BLUE ACTION

How can we use climate predictions to adapt to the future?

www.blue-action.eu

Climate Service Case Studies

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

The Blue-Action Partnership

Blue-Action has brought together more than 120 experts from over 40 research, business and policy organisations in 17 countries.

Why Blue-Action?

We are all facing a changing climate.

Businesses, policymakers, and local communities need to access reliable weather and climate information to safeguard human health, wellbeing, 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 prediction a considerable challenge.

Blue-Action evaluates the impact of Arctic warming on the northern hemisphere and develops new techniques to improve forecast accuracy at sub-seasonal to decadal scales.

Blue-Action specifically works to understand and simulate 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.

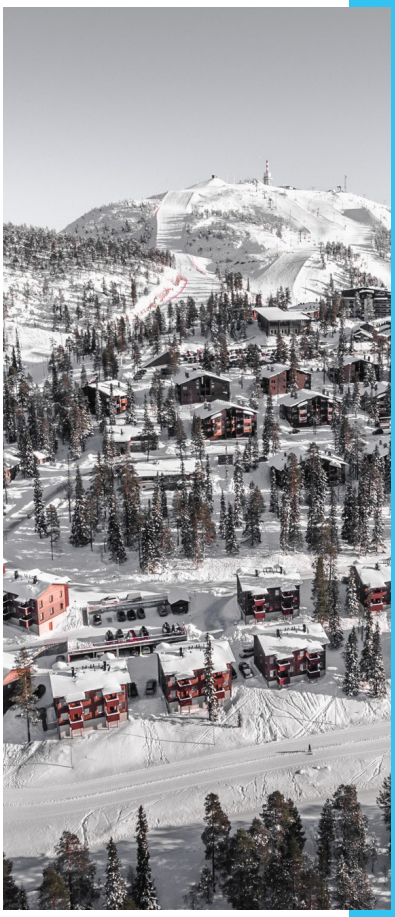
In doing so, Blue-Action aims to improve the safety and wellbeing of people in the Arctic and across the Northern Hemisphere, to reduce the risks associated with Arctic operations and resource exploitation, and to support evidence-based decision-making by policymakers worldwide.

Securing Sustainable Snow for Winter Tourism

Winter tourist destinations rely on predictable cold weather conditions to ensure the safety and enjoyment of the millions of visitors each year. Global rises in temperature, warmer early season temperatures and unusual weather occurrences are a challenge to the livelihoods of communities based around destinations such as ski resorts.

This case study focuses on providing relevant predictions on snow cover for a partner ski resort to allow preparation for the winter season. Ruka is a Northern Finnish ski resort that welcomes around 400,000 skiers annually. It is in the business strategy of Ruka ski resort to be the most snow secure resort in Europe. A consistent snow base is a key resource for Ruka that has around 200 skiing days from early October to early May, and it relies heavily on machine-made and stored snow to ensure the slopes can be opened early and maintained through the winter.

Blue-Action has co-designed a climate service incorporating short- to medium-term climate predictions into ski season, offering substantial value to Ruka and other ski resorts facing similar challenges. For example, early season snowmaking can be up to 30 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. Seasonal climate forecasting can help Ruka to anticipate its machine-made and stored 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.



Climate services could significantly improve Ruka's climate-resilience and provide a substantial comparative commercial advantage.

Case Study Leader

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An Early Warning System for European Heat Waves

As the number of warm days and nights continues to increase across Europe, so does the intensity, frequency and length of heat waves. Heat waves have caused many more fatalities in Europe in recent decades than any other extreme weather event, according to the European Environment Agency. However, the vulnerability of communities and individuals to heatwaves is localised, and depends on socioeconomic, political, physiological, and behavioural factors.

This case study focuses on developing a prototype of heat health early warning system for European regions. Heat early warning systems are designed to reduce the health consequences of heat episodes, by providing sufficient warning to allow authorities to notify affected populations and put mitigation measures in place for the most vulnerable communities.

Blue-Action has developed a climate service to provide more accurate sub-seasonal to seasonal forecasts of heat wave events. 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 provides targeted information to help the public health sector improve decision-making, planning and adaptation to climate change.

