simple lower-end estimates indicate that the recent AW warming episode could have contributed up to 150-200 km^3 of sea-ice melt per year, which would constitute about 20% of the total 900 km^3 / year negative trend in sea-ice volume since 2004.
- A considerable portion of heat and salt lost from the AW layer on its transit along the Eurasian continental margin is gained by the overlaying halocline water at the continental slope. Consistent differences exist in the cross-slope characteristics of the halocline water layer over the Laptev Sea continental slope: warmer and more salty on-slope water and cooler and fresher off-slope water. The upper AW layer exhibits the opposite cross-slope distribution of temperature and salinity (Figure 2). This suggests that the heat and salt, lost from the AW are partly acquired by the overlying halocline layer. Analysis of historical and modern data, and regional modelling exercises imply that modification of the halocline waters mostly occurs near the continental slope as a result of enhanced vertical mixing over the sloping topography (Dmitrenko, et al., 2011; Dmitrenko, et al., 2012).

• In the central Arctic Basin, vertical heat flux from the AW layer via double diffusion convection is the only known candidate to transport the ocean heat towards the surface and sea-ice. Several efforts to quantify this process for the deep Arctic interior were recently completed (*e.g.* Polyakov, et al., 2012). In framework of the ACCESS project, the analysis of 25 000 ITPs (Ice-Tethered Profilers) was carried out with the goal to estimate double-diffusive vertical heat fluxes from AW. This work is still in progress.

• Decreasing summer ice concentration and increasing duration of vast open water areas inside Arctic ice massifs implies enhanced accumulation of heat in the upper layer. According to Perovich, et al. (2008), intensified ice melt in summer 2007 in the Canadian Arctic was markedly caused by bottom ice melting. Progressive expansion of open water zones and ice thinning can also provide favourable prerequisites for enhanced ice side melting due to an increase of total perimeter of ice floes (Perovich, et al., 2003). Study of this mechanism on the basis of historical North Pole manned drifting stations data is part of the work underway by AARI in the context of ACCESS WP1 tasks.

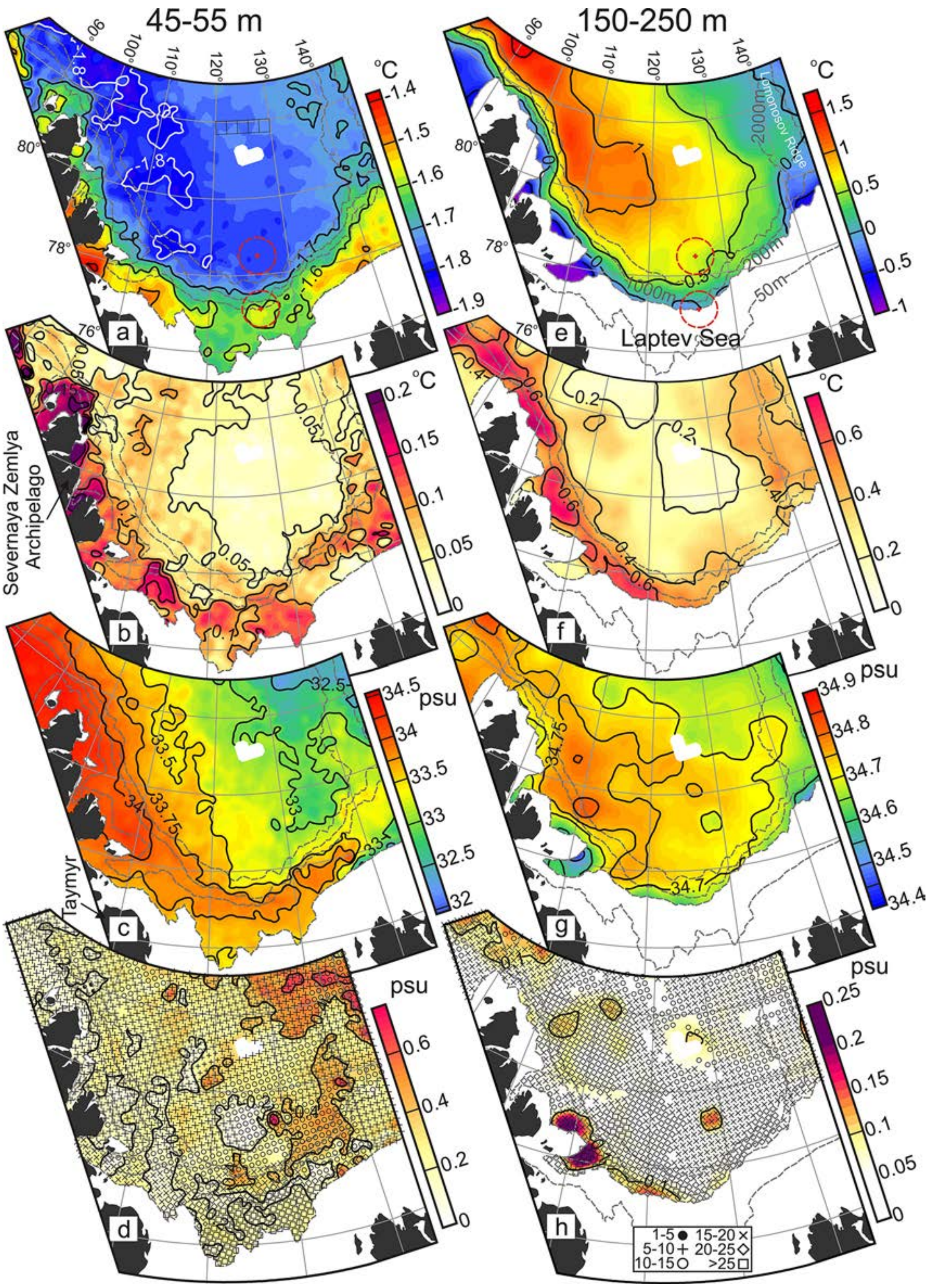

Figure 2 - Temperature and Salinity Distribution in the Laptev Sea at 50 metres, 1940 – 2009 (Source: Dmitrenko, et al., 2012)

Freezing Degrees Day and Melting Degrees Day Anomalies in the Arctic Ocean over Three Decades

Université Pierre et Marie Curie (UPMC-LOCEAN, Paris, France)

Freezing degrees days (FDD) and melting degrees days (MDD) for the past 30 years all over the Arctic Ocean have been calculated using ERA Interim Reanalysis surface temperature at 2 metre height in the atmosphere. This has been accomplished in the context of ACCESS Work Package 1. Some preliminary results are highlighted here.

