



the weekly anthropocene



dispatches from the wild, weird world of humanity and its biosphere
by Sam Matey

Carbon Engineering. In an astonishing new revelation with the potential to transform the world's energy system, a Canadian company has developed a scalable, cost-effective way to capture carbon dioxide (the major contributor to human-caused climate change) from the air and convert it into fuel. Carbon Engineering was founded by Harvard Professor of Applied Physics David Keith in 2009 to develop two technologies



Professor Keith calls Direct Air Capture and Air to Fuels. Carbon Engineering's renewable energy-powered prototype plant in Squamish, British Columbia (pictured above, their concept art for a larger Direct Air Capture plant in the future) has been successfully removing carbon dioxide in the air since 2015. This is possible through giant fans that suck air into an aqueous solution that traps the air's carbon dioxide. Now, as revealed in a new study published in the journal *Joule* and coauthored by Keith, Carbon Engineering has found a way to convert that carbon dioxide into fuel. A sequence of industrial chemical reactions converts the CO₂ in that solution into hydrocarbon fuels like gasoline that are compatible with existing car engines. "The carbon dioxide generated via direct air capture can be combined with sequestration for carbon removal, or it can enable the production of carbon-neutral hydrocarbons, which is a way to take low-cost carbon-free power sources like solar or wind and channel them into fuels that can be used to decarbonize the transportation sector," said Keith. (Pictured, a bottle of fuel produced by Carbon Engineering's new technologies). This company has essentially found a way to mine the air to create carbon-neutral, renewable gasoline: the same CO₂ could be emitted, re-converted into fuel, and used again. This is a carbon capture solution of unprecedented cost-efficiency, scalability, and proven effectiveness. It is not an exaggeration to say that if widely adopted, it could transform the world's energy economy. Carbon Engineering is currently working to expand their business by licensing their technology and building more, larger air-to-fuel plants. "After 100 person-years of practical engineering and cost analysis, we can confidently say that while air capture is not some magical cheap solution, it is a viable and buildable technology for producing carbon-neutral fuels in the immediate future and for removing carbon in the long run," says Professor Keith. For more on this amazing story, check out goo.gl/SmGK2y, goo.gl/CXh8iV, goo.gl/k2SB3B and carbonengineering.com. Spectacular news!



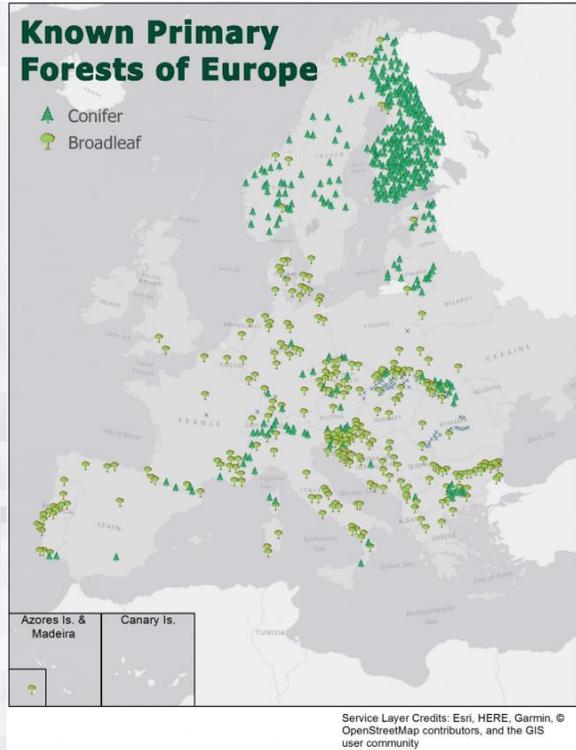


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Europe. A new study published in the journal *Diversity & Distributions* has found that there are many more small tracts of European primary forest than previously thought. In Europe, “primary forests” include any forests that have shown no sign of human modification for at least the past 60 years. In this study, an international research team used tree cover data and interviews with thousands of foresters around Europe to determine the current extent of European primary forests. They found that 5,313 square miles of primary forest remain in Europe (pictured), considerably more than previously believed. “It is not that these forests were never touched by man. This would be hard to believe in Europe,” said Dr. Francesco Maria Sabatini, lead author of the new study. “Still, these are forests where there are no clearly visible indications of human activities. Maybe that’s because they were blurred by decades of non-intervention, where ecological processes follow a natural dynamic.” These undisturbed ecological processes allow primary forests to be more productive, and to support more species. The researchers also found that although 89% of these forests receive some legal protection, only 46% protect receive strict protection, meaning the majority of these forests could be legally logged. They are now working to use their data to direct forest conservation to these areas. For more, check out goo.gl/VxNbVg.



