BLUE ACTION

Arctic Impact on Weather and Climate

Developing and Valuing Climate Services and Information Services: Case Studies

Blue-Action Workpackage 5

Update March 2018

The Blue-Action project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727852

WHY BLUE-ACTION?

Faced with a changing climate, businesses, policy makers and local communities need to access reliable weather and climate information to safeguard human health, well-being, economic growth, and environmental sustainability. However, important changes in climate variability and extreme weather events are difficult to pinpoint and account for in existing modelling and forecasting tools. Moreover, many changes in the global climate are linked to the Arctic, where climate change is occurring rapidly, making weather and climate predictions a considerable challenge.

Blue-Action is evaluating the impact of Arctic warming on the northern hemisphere and developing new techniques to improve forecast accuracy at sub-seasonal to decadal scales. Blue- Action specifically focusses on understanding and simulating the linkages between the Arctic and the global climate system, and the Arctic's role in generating weather patterns associated with hazardous conditions and climatic extremes. In doing so, Blue-Action aims to improve the safety and wellbeing of people in Arctic and across the Northern Hemisphere, to reduce risks associated with Arctic operations and resource exploitation, and to support evidence-based decision-making by policymakers worldwide.

THE BLUE-ACTION PARTNERSHIP

Blue-Action has brought together >120 experts from over 40 research (blue), business and policy (green) organisations in 17 countries.

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CASE STUDY 1: RUKAKESKUS SKI RESORT

Climate Services

Ruka is a Northern Finnish ski resort that welcomes around 400,000 skiers annually. Ruka aims to be the most snow sure ski resort in Europe, and already provides more than 200 ski days each year; more than any other non-glacier ski resort in the world. Like many other ski resorts, Ruka is increasingly affected by global rises in temperature. Warmer early season temperatures and unpredictable or unusual weather occurrences are among the growing challenges Ruka faces.

ENHANCING CLIMATE RESILIENCE

A consistent snow base is a key resource for Ruka, as part of their strategy to attract tourists and maintain a competitive advantage over rival ski resorts in Finland and Europe. Ruka relies heavily on artificial snow to ensure the slopes can be opened early and maintained through the winter. Snow is especially important in October, when Ruka markets itself as the first resort to open in Finland.
A new climate service incorporating short- to medium-term climate predictions into ski season planning could offer substantial value to Ruka and other ski resorts facing similar challenges. For example, early season snowmaking is up to 10 times more expensive than it is in the colder mid-season. This difference in cost means that it is more efficient to make snow in January and store it over the summer, than it is to make snow for immediate use in October. Short- to medium-term climate forecasting can help Ruka to anticipate its artificial snow requirements and to plan accordingly for the upcoming ski season. It can also provide Ruka with valuable information about changing weather patterns and future temperature trends.

BEYOND STATE OF THE ART

Climate services could significantly improve Ruka's climate-resilience and provide a substantial comparative commercial advantage. Together, Blue-Action and Ruka have identified the following requirements for new climate services:

- Seasonal forecasts – both short and long term, but especially long term (five year intervals)
- Micro-scale forecasting relevant to the ski resort and the immediate surrounding area
- Consideration of how global phenomena such as El Niño and La Niña affect the predictions
- Improved accuracy over existing snow forecasting tools
- Improved predictability of temperature, humidity and wind over existing forecasting tools

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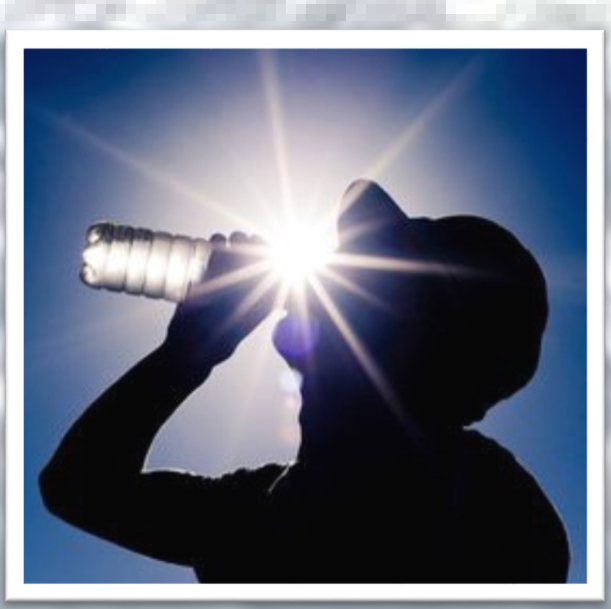
CASE STUDY 2: A EUROPEAN HEAT WAVE EARLY WARNING SYSTEM