FDD and MDD are simply a daily integration of 2 metre air surface temperature expressed in number of degrees of freezing or melting respectively below or above the sea water freezing temperature (considered to be -1.7°C). The space resolution for the FDD and MDD calculation is identical to the ERA Interim resolution (*i.e.*,0°75 in lat. and long.) and corresponds to about 1000 km² at 80°N. In this calculation, the temperature resolution is 100 FDD and 10 MDD for a corresponding scale of 0 to 10 000 FDD and 0 to 1 000 MDD respectively. In both calculations only the sensible heat flux is considered as far as freezing of sea water and / or melting of sea ice is concerned.

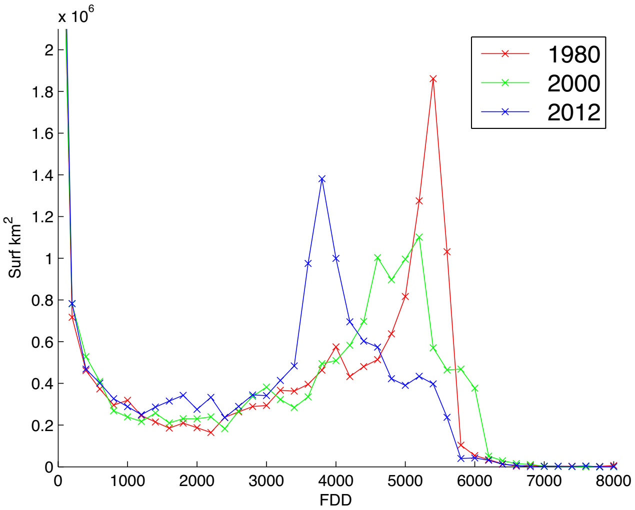

Figure 3 - Freezing Degrees Days in the Arctic Ocean, 1980, 2000 and 2012

It is clear (figure 3) that the number of FDD decreased significantly between 1980 and 2012 by more than 2 000 FDD which is equivalent to the sensible heat flux required to form more than a metre of sea-ice thickness. Direct observations of Arctic sea-ice revealed a decrease of about 1 metre of sea-ice thickness over the past 20 to 30 years. This is mainly due to successive winters being milder in recent years and therefore less and less capable of forming thicker ice.

The number of MDD increased significantly between 1980 and 2012, and doubled between 2000 and 2012 (Figure 4). This was mainly due to an increase in the duration of the melting season rather than due to an increase in temperatures above freezing. The opposite is true for freezing due mostly to a decrease in the strength of the cold (lower cold temperatures) during the winter-spring season rather than due to a decrease of the freezing period length. The surface impacted by melting due to MDD is rather stable and centred around the North Pole. This is in contrast with the surface impacted by freezing due to FDD which is centred above the Canadian archipelago and in the north of Canada and Greenland where the coldest average temperatures are dominant. While both FDD and MDD anomalies are impacting on sea-ice volume (or mass), FDD anomalies are impacting more on sea-ice thickness and MDD anomalies are impacting more on sea-ice extent.

The FDD and MDD anomalies appear to well explain Arctic sea-ice anomalies both in terms of sea-ice thickness and sea-ice extent. But what is the cause or causes of these anomalies ? There are several culprits. One might be an increase in the incoming solar radiation reaching sea-ice and the ocean surface due to a change in the transparency of the atmosphere (optical depth, albedo related to clouds and aerosols). Another factor might be an increase of long-wave downward radiation due to an increase in greenhouse gases. Another driver might be an increase in warm air advection carrying more heat towards the pole and more cold southwards. There is a strong need to differentiate local and regional temperature and sea-ice anomalies to attribute effects to specific causes. Another important aspect not treated in this calculation concerns the timing of the seasonal break-up and freeze-up events that are inevitably related to temperature anomalies.

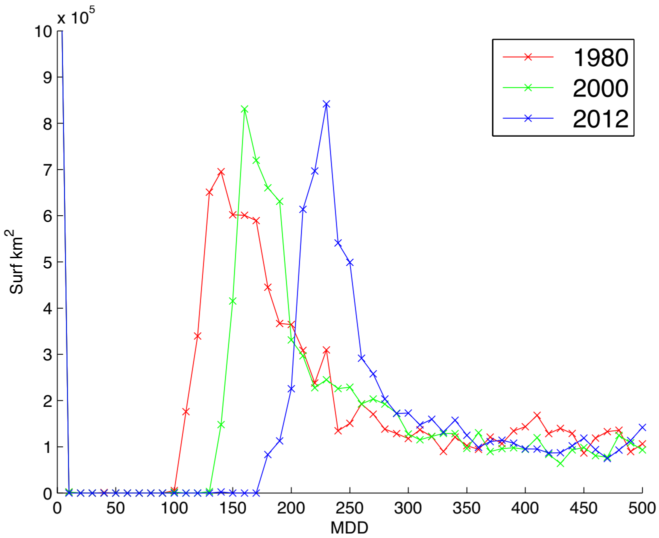

Figure 4 -Melting Degrees Days in the Arctic Ocean, 1980, 2000 and 2012

Work Package 2 – Marine Transportation and Tourism

Changing Arctic Sea-Ice and Navigation along the Northern Sea Route

Arctic and Antarctic Research Institute (AARI)

Increased duration of ice-free waters along the Eurasian coastline preconditions opportunities for more navigation from Europe to Asia. Hence, another AARI research focus is an assessment of navigation efficiency on the Northern Sea Route (along the Russian Arctic coast) with particular emphasis on potentially difficult shipping zones. The effect of climate change on Arctic shipping is investigated as part of ACCESS WP 2. Specific sub-tasks include:

- Analyse historical sea-ice data and their influence on navigation along the Northern Sea Route (NSR) in the 20th and early 21st centuries.
- Estimate navigation efficiency along the NSR under past climate situations in comparison with various climate change scenarios.
- Provide recommendations for navigation based on present sea-ice conditions along the NSR and other navigational routes in the Arctic.

Ice conditions in the Arctic in the 20th century were analysed including both natural variability and climate change effects. Historical data sets were used to study regimes and variability of the key sea-ice parameters along the traditional navigation routes and along the sea routes that potentially may become suitable for navigation under conditions of reduced sea-ice cover.

The Northern Sea Route is a wide area including the Siberian Arctic seas and some boundary parts of the Arctic Basin. Multi-year experience of navigation in the Arctic seas determines the main variants of the routes at which favourable conditions for shipping can form. These routes now have modern hydrographic support and are the recommended "traditional" routes. Yet, in today's reality the optimal route may differ from the standard route depending on the ice and weather conditions. In most cases, the optimal route is either one of the recommended routes or a combination of their various segments. Figure 5 shows standard routes of navigation in winter (5a) and summer (5b).

Recent years have witnessed increased use of the NSR for transit navigation, confirming profitability of cargo transportation to and from Europe and Asia. More cargo transportation, application of flexible rate policies and reduced sea-ice conditions in summer along the NSR contributed to the intensification of transit navigation along the NSR.

