CARTOGRAMS

# THE GREAT THAW

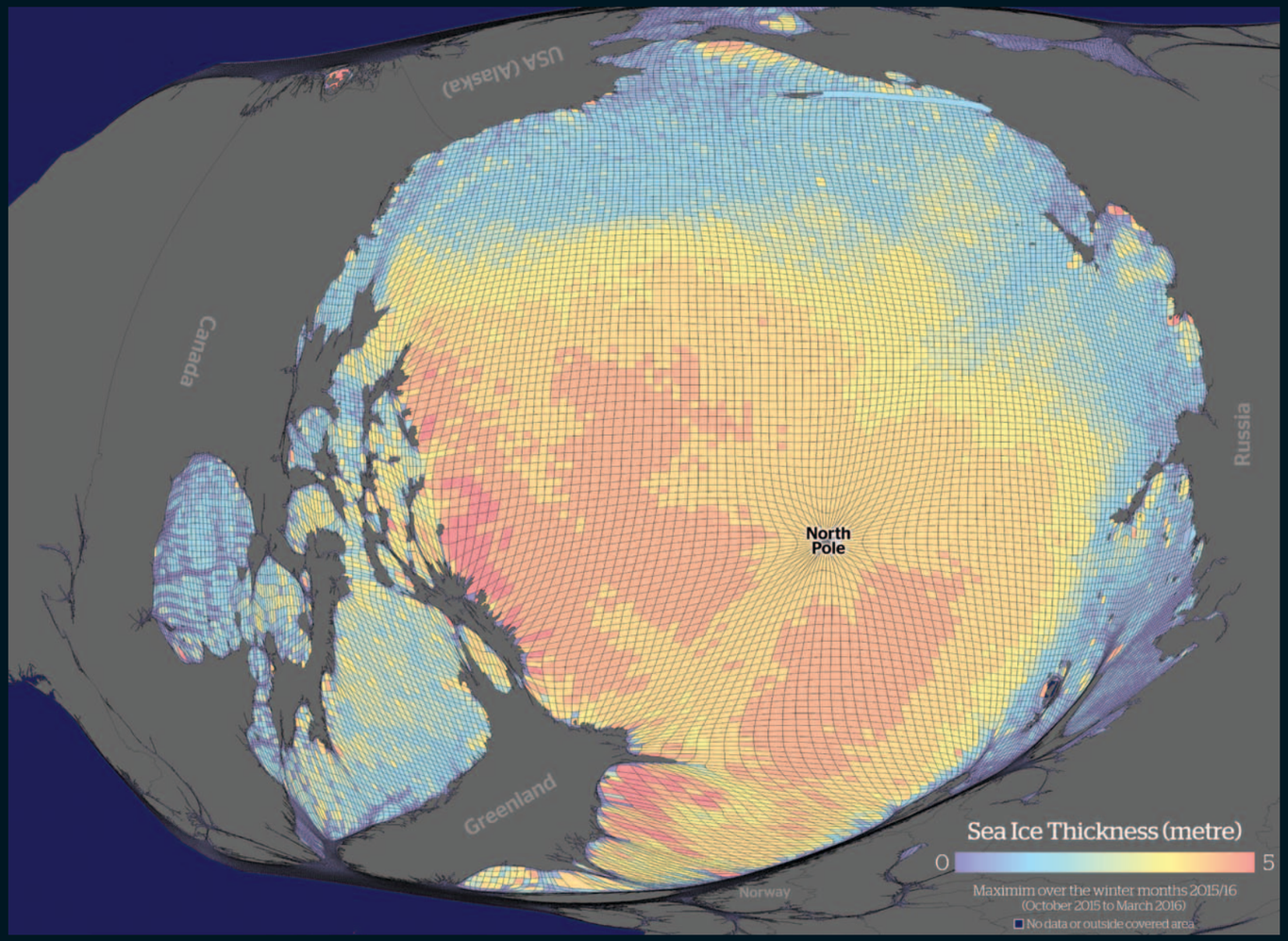
**BY BENJAMIN HENNIG**

Sea ice can be described as frozen seawater floating on the surface of the polar oceans. It does not include icebergs or ice shelves, as these are originating from glaciers, rather than sea water. Sea ice becomes thickest and most widespread over the respective winter months in each hemisphere, covering the oceans around the Arctic and Antarctic with millions of square kilometres of ice. It melts when the seasons change, but in the Arctic large areas remain covered all year around, while Antarctic sea ice melts away over the summer in the southern hemisphere.

Sea ice in the Arctic has become of special interest of late, with research taking place on its role in regulating the global climate. It influences salinity of the ocean and affects the heat flux between the air and the ocean temperature. Sea ice also plays an important role in the polar ecosystems, most notably for marine mammals such as polar bears and seals.

