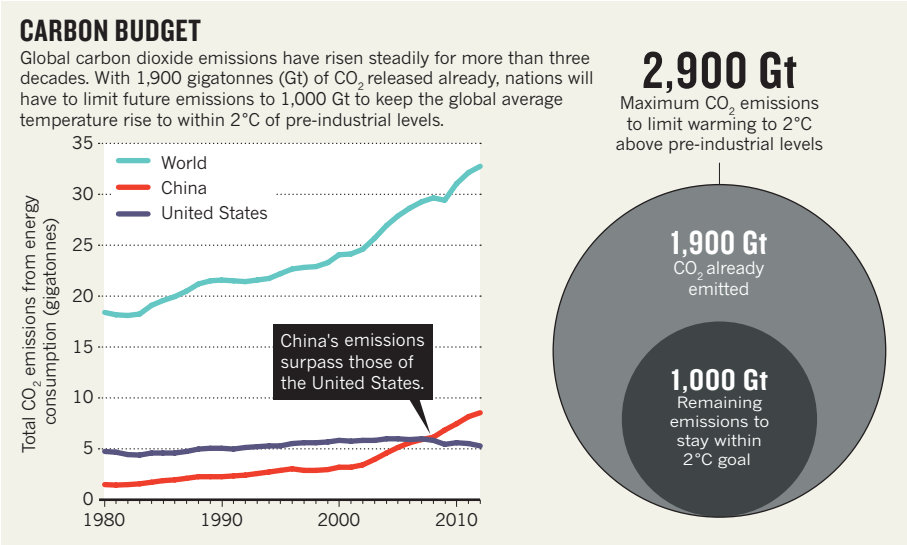


SOURCE: UNEP

commitments, intervening when they do not and then revisiting the pledges to ratchet down emissions over time.

Saleemul Huq, director of the International Centre for Climate Change and Development in Dhaka, says that the US–China agreement marks a shift in climate negotiations. Battles may arise over the ultimate treaty's structure, further emissions reductions and financial aid promised by developed nations. But most countries, rich and poor alike, are now aligned and committed to addressing climate change. "I think momentum is the key, rather than an agreement that solves everything on paper," Huq says.

He maintains that the political challenge is quite simple: move investments away from fossil fuels and into clean energy. "If we can make that switch," he says, "then we have more or less won the game."

Nations have committed to limiting the global average temperature increase to 2 °C above pre-industrial levels, but so far there is little evidence that their governments will follow through. Scientists have calculated an overall limit on how much more carbon dioxide can be emitted to stay within that range — about a trillion tonnes — and mapped out a range of emissions-reduction pathways that are required to keep within that budget. On the basis of commitments in place before the US–China deal, the UN Environment Programme projects that emissions will exceed the level consistent with the 2 °C mark by 40% in 2030.

The US–China deal will not close this gap, but it is nonetheless a step in the right direction, says Bill Hare, managing director of Climate Analytics, a think tank in Berlin that analyzes national climate policies. "They are definitely within shouting distance of the 2 °C pathway," he says, "and it's going to put pressure on many others to enter the game."

The European Union has already said that it will reduce its emissions to 40% below 1990 levels by 2030, and further pledges are expected in the first quarter of 2015. Whereas the 1997 Kyoto Protocol bound only developed countries and covered around 40% of global emissions, experts expect that the current round of commitments, scheduled to be submitted to the UNFCCC by March, includes all major countries and is likely to cover up to 80% of global emissions.

"It's a completely different ball game," says Valli Moosa, a former environment minister for South Africa and current chairman of the conservation organization WWF South Africa. He is currently co-chairing an independent dialogue involving climate officials from more than 20 leading countries at the Center for Climate and Energy Solutions — and on the basis of those discussions, he thinks that the road to Paris looks promising.

"Everything is aligned for success," he says. "Having said that, it's anybody's guess." ■

MARINE SCIENCE

Ocean observatory project hits rough water

Problems with data management challenge US effort to monitor seas in real time.

BY ALEXANDRA WITZE

From the waters off western North America to the seas surrounding Greenland, US oceanographers have nearly finished deploying hundreds of sensors, moorings, gliders and other equipment that make up an ambitious US$386-million effort to establish the world's biggest interactive portal to the oceans. Through the Ocean Observatories Initiative (OOI), set for completion by May 2015, anyone could watch the climate changing in the North Pacific or an underwater volcano erupting in real time.

But even as the final instruments splash into the sea, the project has hit a snag. After spending $37 million to develop state-of-the-art software to manage live data, the OOI has terminated that contract — shifting responsibility for 'cyberinfrastructure' from the University of California, San Diego (UCSD), to a group based at Rutgers University in New Brunswick, New Jersey.

The shift is meant to help the OOI finish construction on time and on budget by next spring, and is likely to delay the start of data streaming by only a few months. Still, it is making some oceanographers anxious, given the project's broad scope. Data from its observatories are likely to dominate US oceanography for the next 25 years — the OOI's planned lifetime.