Several areas along the NSR where ice conditions for navigation are the most difficult are illustrated in Figure 6. Their location depends on positions of fast-ice and ice massifs. These areas include: the southwest part of the Kara Sea (Novozemelskiy ice massif); fast-ice area in the northeast part of the Kara Sea, including Vilkitskiy Strait; western part of the Laptev Sea (Taimyr ice massif); Sannikov Strait; eastern part of the East Siberian Sea (Aionskiy ice massif).

Sea-ice distribution along the NSR is essentially irregular. Unfavorable conditions of navigation can be observed only along some sections and sometimes only one part of the NSR. Nevertheless, in such cases these constrictions and blockages require the use of icebreaker assistance.

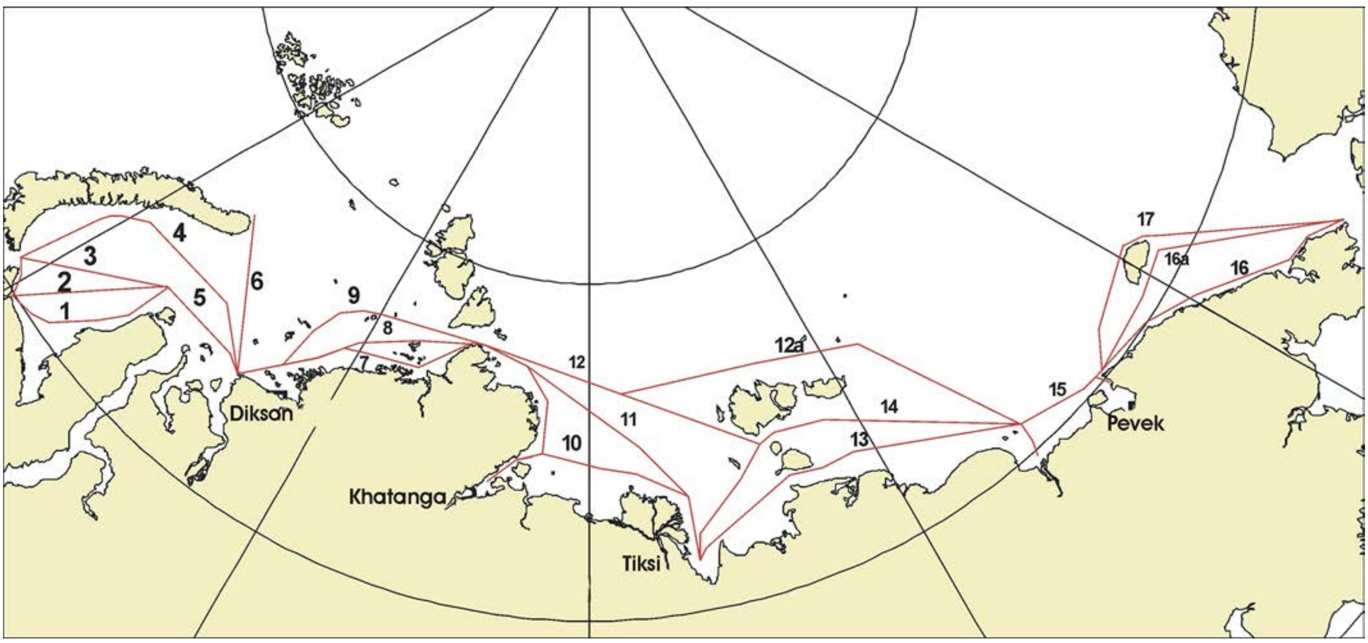

Figure 5a - Traditional Navigation Routes along the Northern Sea Route in winter

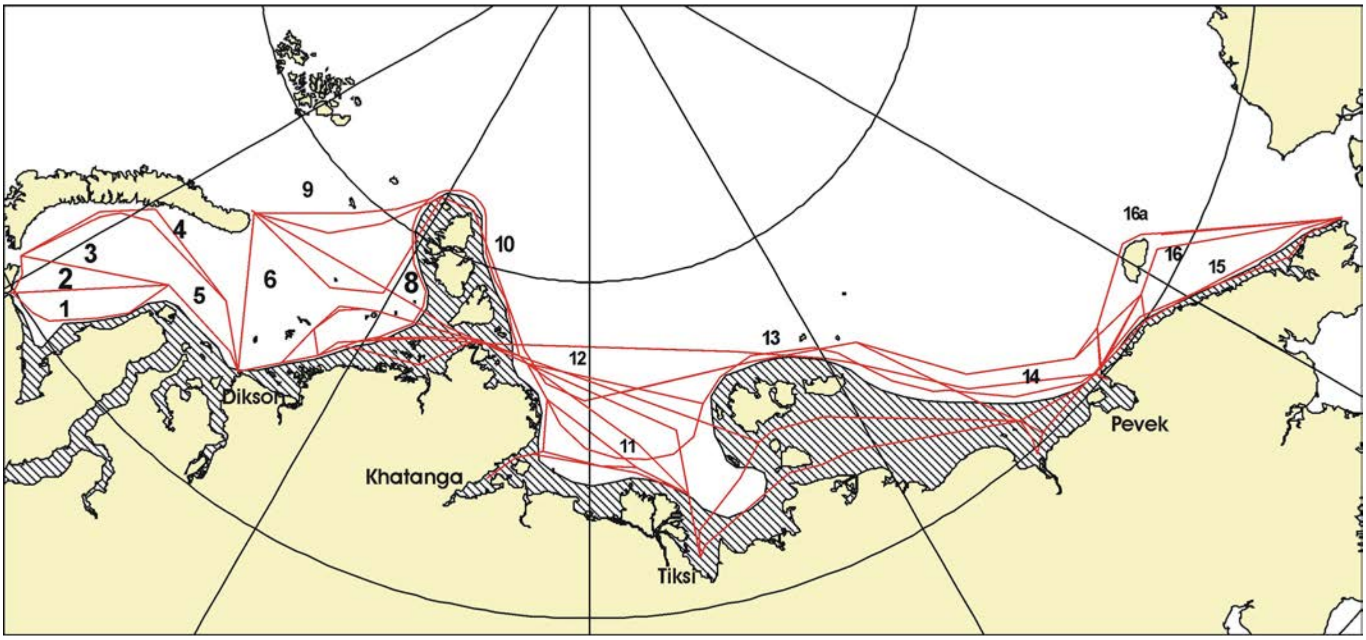

Figure 5b - Traditional Navigation Routes along the Northern Sea Route in summer

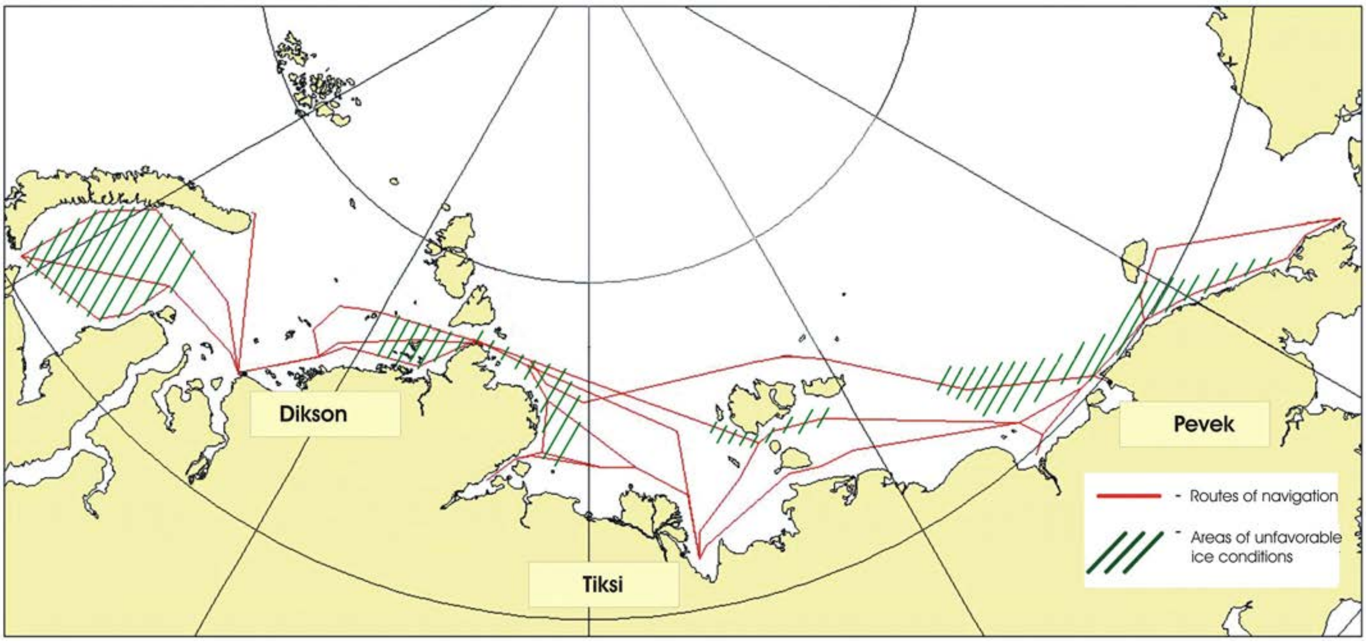

Figure 6 - Areas with unfavorable ice conditions and navigational routes along the Northern Sea Route

ACCESS Partner Transits Canadian Arctic Waters

Nordic Bulk Carriers NBC

It was a first in September 2013 when a bulk cargo ship passed through the Northwest Passage into Baffin Bay along Greenland's southwest coast – the first bulk carrier to make the journey (Figure 7). The 225 metre ice-strengthened vessel transported coal from the port of Vancouver, British Columbia to Finland. It cut about four days and more than 1 000 nautical miles off the usual route through the Panama Canal. Plus it carried 25% more coal since it did not need to factor in the shallow Panama Canal crossing.

The Northwest Passage across the Arctic is shorter than the traditional route through the Panama Canal and thereby has the potential to generate important saving in time, fuel and CO_2 emissions. Smaller vessels have been navigating the Northwest Passage for decades, but reduced Arctic pack ice has increased some accessibility. It is estimated that the Northwest Passage will be open for transit voyages for approximately two months per year depending on the weather and ice conditions.

ACCESS partner, Nordic Bulk Carriers A/S, a Danish Arctic pioneer, was responsible. Its MV NORDIC ORION – one of the world's few modern ice-class bulk carriers – transported the 75 000 tonnes of coal, mined in the Powder River Basin of Wyoming, US to Finland via the Northwest Passage. "*We were very excited about this historic voyage, which has been a dream and ambition for several years*" said Christian Bonfils, Nordic Bulk Carriers managing director, "*we have deep respect towards these important Arctic waters and planned this voyage in close co-ordination with Transport Canada and the Canadian Coast Guard to ensure a safe execution.*"