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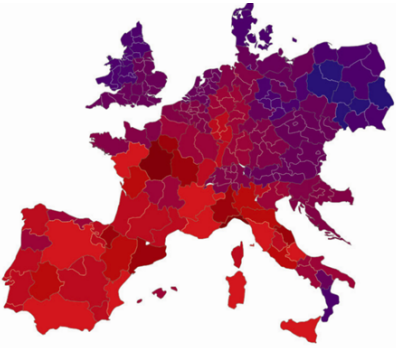
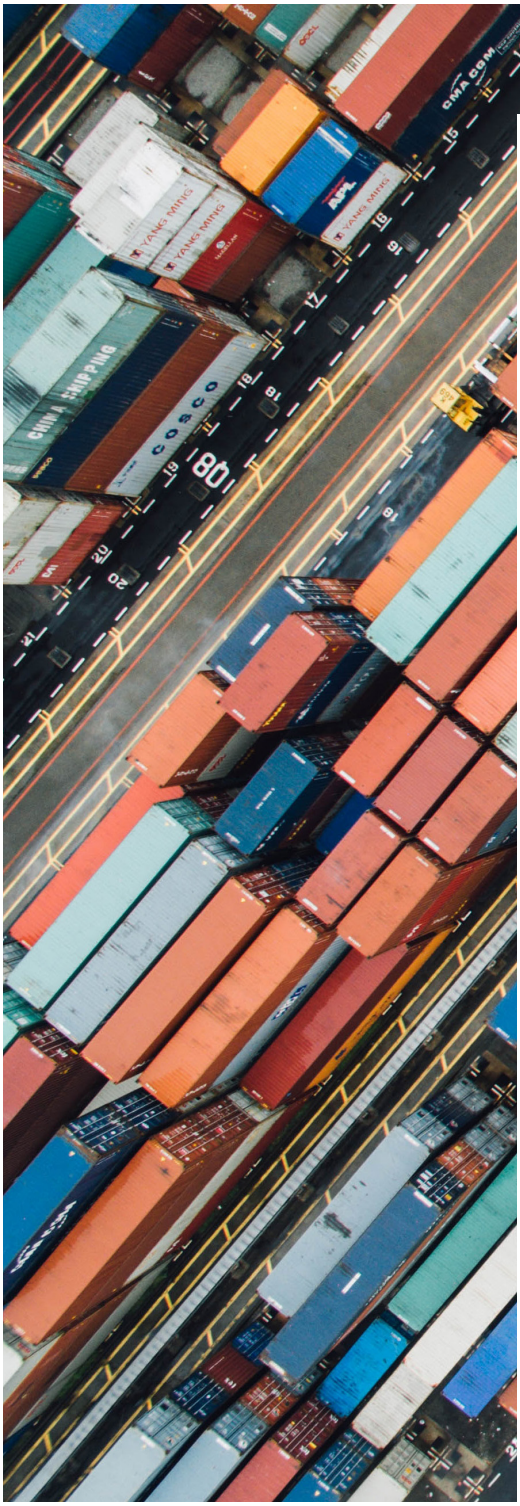


Mortality excess during the 2003 heat wave in Western Europe

Even though the majority of the European countries already have early warning systems, they only consider climate information and do not include health data. Moreover the predictive capacity of currently available operational schemes is currently limited to lead times of a few days, within the temporal scales of weather phenomena and forecasting.

Blue-Action, however, is using sub-seasonal to seasonal climate forecasts to drive the European heat health early warning system and extend their predictive capacity. With improved spatial resolution of climate data, as well as an exhaustive mortality dataset covering a large ensemble of 147 regions in 16 countries, this innovative prototype of heat health early warning system enables health services to predict the impacts of heat on health and therefore activate preventive actions, as well as to understand the spatiotemporal differences among European societies in human vulnerability to ambient temperatures.



Predicting Severe Weather Formations & Their Relevance to Maritime & Offshore activity in the Arctic

Polar lows are a special weather phenomenon occurring in polar regions. They are much like tropical hurricanes, only they appear where cold winds draw across relatively warm ocean waters. With a melting ice cap, and a more unstable and volatile atmosphere, severe and extreme weather formations tend to become more common, especially in some regions. As the face of these storms can exert a high risk to operations, the risks involved need to be managed.

This case study seeks to understand how polar lows develop and deliver predictions on a sub-seasonal scale. The IMO Polar Code identifies specific hazards which must be addressed in voyage preparation and planning, which

means ships sailing in Arctic waters need to be aware of the environmental conditions they face. Through investigating links to marine cold-air outbreaks and other large-scale features, the project investigates a set of precursors to describe the environment in which they form, helping the industry be aware and improve resilience towards polar lows.

Through collaboration with industry stakeholders, Blue-Action is developing a tailored climate service to communicate risks towards severe and extreme weather conditions. The service specifically addresses sea-ice, marine icing, water temperature, precipitation, and winds.

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. The aim is to facilitate efficient knowledge exchange of Arctic conditions, and to deliver consistent and accurate risk-informed decision support to maritime and offshore operations.

