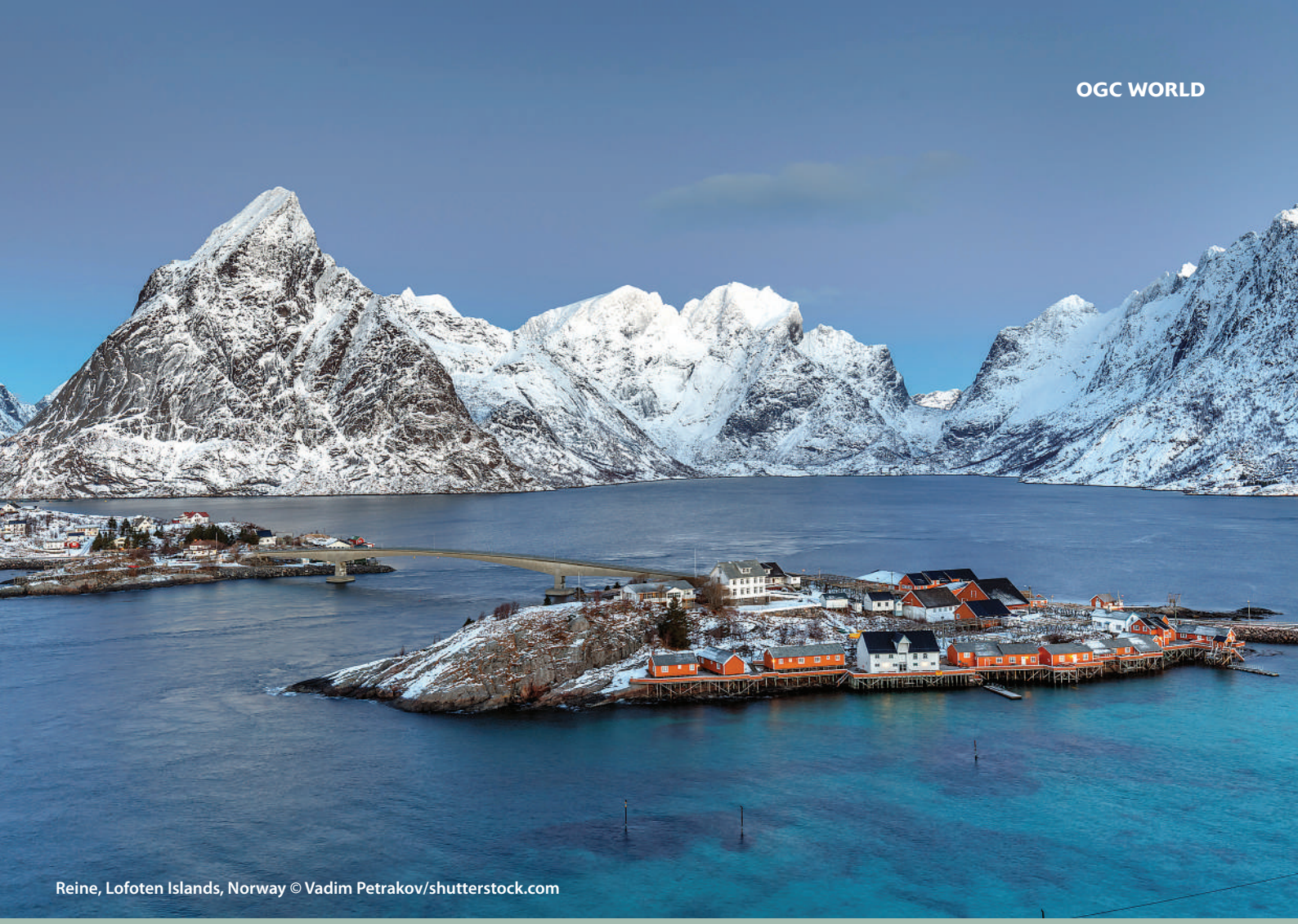

Reine, Lofoten Islands, Norway © Vadim Petrakov/shutterstock.com

NORTHERN EXPOSURE

DATA FOR PROJECTS IN THE ARCTIC ISN'T LACKING – BUT ACCESS TO IT IS. INGO SIMONIS REPORTS ON A PROJECT TO CREATE A SPATIAL DATA INFRASTRUCTURE FOR THE ARCTIC THAT WILL UNITE DATASETS AND UNLOCK VALUE FOR EVERYONE INVOLVED WITH THE REGION

A single Arctic weather station provides valid information for a rather small geographic area and time frame, but combining that with a network of weather stations, plus satellite data, forecast models, and data retrieved from ice cores, for example, allows understanding climatic variations for large geographic areas including the impact of climate change on the Arctic and vice versa. This combined data becomes more valuable than the sum of its parts.

