

A scenic view of a lake with mountains in the background and a dog sled team in the foreground. The water is a vibrant blue, and the sky is clear with a few clouds. In the foreground, the wooden deck of a boat is visible, with green ropes leading to a sled team. The sled team consists of several dogs of various breeds, including huskies and malamutes, pulling a sled. A person is visible on the sled in the distance. The overall atmosphere is serene and adventurous.

BLUE ACTION

From observing the ocean
to predicting the future

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How Blue-Action is
helping stakeholders
adapt to the
changing climate.



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

Blue-Action is a large-scale project that is actively improving our ability to observe, model and predict Arctic climate change and its impact on Northern Hemisphere climate and society.

The Arctic is warming twice as fast as anywhere else on the planet and rapid changes are occurring, from sea ice melt to warming air temperatures. However, these impacts are not restricted to the far north, as the Arctic is connected to the rest of the world via the atmospheric and ocean circulations. Understanding the drivers of these changes, and the connections between the Arctic and the Northern Hemisphere, allows us to make predictions

about the impact beyond the Arctic. Developing robust predictions is a vital step to allow businesses, communities and government to be able to adapt to the future.

Blue-Action involves over 120 experts from 40 organisations in 17 countries, pooling expertise to improve how we predict the impact of warming in the Arctic region and across the Northern hemisphere.

We work as part of international collaborations to:

Undertake comprehensive and sustained observations, especially in the Atlantic ocean

Use these data to develop and improve models that can predict climate from seasons to decades in advance

Translate these predictions into climate services, information that can directly help communities adapt to changes to come



Ocean Observations

Ocean observations let us understand, predict, and ultimately adapt to changes in the marine environment. These observations are central to understanding and forecasting societally relevant problems such as sea-level rise; changing climate patterns in a warming world and ocean services such as fishing.

Blue-Action is involved in global programs for ocean observations, including the Overturning in the Subpolar North Atlantic Programme (OSNAP), that measures circulation in the subpolar North Atlantic and connections to and from the Nordic Seas and Arctic Ocean.

Observing, modelling and predicting Earth's climate in the

21st Century is one of the pre-eminent problems facing society. Blue-Action is contributing to this global, international effort by focussing on the high latitudes, because climate changes there impact societies in the whole of the Northern Hemisphere.

The main reasons for observing the oceans:

- To better understand the physics and dynamics of ocean circulation.
- To quantify the effect of climate change of the oceans.
- To use these observations in models to verify and improve predictions

A comprehensive and sustained observational network for the ocean is required to monitor, understand and predict climate.

Methods for observing the ocean

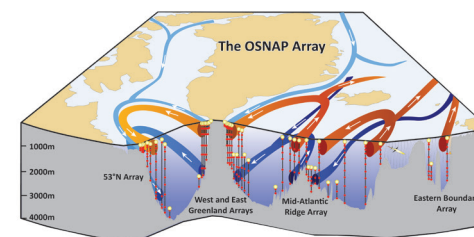


From space

Scientists can use satellites to measure surface variables such as ocean colour, sea ice extent and sea surface temperatures globally.

From mobile in-sea devices

Technology such as Autonomous Underwater Vehicles (AUVs) & Argo floats are able to provide subsurface measurements of variables such as temperature, salinity, pressure and oxygen.



Lozier et al. (2017) Bull. Amer. Meteor. Soc., 98, 737–752.

From in-situ arrays

Global collaboration has allowed a series of expansive permanent mooring arrays to directly measure ocean current and heat transport, answering questions about climate change and how ocean circulation is changing.



Climate predictions provide a reliable outlook on conditions in years to come across Europe and the North Atlantic

Climate Predictions

Climate predictions that use observations of the climate of today are a powerful tool for climate adaptation efforts in sectors and regions affected by strong natural climate variability and extremes.