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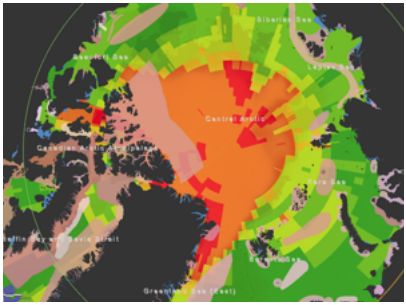

The Arctic Risk Map, safety and operability index

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Forecasting Marine Fisheries in the North-East Atlantic

Climate change is causing warming sea temperatures and increasing ocean acidification, fundamentally altering marine ecosystems. In particular, fish species are responding by changing their distributions productivity and the timing of their migrations, with consequences for conservation, fisheries and tourism.

This case study focuses on forecasting fisheries up to a decade into the future. 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.

Blue-Action has developed a climate service by exploiting newly available predictive skill in climate model outputs. It 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. This has the potential to improve the way that fisheries are performed and the quality of fisheries management systems by facilitating better planning and reducing uncertainty associated with estimates of fish abundance, productivity, and fish stock dynamics.

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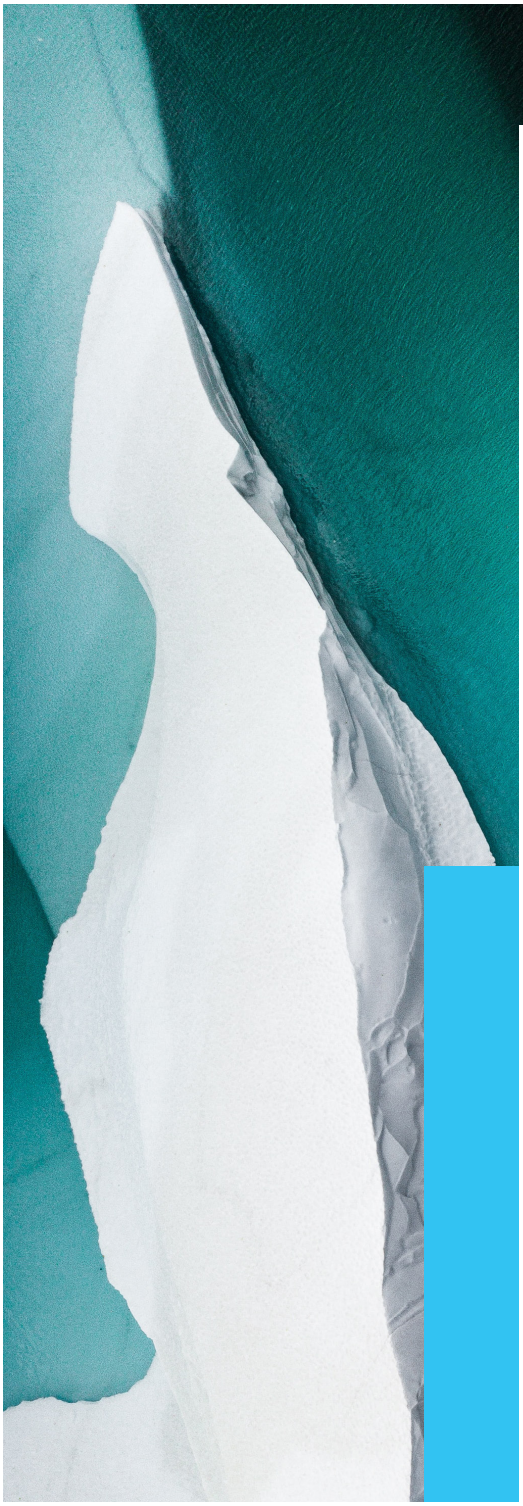
Exploiting this new predictive skill to support marine fisheries is emerging as one of the new opportunities and challenges of marine science. We aim to pioneer annual and multi-annual fisheries-related predictions by developing and operationalizing the first such products in collaboration with stakeholders.

Blue-Action is also 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”. Translating these predictions of the physical environment into biological outcomes, however, is not straightforward and forecasting marine ecosystems is a scientific field still in its infancy.



Producing Future Scenarios for the Russian Arctic

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.

This case study is focusing in the Yamal region of Russia, 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 sustainable 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.

Image credit: Oldag Caspar, Germanwatch

Blue-Action has developed an information service producing forward-looking scenarios to better understand the risks and opportunities associated with sustainable development in the Arctic, with a particular focus on oil and gas extraction. Together with stakeholder groups, Blue-Action co-developed 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.

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 helps 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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Image Credit: Steffen M. Olsen (DMI)


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