

All eyes are on the Arctic right now

Sea ice coverage now below levels of record-setting 2012

BY CHRIS MOONEY
THE WASHINGTON POST

New data from NASA and the National Oceanic and Atmospheric Administration suggest that January of 2016 was, for the globe, a truly extraordinary month. Coming off the hottest year ever recorded (2015), January saw the greatest departure from average of any month on record, according to data provided by NASA.

But the record breaking heat wasn't uniformly distributed — it was particularly pronounced at the top of the world, showing temperature anomalies above 7.2 degrees Fahrenheit, higher than the 1951 to 1980 average in this region.

Indeed, NASA provides a “zonal mean” temperature map, which shows how the temperature departures from average change based on one's latitude location on the Earth. Things get especially warm, relative to what the Earth is used to, as you enter the very high latitudes.

Global warming has long been known to be particularly intense in the Arctic — a phenomenon known as “Arctic amplification” — but even so, lately the phenomenon has been extremely pronounced.

This unusual Arctic heat has been accompanied by a new record low level for Arctic sea ice extent during the normally ice-packed month of January, according to the National Snow and Ice Data Center — more than 400,000 square miles below average for the month. And of course, that is closely tied to warm Arctic air temperatures.

“We've looked at the average January temperatures, and we look at what we call the 925 millibar level, about 3,000 feet up in the atmosphere,” says Mark Serreze, the center's director. “And it was, I would say, absurdly warm across the entire Arctic Ocean.” The center reports temperature anomalies at this altitude of “more than 13 degrees Fahrenheit above average” for the month.



ALISTAIR SCRUTTON | REUTERS
A whale dives into sea off the coast of Greenland's capital in 2012. Unusual Arctic heat this year has been accompanied by a new record low level for Arctic sea ice extent during the normally ice-packed month of January, according to the National Snow and Ice Data Center.

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RICK THOMAN, ALASKA NATIONAL WEATHER SERVICE

The low sea ice situation has now continued into February. Current ice extent is well below levels at the same point in 2012, which went on to set the current record for the lowest sea ice minimum extent.

“We're way down, we're at a record low for this time of year right now,” says Serreze. When it comes to the rest of 2016 and the coming summer and fall season when ice melts across the Arctic and reaches its lowest extent, he says, “we are starting out in a deep hole.”

So what's causing it all? It's a complicated picture,

say scientists, but it's likely much of it has to do with the very strong El Nino event that has carried over from 2015. But that's not necessarily the only factor.

“We've got this huge El Nino out there, we have the warm blob in the northeast Pacific, the cool blob in the Atlantic, and this ridiculously warm Arctic,” says Jennifer Francis, a climate researcher at Rutgers University who focuses on the Arctic and has argued that Arctic changes are changing mid-latitude weather by causing wobbles in the jet stream. “All these things happening

at the same time that have never happened before.”

Serreze agrees that the El Nino has something to do with what's happening in the Arctic. “I think this is more than coincidence. That we have this very strong El Nino at the same time when we have this absurd Arctic warmth. But exactly what the details are on that, I don't think we can say right now,” he says.

In Alaska, matters have been quite warm but not record-breaking this winter, says Rick Thoman, climate science and services manager for the National Weather Service in the state.

“It's been another warm winter in Alaska,” Thoman says. “No other way to put it. This is the third in a row that's been significantly warmer than normal.” Alas-

ka's winter so far (taking into account the months of November, December and January) has been the third warmest on record since 1925, he says.

Still, it all fits a by-now familiar picture of an Arctic warming up considerably faster than the mid-latitudes, with consequences that could extend far outside of the polar region, says Rafe Pomerance, a former deputy assistant secretary of state who sits on the National Academy of Sciences' Polar Research Board.

Impacts of Arctic warming are usually considered in isolation, and that's a mistake, he says. “It's unraveling, every piece of it is unraveling, they're all in lockstep together,” Pomerance adds. “What tends to happen is, everybody nationally reports on the latest piece of news, which is about one system. You hear about the sea ice absent the temperature trend. So you really have to think of it as a whole.”

Indeed, impacts of Arctic warming include the melting of major Arctic glaciers and Greenland (containing the potential for up to 23 feet of sea level rise if it were to melt entirely), the thawing of carbon rich permafrost (which could add to the burden of atmospheric greenhouse gas emissions) and signs of worsening wildfires across the boreal forests of Alaska, to name a few.

If the Arctic is this warm in January and February, then when real warmth comes later this year, these will all be areas to watch.

“I think this winter is going to get studied like crazy, for quite a while,” says Francis. “It's a very interesting time.”

The high carbon cost of growing marijuana

Energy costs make cannabis a not-so-green business

BY CHELSEA HARVEY
THE WASHINGTON POST

As legal marijuana markets continue to expand in the United States, some experts are arguing that growers have both the need and the opportunity to make their operations, well, greener. A new report, published by data analysis firm New Frontier, highlights the huge energy footprint of marijuana cultivation and outlines strategies to make production more energy efficient — a transition that the authors claim is not only good for the environment, but good for business, too.