From a human perspective, changes in the sea ice cover and resulting changes of important habitats have an impact on indigenous populations whose livelihoods are intertwined with the changing polar seasons and the existence of sea ice. It also affects the ability to navigate the polar oceans. Icebreakers are only capable of sailing through ice of a certain thickness. In recent years, the prospect of possible ice-free shipping routes through the northern seas during the summer period has become a serious prospect for shortening the distance between the Asian and European sea ports. Other economic factors are the natural resources in the Arctic Ocean which could become easier to access and exploit if sea ice concentrations are in decline due to global warming.

While sea ice melts over the summer months, the winter period is crucial to building up the sea ice cover. This map shows the thickness of sea ice over the last northern hemisphere winter period, between the months of October 2015 and March 2016. Data used in this cartogram was measured by the CryoSat-2 satellite operated by the European Space Agency. CryoSat-2 is a sensor specialising in measuring the changes in the polar ice cover in both the Arctic and Antarctic region.




The cartogram distorts the Arctic Ocean by the total thickness of sea ice aggregated over the last winter. Using a regularly distributed raster grid, the cartogram transformation resizes each of the grid cells proportionally to the thickness of sea ice in that area. The map is centred on the North Pole, and the surrounding land area is included in the transformation for better orientation. Countries neighbouring the Arctic seas within the polar circle are labelled. The additional colour key highlights the maximum thickness of sea ice averaged for each grid cell area.

Arctic sea ice covers 14 to 16 million square kilometres in late winter. The cartogram shows the spatial patterns in the higher concentration of thicker sea ice towards the Canadian archipelago and the Greenlandic coast, while it appears much thinner along the Russian coast. It's here that we might see possible future shipping routes, as the thinner ice cover over the winter period increases the chances of these areas becoming ice free over summer. At the moment it is estimated that the ice cover over summer decreases to about seven million square kilometres. Long-term trends also suggest that the median ice edge is in retreat, and that the thickness of sea ice in the Arctic is changing. A long-term study using other satellite observations recently found that ice thickness in the Arctic declined from an average of 3.59 metres in 1975 to 1.25 metres in 2012, which is a reduction of 65 per cent.

Changes in Arctic sea ice has begun to turn the region into an important area of economic interest for neighbouring nations. Claims over ownership of the Arctic waters (and resources) has already begun. With its decline and changing patterns, sea ice might soon no longer be capable of protecting one of the last frontiers of human impact.

*Benjamin Hennig (**@geoviews**) is Assistant Professor in Geography, University of Iceland and Honorary Research Associate in the School of Geography and the Environment at the University of Oxford. He is also part of the Worldmapper project and is author of mapping blog **www.viewsoftheworld.net**.*

*For a deeper look at the geopolitical state of the Arctic, see Perspectives on page 38.*

ENERGY

# OUT OF THE DARK

As a dried-up dam starts to refill, and a push towards cleaner, renewable energy gets underway, many are still asking if Ghana's chronic power cuts will ever come to an end?

It is with nervous relief that Ghana is finally embracing an improvement to its ongoing electricity crisis. For the past five years, the country has been plagued with blackouts. In that time, small businesses have crumbled, families have relied on costly and polluting home generators, and, in hospitals, babies have been born by the glowing, blueish light of smartphones.

The crisis came mostly from a lack of supply. Ghana's strong, growing economy, along with a rapidly urbanising population, has meant that demand for electricity has increased by 300 per cent in the past 50 years. To make matters worse, the supply that should have been available simply wasn't there. Gas usually imported from Nigeria has been unreliable, thermal plants have not delivered on promises and, crucially, its prodigal Akosombo Dam has been running dry.

'The Akosombo Dam is the largest source of power in Ghana,' says Dr Ishmael Ackah, Head of Policy at the Africa Centre for Energy Policy. 'It makes up 27 per cent of Ghana's capacity.' Built in 1965, the dam was celebrated as a triumph of engineering and a symbol of the country's recent independence. Lately, however, Akosombo has struggled. In 2015, six unusually dry months meant that its turbines had to work with water well below its minimum operating level. Lack of rainfall, few alternatives and high demand became a three-headed problem that kept Ghana in the dark.

'The water level has risen again but the availability of gas continues to be a challenge,' says Ackah. 'The solution must be to diversify the power, with an emphasis on solar and wind.' By 2020, the government hopes to generate ten per cent of its electricity from renewables, excluding the large amount already coming from hydro. More than just an environmentally noble solution, renewables would be more practical for Ghana. 'They would help promote self-sufficiency in energy supply,' explains Ackah. Plus, they can work off-grid: in the past year the government has dispatched 50,000 home solar systems and lanterns to rural communities.