



# Assessing Potential for North Atlantic Integrated Atmospheric Research

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## Identifying pressures

The impact of human activity since the Industrial Revolution has altered the environment, pushing its stability to critical limits, with real implications for societal, economic and environmental systems. The planetary boundaries framework has provided a powerful tool for communicating the individual and collective threats arising from unsustainable post-industrial development, yet actions and responses take place at regional, national and local levels.

The North Atlantic is a key earth system component, surrounded by densely populated countries. It is particularly vulnerable to the effects of climate change owing to its interface with the Arctic, its housing of the Greenland ice shelf and the interlinked circulation patterns that have a profound impact on global climate variability and the carbon cycle. The North Atlantic atmosphere is influenced by natural and anthropogenic emissions. Environmental impacts arising from changes to the North Atlantic atmosphere will have major global consequences.

This study aims to conduct a detailed assessment of current national and international atmospheric research activities and evaluate the performance of research outputs from the North Atlantic research community in addressing major environmental challenges facing society today: air quality and climate change.

## Informing policy

Atmospheric protection is served by three multilateral environmental agreements (MEAs): the United Nations Economic Commission for Europe's Convention on Long-range Transboundary Air Pollution, the Vienna Convention for the Protection of the Ozone Layer and the United Nations Framework Convention on Climate Change (UNFCCC). Each addresses different environmental issues. This siloed approach has had varying degrees of success, with the success of the Vienna Convention being overshadowed by the failure of the UNFCCC to halt the rising concentration of global greenhouse gases. Many scientific and organisational partnerships exist between the atmospheric observation communities that

support the respective MEAs, but a unified approach to assessing our knowledge of the interactions and feedbacks between the changing atmospheric composition and the Earth system globally is yet to be seen.

Effective mitigation policy that addresses multiple environmental issues must be supported by integrated research systems that span multiple strands of the atmospheric system, so that connections can be made between atmospheric processes.

Commitments to protecting the atmosphere have been made – but similar commitments to the sustained monitoring programmes that fundamentally inform policy and evaluation are limited.

## Developing solutions

The North Atlantic boasts unique atmospheric observational capacity and is home to some of the most globally advanced atmospheric measurement sites. Considering the investment capacity that exists in the surrounding developed countries, the North Atlantic community is uniquely positioned to assess and inform effective integrated responses to these challenges. However, this study found that gaps remain in North Atlantic atmospheric measurement, not only in terms of the spatial distribution of the measurement sites, but also the coordination and synthesis of measurements. Filling these gaps is necessary for integrated scientific assessment that leads to targeted policy responses addressing atmospheric protection, cross-cutting all issues of atmospheric and environmental protection. The North Atlantic region has set the stage for collaborative initiatives that have advanced atmospheric research considerably, including Aerosol Characterisation Experiments 1 and 2.

There is scope to build on the legacy of the observation capacity and international scale of atmospheric composition projects, to bring together the existing monitoring activities of large-scale international projects for targeted scientific output and public engagement and effective responses to environmental change.