Climate Services

According to the European Environment Agency, heat waves have caused many more fatalities in Europe in recent decades than any other extreme weather event. For example, the record-breaking hot conditions in summer 2003 were responsible for over 70,000 additional deaths across twelve countries in Western Europe. As the number of warm days and nights continues to increase across Europe, so does the intensity, frequency and length of heat waves. The vulnerability of communities and individuals to heatwaves, however, is very localised, and depends on socioeconomic, political, physiological, and behavioural factors.

ENHANCING CLIMATE RESILIENCE

This case study focuses on developing a Heat Early Warning System for European regions. This climate service aims to provide more accurate sub-seasonal to seasonal forecasts of heat wave events, enabling health authorities to optimize how they manage public resources to plan for and mitigate consequences to human health. Co-designed with the City of Almada, Portugal, and other relevant national and international health agencies and built on the experiences of existing operational schemes, this initiative will provide targeted information to help the public health sector improve decision-making, planning and adaptation to climate change.



BEYOND STATE OF THE ART

Climate services could significantly improve Ruka's climate-resilience and provide a substantial comparative commercial advantage. Together, Blue-Action and Ruka have identified the following requirements for new climate services:

- Winter and summer forecasts - both short and long term, but especially long term (five year intervals)
- Micro-scale forecasting relevant to the ski resort and the immediate surrounding area
- Consideration of how global phenomena such as El Niño and La Niña affect the predictions
- Improved accuracy over existing snow forecasting tools
- Improved predictability of temperature, humidity and wind over existing forecasting tools

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CASE STUDY 3: FORECASTING POLAR LOWS FOR THE SHIPPING AND OFFSHORE INDUSTRIES

Climate Services

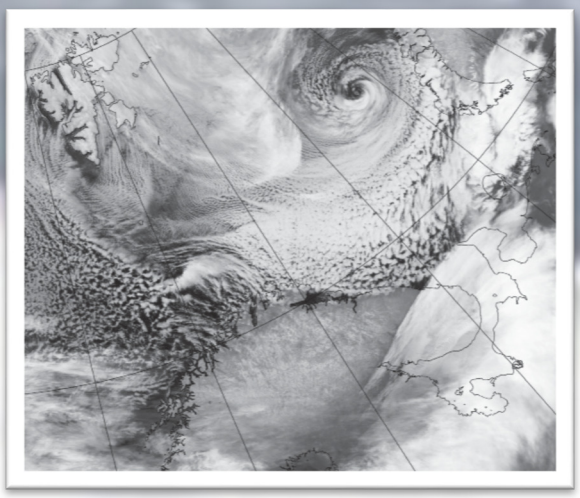
Polar lows are small, powerful storms which develop in the open waters of the Arctic Seas. They are associated with strong winds and intense snowfall, and they have caused many fatal shipwrecks. Polar lows are challenging to predict more than 10 days in advance, but the marine cold air outbreaks which encourage their formation may be much more predictable.

ENHANCING CLIMATE RESILIENCE

Predictions of marine cold air outbreaks could be used to provide a risk forecast for polar lows, which in turn can improve operational safety in Arctic waters and reduce the risk of financial and human loss in the region. While improvements in short-term forecasting (0 to 10 days) can reduce the risk of ships and other infrastructure becoming embroiled in dangerous conditions, improvements in long-term forecasting (10 days +) will enable effective operational planning, reducing the risk of delays, and increasing the efficiency of Arctic operations.