“We wanted to focus on this issue of energy use in the marijuana industry because we think it is one that is going to have very significant long-term implications,” said the new report's lead author John Kagia, director of industry analytics for the firm, which specializes in data and analytics for the cannabis industry. “Marijuana is the most energy-intensive agricultural commodity that we produce, and that's largely because of the very high energy costs associated with its cultivation and production indoors.”

The new report draws on data from a variety of sources, including businesses within the industry, government agencies and consumer studies, and paints an alarming portrait of the industry's extreme energy use. Research cited in the report suggests that marijuana production in the U.S. accounts for 1 percent of the entire nation's electrical output — the equivalent of the electricity used by 1.7 million homes with a staggering price tag of \$6 billion every year.

Most of this electricity is used to facilitate indoor cultivation, which is the focus of the new report. Historically, this growing strategy has been a way for growers to cultivate their plants discreetly, the report notes, although it also allows for more precise control over the plants' environment. The problem is that all the controls required to maintain an indoor growing space can require huge amounts of electricity. In addition to artificial lighting, indoor cultivation also requires dehumidification, ventilation and air conditioning — all energy-intensive processes.

The report's focus highlights a problem that de-

Marijuana production accounts for 1 percent of the entire nation's electrical output — the equivalent of the electricity used by 1.7 million homes with a price tag of \$6 billion every year.

serves greater attention, according to Evan Mills, an energy efficiency consultant and staff scientist at the Lawrence Berkeley National Laboratory. Mills served as an adviser to the new report and his independent research on the carbon footprint of cannabis production (not associated with his work at the national laboratory) is extensively cited in the paper.

While the issue may remain under-addressed in many places, though, it is starting to gain mainstream attention. Last year, for instance, a paper in the Columbia Journal of Environmental Law noted the industry's high power use and proposed that states in which marijuana use is legalized should also write policies requiring the industry to power itself with clean energy.

As an example of indoor cultivation's intensive energy requirements, the new paper points to a report from utility company Xcel Energy, which claimed that marijuana facilities in Colorado consumed 200 million kilowatt-hours in 2014. Overall, Kagia's report estimates that the industry in the state paid an electricity bill of approximately \$19.6 million in 2014 — notable, as he pointed out, because there were fewer than 1,200 licensed growers in the state that year.

There's an economic imperative to use less energy as well as an environmental one. The question is how it can be done. Kagia's report outlines a number of strategies on this front.

First, and most obviously, growers could switch to outdoor or greenhouse cultivation when possible. But Kagia pointed out that this isn't an option for everybody. “There are some environments, by regulation or because of the environmental conditions, you would not be able to,” he said, noting that very cold or very hot climates would prohibit the growing of all but a few strains of marijuana. But in cases where state or municipal laws prohibit outdoor growing, the report suggests that growers begin advocating for less restrictive regulations.

However, there are certain other appeals to indoor

growing, such as easier pest management, that may deter some growers from moving outdoors, even if the option is available. And it's also important to note that outdoor cultivation, while certainly less energy-intensive, comes with its own set of environmental concerns. The large amounts of pesticides typically used to protect outdoor marijuana farms is among the biggest of these.

Fortunately, it's possible to make indoor cultivation more energy efficient, the new report says. Installing more energy efficient lighting is one of the biggest steps. According to the report, growers have traditionally tended to rely on high intensity discharge lamps for their lighting. The report lists several more efficient alternatives, including specially designed LED lights and induction lights, which use magnets to transmit electricity.

“Over the past decade or so, great strides have been made in the lighting technologies or solutions provided by the LED companies,” Kagia said. “To date, they have still not been able to surpass the cost performance threshold offered by existing lights, but we are getting there, and we think this innovation that is happening around the lighting sector is one of the ways that this industry will be able to decouple itself from this extremely high energy use.”

The report also recommends that growers conduct energy audits and install smart meters to keep better track of where they are expending the most energy. And finally, Mills also noted that a major challenge for improving efficiency in the future will be for policymakers to get involved in the issue and “exercise foresight” when developing regulations that will affect the industry's energy use. Addressing grow facilities in building energy codes, for example, and coming up with carbon-neutral building designs specifically for grow facilities is one forward-thinking goal he suggested.

Chris Mooney contributed to this report.

Los Angeles-area methane leak sealed

BY PAULA LEHMAN
REUTERS

LOS ANGELES — An underground natural gas pipeline rupture that caused the largest-ever methane leak in California has been permanently capped, paving the way for thousands of displaced Los Angeles residents to return home, state regulators said on Thursday.

The leak, which began in October and accounted for a fourth of all daily methane emissions statewide at its height, was confirmed by a series of independent laboratory tests to have been successfully sealed as of Wednesday night, officials said.

The leak originated from a broken injection-well pipe deep beneath the surface of

the 3,600-acre Aliso Canyon natural gas storage field, owned by Southern California Gas Co.

The stench of fumes from the site sickened scores of people for weeks and prompted the temporary relocation of more than 6,600 households from the northern Los Angeles community of Porter Ranch, located at the edge of the gas field.



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