Bonfils pointed out the reduction in fuel consumption and transportation time as well as lower CO_2 emissions. The fuel savings alone were about USD 80 000. In addition, the route allowed full use of the ship's capacity thereby allowing it to transport 25% more cargo than the Panama Canal route.

It takes more than an average ship to sail the Northwest Passage. The trip across the Arctic is a challenging task that requires great experience, navigational skills and modern world class ships. In fact, there are only a few vessels which can handle the task. "*MV NORDIC ORION is an ice-class 1A ship*" explains Bonfils. "*These ships are designed and built to operate in the harsh conditions of the Arctic.*"

Figure 7 - For the first time ever, an ice class 1A bulk carrier "Nordic Orion" 225 m long from the Nordic Bulk Carriers A/S Danish company, is using the North West Passage in September 2013 as a transit trade lane when transporting 75 000 tons of coal from Vancouver, Canada to the port of Pori in Finland.

Climate Change and Tourism in the Arctic

Economic and Social Research Institute ESRI

The effects of climate change are likely to lead to changes in socio-economic activity in the Arctic region, including tourism which is not presently well developed. Research, not surprisingly, shows a significant relationship between weather characteristics and tourism choice – for instance, snow for skiing, warm water beaches for swimming. Climate change is expected to influence a redistribution of tourists from areas that are becoming increasingly hot to cooler destinations (Hamilton, et al., 2005a,b). Climate change is likely to have various impacts on tourism in the Arctic. They may be contradictory as the Arctic becomes more accessible and less forbidding, while some of its unique characteristics may shift or disappear in a changing climate regime. Such threats may lead to a temporary surge in the number of tourists, who might want to experience the Arctic in its current profile. Climate change may affect tourism numbers and patterns across the Arctic region. The ACCESS project (Task 2.6.2) estimates the effects of climate change on tourism in the Arctic with the work now substantially complete.

Our efforts extend the work of Bigano, et al. (2006, 2007), which constructed the Hamburg Tourism Model (HTM) - a climate change tourism simulation model. We expanded the range of destination choices and estimated the specific determinants of holiday destination choice across 182 countries to identify the climate preferences of tourists. The results show that tourism destination is a function of social, economic, political and climatic factors (Tol and Walsh, 2012a). With regard to climate variables, the results suggest that temperature has a larger impact on destination choice than precipitation, which explains the popularity of holiday spots along the coasts of the Mediterranean and Caribbean seas. Temperature preferences appear to be similar across countries in general, but tourists from colder countries tend to be more flexible with respect to holiday destination temperatures than those from warmer countries.