BEYOND STATE OF THE ART

In collaboration with DNV-GL, Blue-Action is developing new forecasting tools for polar lows, specifically tailored for industrial use. Industry requirements for risk management and maritime operational planning are guiding development of this service, for immediate implementation by industries affected by polar lows in the North Atlantic and Arctic oceans.



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CASE STUDY 4: MARINE FISHERIES IN THE NORTH EAST ATLANTIC

Climate Services

Advances in our ability to measure and model the oceans and climate over the last decade mean that in some areas (e.g. the North East Atlantic) we are increasingly able to predict ocean characteristics such as sea surface temperature five years or more into the future. These ocean characteristics play an important role in the timing of migration, spawning, and population dynamics of many economically important fish species.

ENHANCING CLIMATE RESILIENCE

By exploiting newly available predictive skill in climate model outputs, Blue-Action aims to improve the management of marine living resources, enabling productive and sustainable fisheries in both the short and long term. Blue-Action is working with a broad group of fisheries stakeholders to co-develop the first suite of marine ecological climate services for Europe. Once operational, the value of these annual and multi-annual fisheries-related products will be estimated for end-users and for the wider fisheries sector.

BEYOND STATE OF THE ART

Blue-Action is ambitious in the breadth of end-users it is engaging to co-develop marine ecological climate services, going beyond traditional commercial fisheries stakeholders to include international groups who monitor and provide advice on the management of marine resources, NGOs, and a citizen science project, "Fangstjournal". Consultation with these groups has revealed the potential of climate services to improve the quality of fisheries management systems by reducing uncertainty associated with estimates of fish abundance, productivity, and fish stock dynamics.

The project has also generated surprising new avenues for climate services that predict fish recruitment synchrony and regime shifts. It has also drawn in unexpected new end-users such as the recreational fishing community, expanding the scope for marine ecological climate services beyond the project's immediate partners, the Pelagic Freezer Trawler Association and the Danish Pelagic Producers' Organisation.

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CASE STUDY 5: YAMAL 2040: SCENARIOS FOR THE RUSSIAN ARCTIC

Information Services

The Arctic is facing unprecedented environmental change as temperatures in the region continue to increase twice as fast as the global average. As sea ice retreats, Arctic resources and waterways become increasingly accessible, representing not only opportunities, but also risks for local and international stakeholders. In this region, characterized by fragile ecosystems, a harsh climate, and extreme weather, large-scale economic projects must be assessed for their capability to provide local economic benefit without causing harm to local ecosystems, social and cultural livelihoods, and the global climate.
Developing Arctic oil and gas resources is a highly contested issue among different stake- and rights-holder groups. Local economic development and international energy security needs must be balanced against the emission reduction ambitions of the Paris Agreement and considerable social and environmental risks for Arctic, and especially indigenous people.

ENHANCING CLIMATE RESILIENCE

Blue-Action is developing forward-looking scenarios to better understand the risks and opportunities associated with development in the Arctic, with a particular focus on oil and gas extraction. This case study looks at a specific region, the Yamal-Nenets Autonomous Okrug in Arctic Russia: a region with substantial ongoing and planned petroleum and shipping activities. Together with stakeholder groups, Blue-Action is co-developing a suite of scenarios to describe possible futures for the Yamal-Nenets region in 2040, incorporating cutting edge climate predictions with environmental, social and cultural concerns, economic opportunities, and political and legal developments.

BEYOND STATE OF THE ART

Arctic development opportunities, like prospective and ongoing oil and gas related activities, are of concern to a number of stake- and rights-holders, including local communities and indigenous groups; federal and local authorities; intergovernmental and non-governmental organisations; oil and gas, insurance, and transportation companies; as well as scientists and media organisations that contextualise and shape the debate around Arctic resource development. By building alternative yet possible trajectories around development opportunities in the Yamal-Nenets region and evaluating socio-economic, climate, and environmental impacts, the scenarios developed by Blue-Action will help to facilitate decision-making processes in the region which reflect the diverse interests, hopes, concerns, rights, and obligations of everyone involved.

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ALMADA CÂMARA MUNICIPAL

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