In Blue-Action and the wider modelling community, we can make predictions about future climate, but we have to take into account a huge number of variables. To do this we create numerical models of the entire climate system, that include observations of the current conditions of the ocean, sea ice, and atmosphere. Similar to weather forecasting, we run these models into the future to predict the coming climatic conditions. These models are complex and expensive, and require international collaboration to develop and run.

Predictions of climate are possible largely because the ocean stores and transports heat. For example, the Gulf Stream is part of the Atlantic Meridional Overturning Circulation (AMOC), an important ocean current that carries warm water north in the Atlantic. It acts

as a conveyor belt that takes many years to travel from the south to the north. By looking downstream at conditions such as Gulf Stream temperature, we can predict the conditions in the north Atlantic years ahead. These predictions have advanced to a level that we can now provide useful information on climate conditions over Europe for the winter, sea ice conditions for the next few years, and oceanic conditions for the next ten years.

Blue-Action uses these models to make predictions for the next season to up to ten years ahead. We work in a new and exciting research area that closes the gap between short-term weather forecasting and long-term climate change projections. However, this timescale is very relevant to the period that communities, businesses and governments need in order to plan for the near future, and is an emerging field.

Climate and Information Services


Climate services are customised products that take predictions and data from scientific analysis, and turn these into directed knowledge for different end-users.

Predictions arising from climate models are complex and large-scale. For most people, the information they need to adapt to future climate change is simple and local. We essentially have a gap between the information people need, and the level that science operates on. Climate services are an attempt to bridge this gap, translating science into information that can be used by decision-makers.

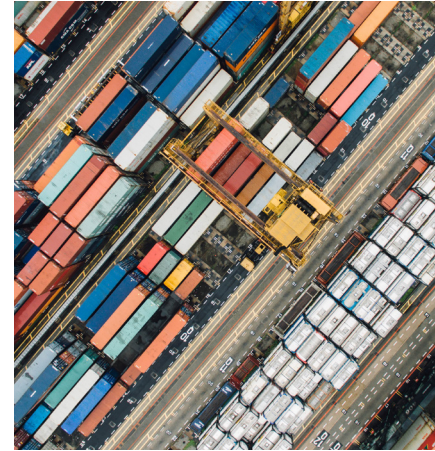
Climate services are co-developed with input from society on their needs, and input from scientists on the data. Engaging both private and public sectors is necessary to develop societally relevant climate services, based on these emerging climate predictions. For example, we are now able to provide forecasts of certain fish

distributions in the North Atlantic using oceanographic models, providing valuable information for governments, conservations and the fishing industry.

In Blue-Action, we have developed a further range of case studies to demonstrate the potential of climate services. These are as diverse as an app for optimal snowmaking conditions for a ski resort, an early-warning system for heatwaves in cities, and analyses of the probability of extreme weather conditions in the Arctic for the shipping industry. We also used climate information to work with communities in the Yamal in Russia to understand possible future scenarios under different actions, to aid current decision-making



Climate services translate climate predictions into valuable and actionable knowledge for citizens, businesses, NGOs and government.



Blue-Action uses the building blocks of ocean observations and computer models to co-design tools that can enable sectors to act on climate change.

We work with a range of partners to achieve societally relevant outcomes, and welcome feedback and further collaborations.

To find out more or to discuss working with us in the future, please contact our Communications Office at hannah.grist@srsi.com.



This publication was authored by Blue-Action partners:

Steffen M. Olsen, Danish Meteorological Institute

Barbara Berx, Marine Scotland Science

Stuart Cunningham, Scottish Association for Marine Science. Stuart was also supported by UK NERC National Capability programmes the Extended Ellett Line and CLASS (NE/R015953/1), NERC Large Grant UK OSNAP (NE/K010875/1)

Noel Keenlyside, University of Bergen

Mark R. Payne, Technical University of Denmark

Hannah Grist, SAMS Research Services Ltd

Pernille Martiny Modvig, Climate KIC



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