Our second step looked at the number of tourists visiting Arctic regions under current conditions using 2009 data for Canada, Denmark, Finland, Greenland, Iceland, Norway, Russia, Sweden and the United States. The volume of tourists in Russia is relatively low compared to those in other countries, which may reflect poor accessibility and less developed tourism products. These factors also explain the higher share of tourists in the capital city regions of the countries included in the analysis.

The regional tourism data for the mentioned countries along with projected total tourist numbers from the HTM were downscaled to a grid level (0.5 degree resolution and) used to simulate future tourism patterns under three climate scenarios (low, medium and high) based on Tyndall Centre for Climate Change Research scenarios. Compared to a no climate change scenario, the effect of the high climatic change scenario was found to be greatest (Tol and Walsh, 2012b). However, the spatial patterns of the changes for each of the three scenarios were very similar. Tourist numbers to all Arctic regions are projected to increase in each of the three scenarios with no significant redistribution of tourism shares across Arctic regions, except for Russia where the potential growth is significantly above the average and to a lesser extent the Northwest Territories and Alberta in Canada. In Russia, the higher than average estimated growth reflects both climate change effects and proximity to strongly growing markets in Asia.

ACCESS research demonstrates that climate change could indeed result in significantly larger numbers of tourists visiting the Arctic. This modelling focuses only on the likely demand for tourism. Ultimately the actual patterns of tourism will depend crucially not only on demand, but also on supply and services in terms of tourism sector engagement, accommodation, transport, and other infrastructure, which will be influenced locally and as part of national or regional development strategies.

Citations:

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Hamilton, J. M., Madison, D.J, and R.S.J. Tol (2005b) "*Effects of Climate Change on International Tourism*", Climate Research, Vol. 29, pp. 245-254."

Tol, R.S.J. and S. Walsh (2012a) "*The Impact of Climate on Tourist Destination Choice*" Economic and Social Research Institute Working Paper WP423.

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Work Package 3 – Fisheries

Aquaculture in the Arctic

Beijer Institute and Norwegian Institute of Food, Fisheries and Aquaculture Research (Nofima)

To provide a good basis for further research on aquaculture developments in the Arctic, specialists at the Beijer Institute and the Norwegian Institute of Food, Fisheries and Aquaculture Research (Nofima) reviewed current aquaculture activity in the Arctic zone and potential implications from climate change. Key findings are summarised here.

Aquaculture in the Arctic represents about 2 % of worldwide volume, relatively small compared with the dominate Asian production. A more regional perspective of Arctic aquaculture shows that it is an important economic activity at about the same scale as total production within the European Union. Farming operations are distributed unevenly within the Arctic region with salmon farming in Norway making up the bulk of the production. There is minor aquaculture production within the Arctic areas in Iceland and Russia, while the small levels of production in Sweden and Finland are mainly outside the Arctic region.

Figure 8 shows the locations of the main aquaculture production in the upper parts of the northern hemisphere. Using the most inclusive definition of what constitutes the "Arctic", the areas above the polar circle in Scandinavia, Finland and coastal areas in Iceland, northern Russia, northern Canada and Alaska are included due to the July isotherm definition. Despite this highly inclusive definition, it means that all current aquaculture production in Canada and Alaska falls outside the Arctic boundary. Even if subdivided into three regions, aquaculture production in Norway is clearly dominant, particularly for salmon rearing. In addition, there is considerable aquaculture production of sea trout in the northern most region of Norway, and production of cod in the southern most region. Aquaculture production in Norway is almost exclusively sea-based cage culture.

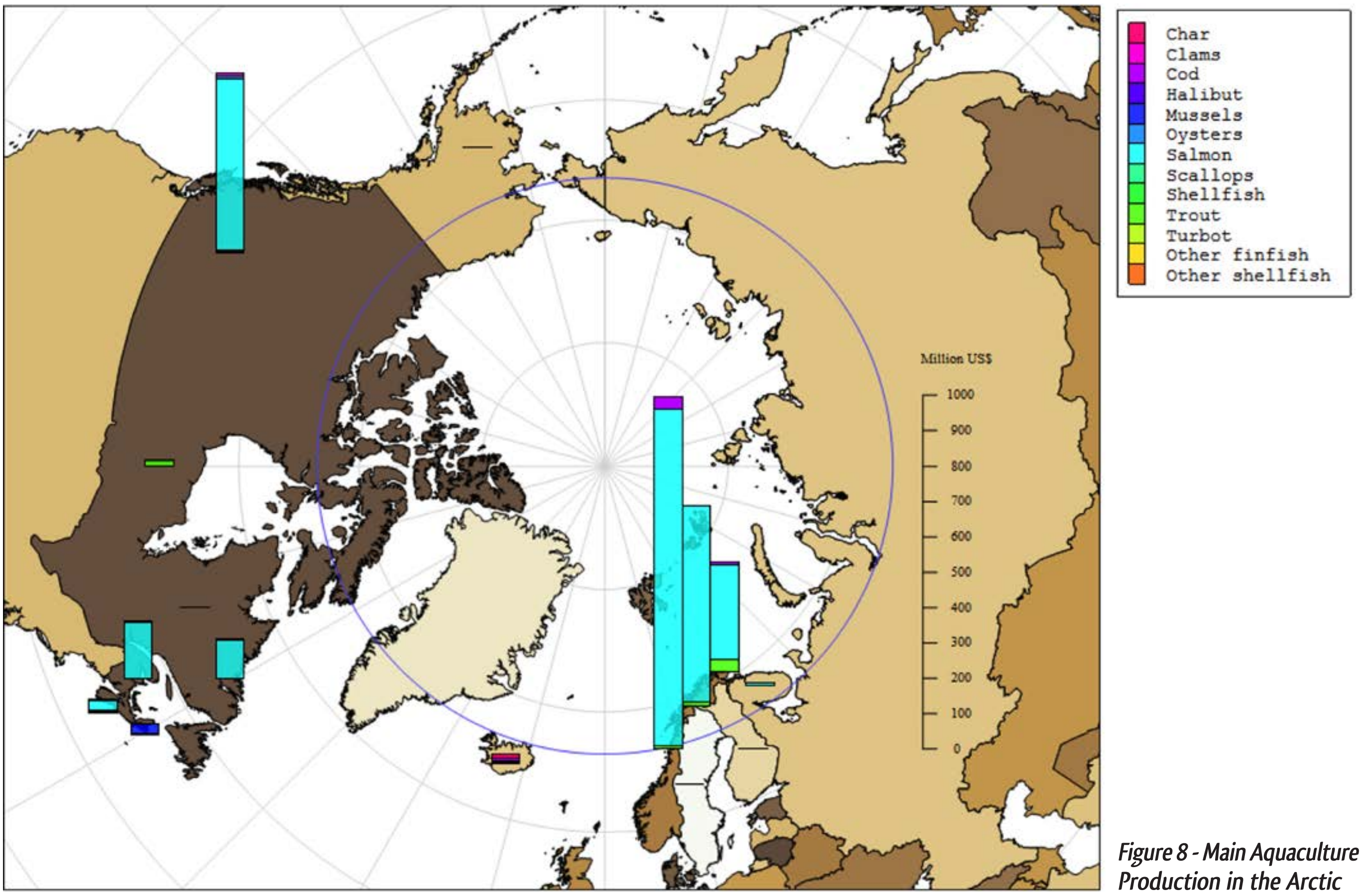

Figure 8 - Main Aquaculture Production in the Arctic

Russian aquaculture in the Arctic region is also dominated by sea-based cage culture of salmon which is concentrated in the Kola Peninsula. Like in Norway, warm currents and the existence of fjords and islands provides relatively good conditions for salmon farming. There are plans for considerable growth in the Kola Peninsula ; however, military restrictions and bureaucratic hurdles hinder development.