The project, funded by the US National Science Foundation, is intended to be for the oceans what earthquake and volcano monitors are for the land: a way to allow real-time glimpses into the currents, marine life and chemistry in the deep sea. It will scrutinize a few select patches of ocean in exhaustive detail, using instruments attached to cables and on free-sailing gliders to measure temperature, salinity, chemistry and other key oceanographic parameters. The network's scattered locations include a cabled sea-floor observatory off the coast of Oregon; sets of instrumented moorings off the US east and west coasts; and

four high-latitude sites (see 'Wired waters').

As *Nature* went to press, a few spreadsheets' worth of data gathered over the summer from the coastal sites was all that was publicly available. Live data from the entire system will start rolling out slowly over the next couple of months, says Tim Cowles, who oversees project construction for the Consortium for Ocean Leadership in Washington DC, which is overseeing the OOI.

Originally, the data were to flow into a sophisticated command-and-control system where, for instance, oceanographers could order a glider to quickly change its course. John Orcutt, head of the UCSD project, says that his team had built this command interface and that it was delivering data reliably.

But Cowles says that the project had been slipping further and further behind schedule, and so the decision was made to terminate the UCSD contract. In the early morning of 1 November, Orcutt's team shut down its connections with OOI equipment and began packing up computer servers to ship to Rutgers.

Cowles acknowledges that the Rutgers software is likely to be more basic than the UCSD system; it might, for instance, have less ability to control equipment in the water. "Somebody's going to say 'I really wanted a Ferrari and you only delivered a BMW'," he says. "But the key user functionality will be there."

Finishing the data-management system could be a race against time, at least for a key OOI site off the Oregon coast. There, the underwater volcano Axial is building up to an eruption. This summer, in a marathon effort, a team led by scientists from the University of Washington finished installing all the instruments at Axial — including seismometers, web cameras, and others — for the sea-floor cabled observatory. "It's in the water, and it works," says John Delaney, an oceanographer at the University of Washington in Seattle who designed the observatory. "I'm very, very excited about that." But data from the OOI cable are not yet available to the broader scientific community.

The timing is urgent: Axial last erupted in 2011, and magma is now refilling the sea floor beneath the volcano so quickly that some geologists predict that it will erupt within a year. As they wait for the OOI software, Delaney and others are working to arrange access through a data centre at the Incorporated Research Institutions for Seismology in Washington DC. "I want the data in the hands of the community," says Delaney. "That's what it was all about to begin with."

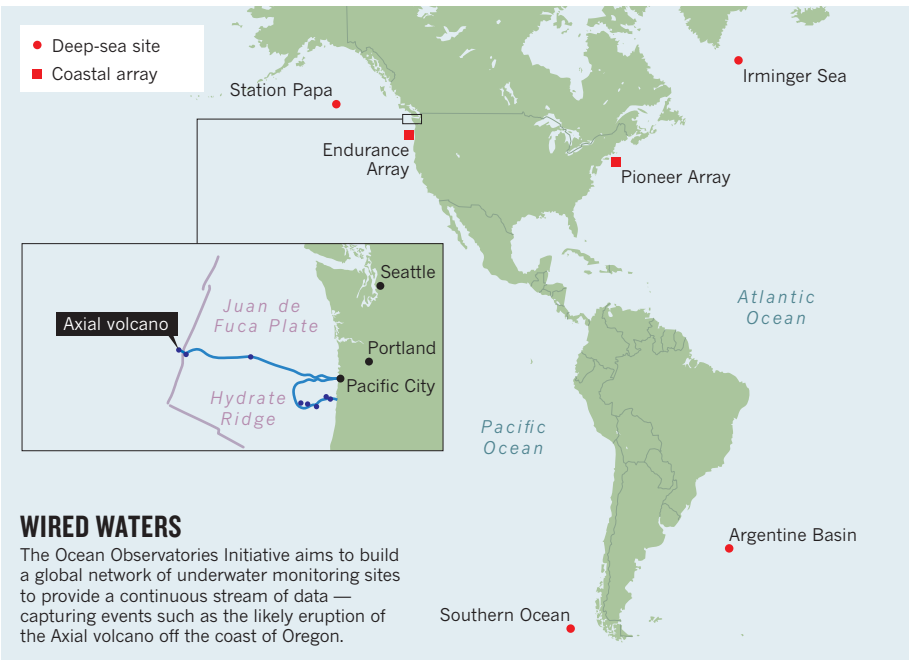
In addition to the unfinished data pipeline, two major parts of the OOI have yet to go into the water. In February and March 2015, oceanographers aboard the research vessel *Atlantis* will deploy moored sensor arrays off the coasts of Chile and Argentina — the network's final sites.

The OOI will be formally commissioned in mid-May, which is the ultimate deadline for all the data to be publicly available. Science workshops on using the data will take place starting early next year, Cowles wrote in a 24 November web update.

"If there are expectations that were developed six years ago by members of the community, maybe that wish won't necessarily come true based on their earliest dream," says Cowles. "Nonetheless, the built reality of the OOI will be remarkable, and unlike any functionality we in ocean science have had before." ■

CANADIAN SCIENTIFIC SUBMERSIBLE FACILITY

Installation of the Ocean Observatories Initiative network is set to finish in May 2015.



WIRED WATERS

The Ocean Observatories Initiative aims to build a global network of underwater monitoring sites to provide a continuous stream of data — capturing events such as the likely eruption of the Axial volcano off the coast of Oregon.