

# A changing Arctic – dialogues from the North

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## Abstract

This paper discusses how climate services can support adaptation decisions in the Arctic, a region that has been changing at an accelerating rate. The research is done within the framework of the APPLICATE project that aims at enhancing weather and climate predictions in the Arctic, through improving modelling, observing system design, and understanding of a changing Arctic climate. For this new climate data to become an asset for decision-making, we need to assure its usefulness and usability. The climate services paradigm proposes collaboration and knowledge co-production with various stakeholders, to transform climate data into useful knowledge. By regularly meeting with the project user group, the research managed to identify pertinent challenges that demand better climate information, while feedback from this group assures timely response to the project outputs and helps shape the products developed, maximising their usability.

**Key words:** *Climate services, Knowledge co-production, Local communities*

## Introduction

Climate change has widespread effects on the Arctic – a region that is warming at almost twice the global average rate. The rapidly transforming Arctic represents new challenges for its sensitive socio-ecological systems. Hence, local populations need to adapt their practices to the emerging circumstances that span from new opportunities related to opening of the local markets, to the negative effects of increased ocean temperature and decreased salinity on native fish species (WMO, 2017). New and more reliable predictions of weather and climate in the Arctic – for the coming days, up to a year in advance – could help coping with the potential risks and support adaptation practices. However, only by assuring that this new climate data provides useful and usable knowledge – such as weather and climate model outputs - can it become an asset for the Arctic stakeholders. The climate services paradigm assumes the

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transformation of climate data into information that can support decision-making and improve knowledge about the environmental and climate change (Hewitt, 2012; Terrado et al., 2018). For this transformation to happen, scientists need to understand the broader context of changes that occur both at local and global scales. This includes considering the existing autonomous adaptation practices, societal changes that affect adaptation processes and barriers to adaptation (Nilsson et al., 2017).

The European project APPLICATE<sup>5</sup> has established a dialogue between climate data providers and users to fulfil its aim to advance weather and climate predictions in the Arctic. In this paper, preliminary results about the role of climate services in supporting adaptation in the Far North are presented.

## Methodology

APPLICATE employs diverse engagement techniques, such as a blog, online meetings and focus groups, to actively exchange knowledge with stakeholders from all over the vast Arctic region. The dialogue is taking place at three principal levels, from a focused engagement with the project User Group (UG), over an open discussion forum, to a wider EU coordinated dialogue with different stakeholders from the Arctic and beyond.

- (i) The UG is composed of the representatives from various stakeholder groups, such as local communities, businesses, and international organisations. By regularly meeting online and in person, local knowledge is combined with scientific findings to understand the potential role of climate data in informing adaptation measures. In focus groups, the UG members discuss pertinent issues in the Arctic and the main challenges stakeholders are facing. This setting allows for finding common solutions for potentially conflicting interests, while findings inform the project and help to focus its efforts on providing relevant and useful climate data (Bojovic and Terrado, 2018). In addition, feedback from this group assures timely response to the project outputs and helps shape the products developed - maximising their usability.
- (ii) The blog “Polar Prediction Matters”<sup>6</sup> is a discussion forum for polar environmental forecast users, providers and all those interested to learn about first-hand experiences from the Arctic. The blog features individual views on how forecasts are actually used and we expect it to foster discussion about how to improve polar

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<sup>5</sup> Advanced Prediction in Polar regions and beyond: modelling, observing system design and Linkages associated with a Changing Arctic climaTE (<https://appliccate.eu>)

<sup>6</sup> (<https://blogs.helmholtz.de/polarpredictionmatters/>)

prediction capabilities. Dialogue developed at this blog helps identifying priority sectors for which project outcomes could be relevant while engaging with a wider stakeholder community.

- (iii) The EU Arctic cluster is a coordinated initiative between different European projects that aims to enhance international cooperation on the most up-to-date findings about Arctic change and its global implications. The cluster collaborates with policy makers, Arctic communities, business representatives and the European civil society. Dialogue within the EU Arctic cluster helps combining efforts in order to avoid overlapping and better exploit synergies among different projects.

## Results

The preliminary results from the interactions with Arctic stakeholders reveal a few priority topics for which appropriate weather and climate information would be useful - these include:

- **Food security** is an important challenge for the Arctic. Local communities are concerned about the melting permafrost and the freezing and melting of lakes and rivers that is becoming ever more irregular. Fishers and hunters often cross frozen lakes and rivers while looking for preys, and need to do so safely. Having access to seasonal climate data, from two weeks up to a year in advance, particularly about precipitation, temperature and snow cover, can help for fishing and hunting planning, allowing local communities to make more reliable estimations for winter food supply.
- **Reindeer herding** reflects well the complexity of the Arctic region being composed of a wide variety of settings and contexts that require different climate change adaptation measures. One of the common challenges for reindeer herders is the difficulty to secure feed for their animals. Shifting seasons, including changes in precipitation and temperature patterns, continuous ground freezing and thawing, as well as rain-on-snow conditions that develop an ice crust, limit reindeer's foraging success (Forbes et al., 2016). Having information on autumn/winter rain-on-snow events days, months or even years in advance could help to buffer against reindeer starvation. In line with this, the project also explores the added value of high resolution weather and climate models. High-resolution data would be an asset for traditional activities like reindeer herding, but also for day-to-day activities, such as commuting.
- **Transport and resupply** is another important issue in the Arctic. In some regions, items like construction materials and fuel are only supplied once per year. Fish catch and other local goods are taken out with the same frequency. One of the questions raised in the UG meeting was about the combination of changes in climate, technology and habits that would reduce the cost of living for Arctic communities. In fact, the economy is already changing with the changing ice conditions and advancing maritime transport. A possibility of shipping out products during the whole year could increase the market

value of local products (Nilsson et al., 2017). More reliable sea ice data was pointed out as crucially important for the expanding shipping industry.

In collaboration with Arctic stakeholders, APPLICATE is co-developing user-relevant metrics for some of the identified priority topics, such as:

- i) enhanced and tailored sea ice prediction that can benefit maritime transport and fishing;
- ii) improved understanding and prediction of freezing, thawing and rain-on-snow events, which can support reindeer herding, hunting and commuting of local communities; and
- iii) better information on climate-related ocean parameters that can support nature conservation, fisheries and blue growth.

In these dialogues from and about the North, knowledge communication and integration was a recurrent topic, emphasising the need for traditional knowledge to be considered in the conventional knowledge system.

## Conclusions

Establishing and maintaining a dialogue with stakeholders throughout the duration of the APPLICATE project facilitates the exchange of perspectives and ideas, and helps shaping climate data into services for various users. As depicted in this paper, some of the services already developed in the project include improved prediction of sea ice and freezing and thawing events. Among the expected users of these services are local communities and the transport and maritime sector. Within the APPLICATE project, the dialogue is taking place between climate scientists - able to provide enhanced knowledge on weather and climate, and stakeholders from the Arctic's complex socio-ecological systems who, by witnessing changes every day, are ultimately the ones knowing what is actually needed. The dialogue results in better understanding of the new Arctic challenges and opportunities, and supports production of trustworthy predictive information. Not only is this new climate information expected to support bottom up, autonomous adaptations, but also top down measures, by informing climate change policy. Discussion forums and a coordinated activity between Arctic initiatives further enhance the exchange of knowledge and could ensure that the dialogue continues after the project ends.

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