Aquaculture in Iceland has declined considerably since 2006. Today production consists of mainly Arctic char, cod and salmon, with lesser quantities of some other species. Char culture is exclusively in land-based facilities. Finland and Sweden have only minor aquaculture production in the Arctic and only rainbow trout is farmed.

Climate Change Impacts

Several abiotic environmental conditions are of fundamental importance for successful aquaculture. Both growth and health of organisms are highly dependent on variables such as temperature, salinity, oxygen concentration and water quality. Physical processes such as waves, currents and ice formation also influence the farming conditions. A number of international studies indicate that these variables and processes to various degrees will be influenced by climate change (Figure 9). Detailed knowledge is limited, which has consequences for making predictions about climate change effects on aquaculture at local and even regional scales. This is due both to the uncertainty in physical climate change and the lack of understanding of the complex causative links between physical processes and aquaculture.

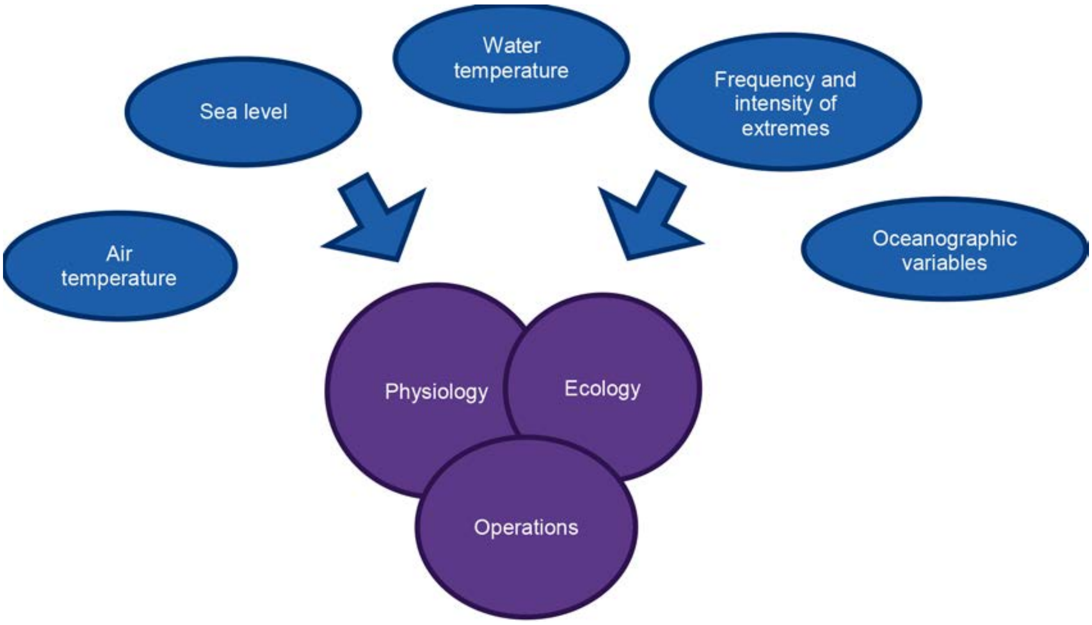

Figure 9 - Climatic Conditions likely to Impact Aquaculture Production

The most important local / regional environmental factor for aquaculture production is probably sea temperature, as fish growth and health to a large extent is temperature-dependent. With a highly competitive seafood market even a small change in temperature can render an area less attractive for farming. There is considerable uncertainty in the estimates of expected temperature changes, ranging from a rise of 0.5 to 1.7 ˚C in about 50 years for the Norwegian Sea. The implication for Norwegian salmon farming, considering the temperature factor alone, will be that larger parts of the Arctic become more suitable for farming. This is also the case for the Kola Peninsula.

Potential impacts from the occurrence and spread of diseases are difficult to predict. Temperatures that stress the tolerance levels for farmed fish will likely result in increased susceptibility to diseases. Pathogens, however, generally have shorter generation times with higher temperatures. Some diseases common for salmonids are also associated with higher water temperature. This may result in higher prevalence that will affect the fish negatively, although parts of the fish immune system may be more efficient in higher temperatures. On the other hand, there are also diseases associated with lower temperatures, for instance parasitic sea lice is a common problem today in salmonid farming. This problem is generally higher in warmer areas, and increased temperatures will likely exacerbate the infestation levels in the Arctic, resulting in increased costs to treat the fish.

Currently coastal aquaculture expansion, for example in Norway, is limited by access to suitable farming areas. Increased sea temperature could allow for farming in regions that today are not considered economically viable, also in areas in Russia, Canada and Alaska. However, there is keen competition for sea areas from a variety of interests and Arctic environmental conservation plans limit expansion.

Dominant climate models generally predict more frequent and more intense storms, including in the Arctic region which pose a challenge to sea-based fish farming. Climatic changes are likely to develop over time enabling the industry to adapt mainly through strengthening structures or moving to less exposed sites. Resulting implications may then relate more to increases in operating costs.

In summary, there is considerable uncertainty with respect to the implications of climate change for aquaculture in the Arctic. The areas available for farming will likely increase as improved temperature conditions will make conditions more favourable. Disease impacts are difficult to predict, but based on experience from other areas no severe changes may be expected. Thus only considering the environmental factors, climate change seems positive for expansion of aquaculture activities in the Arctic. However, there are still many unknown factors and challenges that relate to conservation issues (*e.g.* biodiversity conservation, linkages to fisheries), social considerations (other stakeholders and activities) and also shifts at the global level that have implications for fish farming in the Arctic (*e.g.* feed availability, consumer preferences).

Work Package 4 – Ressources Extraction

Escape, Evacuation and Rescue from Arctic Facilities – A Systematic Approach

IMPaC and HSVA

An assessment of existing and required rescue systems suitable to work with fixed and floating platforms has been carried out in the context of ACCESS (WP 4.3) IMPaC and Partner HSVA. It covers Arctic infrastructure needed to support the pressing challenges of escape, evacuation and rescue (EER) needs arising from increased activity in the fishery, hydrocarbon and minerals extraction, tourism and maritime transport sectors (Figure 10a, 10b). The increasing number of tourism cruise ships with the large number of passengers brings specific constraints to feasible EER concepts. Gaps of existing infrastructure have been identified and possible solutions have been proposed.