Botswana. Twenty years ago, a wildlife biologist drove across the African nation of Botswana to survey the population of local birds of prey. Now, a new team has repeated the survey, with disturbing results. Iconic species have declined by as much as 80%, a highly unexpected result given that Botswana is a nation known for its environmental stewardship, where 40% of the land is under some form of protection. Species that declined the most included the White-headed and Lappet Faced vultures, African Hawk Eagle, Secretary Bird (pictured), Bateleur Eagle, and Red-necked Falcon. “We found declines occurring across species with varying diet and habitat use, which make it hard to pinpoint the main drivers of decline... Climate change is one candidate for these declines, but urgent research is needed to better understand the drivers of these declines,” said Becky Garbett, a PhD student who led the new study. More news as it develops. For more, see goo.gl/1PNmmo.





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Nigeria. In central Nigeria, climate change is driving a deadly new conflict. Since the start of 2018, 1,000 Nigerian civilians have died as a result of attacks by armed Fulani militia. The Fulani are a (mostly Muslim) tribe of herders whose traditional grazing grounds are becoming uninhabitable due to desertification, driving them south. This brings them into conflict with local (mostly Christian) sedentary farmers. The Fulani are attacking farming villages and massacring their inhabitants, leading to the mounting death toll of 1,000 so far this year. The farmers are retaliating: at least 50 unarmed Fulani were killed in a recent attack. The Nigerian government, already struggling with Boko Haram in the north and the Niger Delta insurgency in the south, is barely coping: reports are coming in of government air strikes aimed at the Fulani damaging the villages they are trying to help. However, the Nigerian state of Plateau offers a ray of hope: that state's government has been working to revive traditional grazing routes to offer the Fulani safe passage, as well as organizing peace talks. The story of the Fulani attacks, of ethnoreligious tensions inflamed by climate change and government mismanagement, is unfortunately likely to become a common one worldwide. For more on this story, check out *The Economist's* analysis at goo.gl/htC4PB. Thanks to *The Economist* for the valuable map.



Election Special: Mexico City. Mexico is holding nationwide elections on July 1st. In its capital, Mexico City, an environmental engineer is the front-runner to become the next mayor. For years, Claudia Sheinbaum Pardo researched energy science and engineering at UNAM, the National Autonomous University of Mexico. Now, she's bringing her expertise to solving the problems of one of the world's largest cities: according to the World Economic Forum, Mexico City is the seventh largest city in the world. Ms. Sheinbaum Pardo is making water and energy issues a centerpiece of her campaign: if elected, she plans to invest in water treatment plants, rainwater collection, and public transportation. This newsletter wishes her luck! For more, see goo.gl/akhZPq.

Heroes of the Anthropocene: Benoit Lecomte. On June 5th, French long-distance swimmer Benoit Lecomte (pictured) jumped into the Pacific Ocean off Tokyo, Japan. If all goes well, he'll wade onshore in San Francisco, California, in 5 months. Lecomte is endeavoring to become the first man to swim the Pacific Ocean, planning to swim for 8 hours a day and rest on a boat for the other 16, as well as using GPS tracking to ensure that he starts each new day of swimming exactly where he left off the last day. However, this isn't just an athletic endeavor-Lecomte's route will take him straight through the Great Pacific Garbage Patch, and he plans to use his trip to raise awareness about the growing problem of plastic pollution in the world's oceans. "The ocean can live without us but we can't live without it." says Lecomte. For more, check out goo.gl/4QXdK. For continuing updates, see thelongestswim.com.





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Portland, Maine. On June 9th, Maine Conservation Voters (MCV) organized a beach cleanup at Back Cove in Portland, Maine (pictured, Back Cove shoreline). It was a pleasure to attend: this writer and a friend personally collected over 100 plastic and foam fragments, as well as two discarded hypodermic needles. Maine Conservation Voters' next event is a panel on "Climate Change Extreme Weather Patterns & Biodiversity," co-hosted by the Union of Concerned Scientists. The panel will occur on Thursday, June 28th, from 6 to 7:30 PM, at Urban Farm Fermentory, 200 Anderson Street, Portland, Maine. Attendance is completely free. Presenting speakers include Maine meteorologist Keith Carson, Maine farmer Lindsey Perry, and University of Southern Maine environmental science professors Dr. Joseph Staples and Dr. Robert Sanford. We encourage all interested citizens to take part!



Waldoboro, Maine. Work on the Waldoboro Collective is going well! This writer volunteered there again on Monday, June 11th, and was once more impressed. This nascent community based in Midcoast Maine (pictured) is designed to offer federally subsidized sustainable housing to underprivileged groups. Since the last update, Kate O'Connor, founder of the



Collective, has installed a sink, interior walls, and a Tyvek outer coating on the tiny house currently under construction (pictured, set to be the first of 10). Ms. O'Connor is also working to obtain a trencher or a jackhammer in order to complete the trench from the artesian well on the property to the main community center, a refurbished cabin. This would bring running water to the property, a material advance. Desired materials that would aid progress include: a trencher or jackhammer, a circular saw, a pancake air compressor, Tyvek house wrap, lumber, T-111 siding, windows, and Roxul insulation. If readers are interested in donating any of these materials, Ms. O'Connor is happy to pick them up. For more info, contact Ms. O'Connor at occonnorutexas@gmail.com or 603-707-2607.