Interest in the Arctic is constantly growing due to its strong linkages to global climate systems, geo-political importance, economic opportunities and unique ecosystems. Key to all these domains is reliable and up-to-date data that supports understanding of its complex processes. It needs to be served using standardised interfaces, be made discoverable at various levels of technical aggregation, time slicing, or thematic aggregation, and be processed in an *a priori* unlimited problem space.

There are many Arctic datasets produced by a wide variety of organisations that are available at a number of Internet portals. However, discovery, access, and integration of these datasets are still major issues. The portals provide very little support to their users, require the use of precise query strings, poorly document any 'fit for purpose', and make access to the data unnecessarily difficult. Even after the user has acquired the data, a lack of data standards makes data integration a time consuming, expensive process.

To better understand the key issues with geospatial data and services for the Arctic as experienced by users, the US Geological Survey (USGS) together with Natural Resources Canada (NRCan) have sponsored the Open Geospatial Consortium (OGC) to execute a pilot activity and conceptual study called the Arctic Spatial Data Pilot (Arctic SDP). The goal is to enhance the user experience and to demonstrate the value of geospatial data served to a broad community of stakeholders using standardised interfaces and formats. The results will:

- Inform the Arctic SDI Strategic Plan 2015-2020 and showcase the value of shared and integrated services being delivered into national and regional SDIs.
- Help stakeholders gain new perspectives of social, economic and environmental issues by providing an online network of resources that improve the sharing, use, and integration of information tied to geographic locations.
- Contribute to the understanding of the complex web of stakeholders, SDI architectural approaches, software components, governance settings, and operational guidelines.

- Further inform the future of pan-Arctic science, monitoring, and societal, economic, and environmental decision support.
- Help to generate a better understanding of how national spatial data infrastructures can be developed and applied to support international Arctic priorities, and to potentially showcase for the world the "system of systems" approach for data management across distributed SDIs.

The conceptual study started with an analysis of geospatial web service inventories and their potential extension. Often, a project lacks data not because the data doesn't exist but because it is too difficult to find on the Internet. The project analysis made clear that the installation of additional catalogue services (OGC CSW) with enhanced capabilities is necessary to maximise interoperability, usability, and discovery. Experiments in other initiatives have shown that a simple harvesting of available catalogues is insufficient. Thus, new catalogue models have been put on the 'wish list' for enhanced technology that will be implemented in the second half of the Arctic SDP.

The OGC made a request for information to build a more encompassing view of an SDI for the Arctic, including insight into its stakeholders, their requirements and high-level governance objectives, possible architectures and data products, standards, and potential use cases. Based on direct communication with stakeholders and taking the feedback from respondents into account, a report was produced that describes three different architectural concepts for an SDI for the Arctic.

These three concepts will ensure a robust and sustainable architecture for an SDI for the Arctic, and include some new aspects that are not part of traditional SDI implementations. As the underlying basic requirements remain the same, the three described concepts have mutual dependencies that shall be explored in the second phase of the project. In order to provide a pathway from well-established concepts to ones that will potentially provide higher levels of interoperability, the second phase of this pilot will need to explore these complementary paths carefully.

Architectural evolutions

The conceptual study further describes architectural evolutions and concepts for the SDI for the Arctic – and SDIs in general – complemented by overviews of: existing and required data sets; standards for data formats, data access, metadata and catalogues; geodata integration; and other additional standards. The conceptual study also discusses applications, scenarios and use cases that will need to be further refined for the second phase of the pilot.

The second phase will invite participants through a request for quotation. The goal will be to demonstrate the value of a standards-based SDI for the Arctic by executing a number of data integration scenarios. One potential option will be to use technologies developed or components set up during the pilot implementation that fill gaps in interoperability or data. Others include: compliance tests to optimise interoperability contracts between parties involved in the SDI for the Arctic; experiments with shared vocabularies to enhance the discovery of data; server technologies that support aspects such as low-bandwidth situations or four-dimensional data (3D plus time); or architectural concepts that improve data exchange and integration.

The availability of good data is crucial for any information system to be useful. For most organisations, core data come from their own operations, is produced in-house and rarely shared with others. However, combining datasets from a number of sources enables better understanding of historic, current, and future processes. The key to a successful pilot will bedemonstrating this added-value to multiple stakeholder levels.

THE AVAILABILITY OF GOOD DATA IS CRUCIAL FOR ANY INFORMATION SYSTEM TO BE USEFUL

Dr Ingo Simonis is director, interoperability programs and science at the OGC. More information about the Arctic SDP can be found at www.opengeospatial.org/projects/initiatives/arcticsdp