Based on this assessment IMPaC developed a logistics concept for application in the Arctic region. It comprises Arctic stations with onshore settlement, a transportation link to the mainland for access and evacuation in case of an emergency. The station provides space and infrastructure for medical assistance, accommodation, aircraft landing, port facilities and technical infrastructure. Various EER approaches such as life boats, helicopters, ships and/or hovercrafts have been considered. Following first-aid treatment at local rescue stations, patients with major injuries could be transported to larger facilities via aircraft.

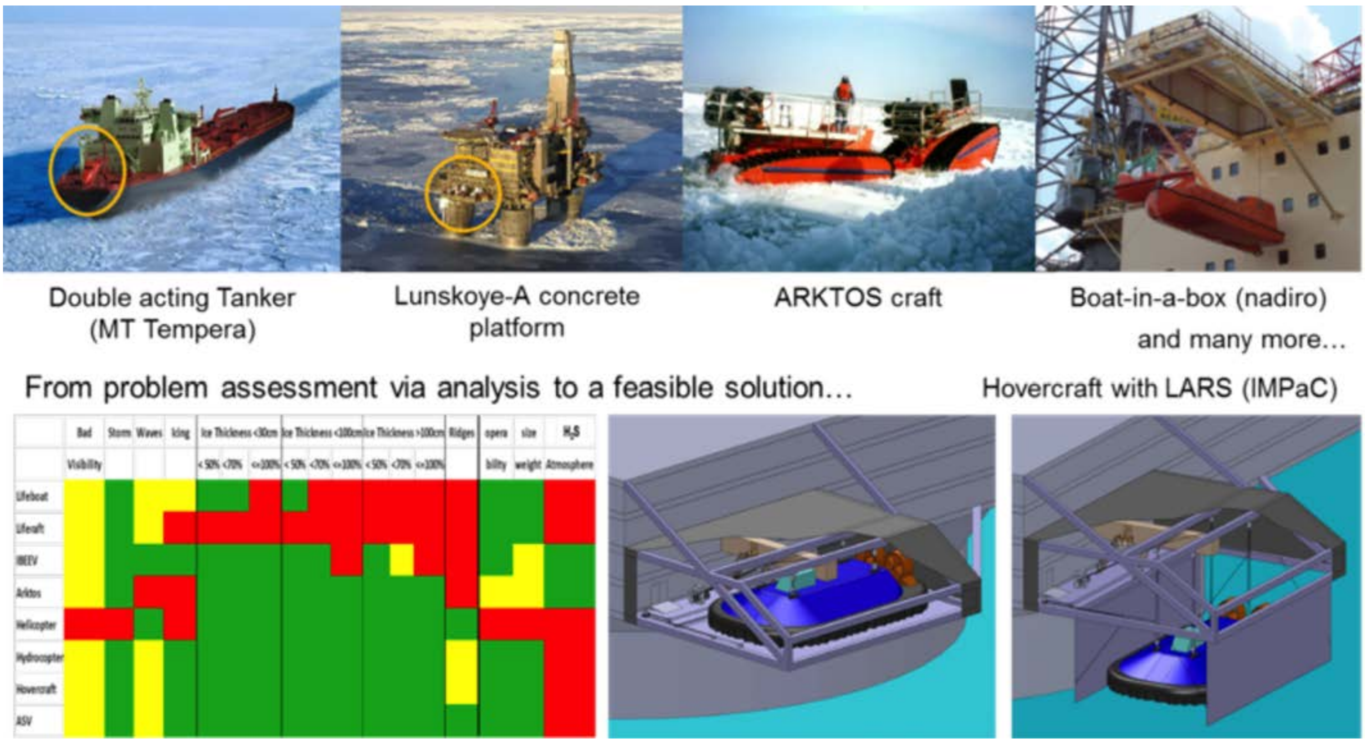

Figure 10a - Assessment of existing EER means and proposal of a new Hovercraft concept with LARS (Launch and Recovery System) for up to 100 persons (IMPaC)

Is Bigger Better?

Is there any requirement and benefit for EER facilities beyond a small Arctic station? Our assessment is that the answer is yes based on the growing demand for infrastructure stemming from the various sectors (Figure 11). Beyond EER objectives there is a demand from people working and living in the Arctic region, whether on a long or short term basis, that could use such a settlement for their needs. This led to the concept of a "common use" infrastructure for multiple industries. Such a configuration could maximise the use of the remote and very expensive infrastructure and minimise the impact on the fragile Arctic environment.

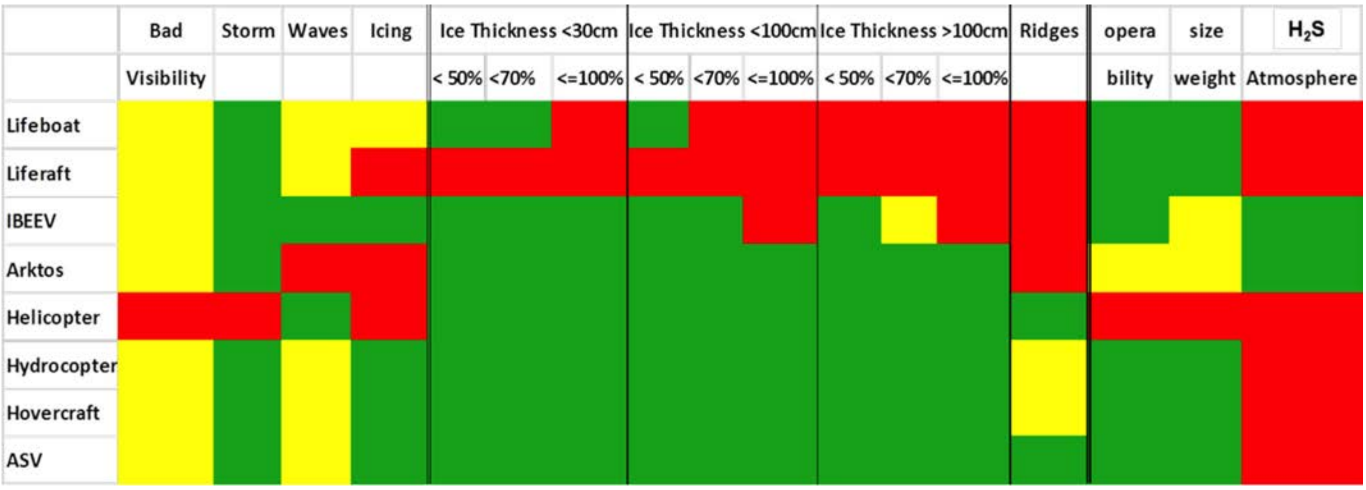

Figure 10b - Matrix showing results from the assessment of existing EER means suitable for different weather conditions (green=suitable, yellow=limited suitable, red=not suitable, HSVA)

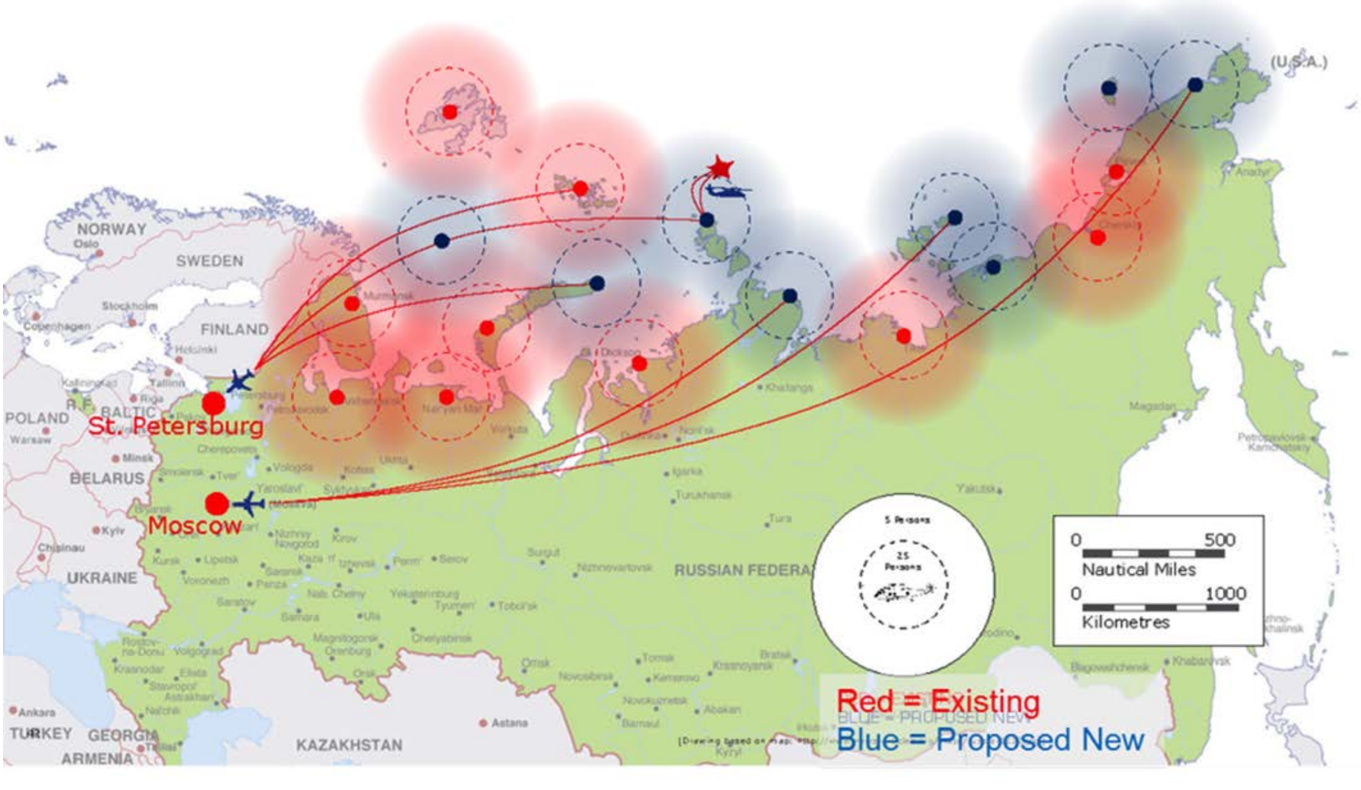

Figure 11 - Assessment of existing and probably required EER stations along the Northern Sea Route (IMPaC)

Work Package 6 – Dissemination and Outreach

Five important meetings of great interest for ACCESS until the next ACCESS GA in Cambridge UK (March 3-7, 2014)

in chronological order

5-6 December 2013

ARCSees (HIACMS) workshop in Santa Barbara California, USA.

Holistic Integration for Arctic Coastal-Marine Sustainability Project (HIACMS) National Science Foundation (NSF) USA and Centre National de la Recherche Scientifique (CNRS) France have selected three hot spots (Barents Sea, West Greenland and Chukchi-Beaufort Seas). The workshop in SB USA at the NCEAS is about Marine Spatial Planning (MSP) applications for these 3 selected regions.

10-12 December 2013

AMAP (AACA-C) in Tromso, Norway.

Adaptation Actions for a Changing Arctic run by the AMAP Arctic Council working group is organizing a two days workshop in Tromso on the Barents Region. The European External Affairs Services (EEAS) mandated ACCESS to participate to this meeting in order to evaluate potential contributions from the EU to this Arctic Council AACA major project. It is remarkable that both AACA and HIACMS selected the same three hot spots (Barents region, Baffin Bay and Chukchi-Beaufort region). It is also remarkable that AACA corresponds to main goals of the ISAC Responding to Change program.

January 21, 2014

ISAC-ACCESS Responding to Change workshop in Tromso, Norway.

The International Study for Arctic Change (ISAC) and ACCESS are co-organizing the second Responding to Change (RtC) workshop in Tromso during the Arctic Frontiers conference in order to benefit from a large stakeholders community interested in Arctic issues that will be present in Tromso during the AF14. The RtC2 will include presentations from major Arctic programs such as ISAC (Intnal), ACCESS (EU), SEARCH (USA), ARCRISK (EU), ARCTICNET (Canada), INTERACT (EU), EUAII (EU), AMAP / AACA (Arctic Council), ARCSees / HIACMS (USA-France), ICE-ARC (EU) and an open panel discussion with stakeholders.

January 22, 2014

EU AII stakeholders consultation in Tromso, Norway.

The EU Arctic Information Initiative is organizing a stakeholders consultation in Tromso on January 22, 2014 back to back with the ISAC-ACCESS Responding to Change workshop. The EUAII is led by the Arctic Center in Rovaniemi and is preparing seven Fact Sheets dealing with climate change, fisheries, marine transportation, oil and gas exploitation, mining, social-cultural, land use, all in the Arctic regions.

February 28, 2014

ARCSees-ACCESS workshop at IMO in London, UK

Workshop on safe ship operations in the Arctic Ocean will be convened at the IMO headquarters in London on February 28, 2014 back to back with the 5th Polar Shipping Summit convened on February 26-27, 2014 at the same location. This HIACMS-ACCESS workshop will immediately precede the ACCESS GA in Cambridge (March 3-7, 2014)