

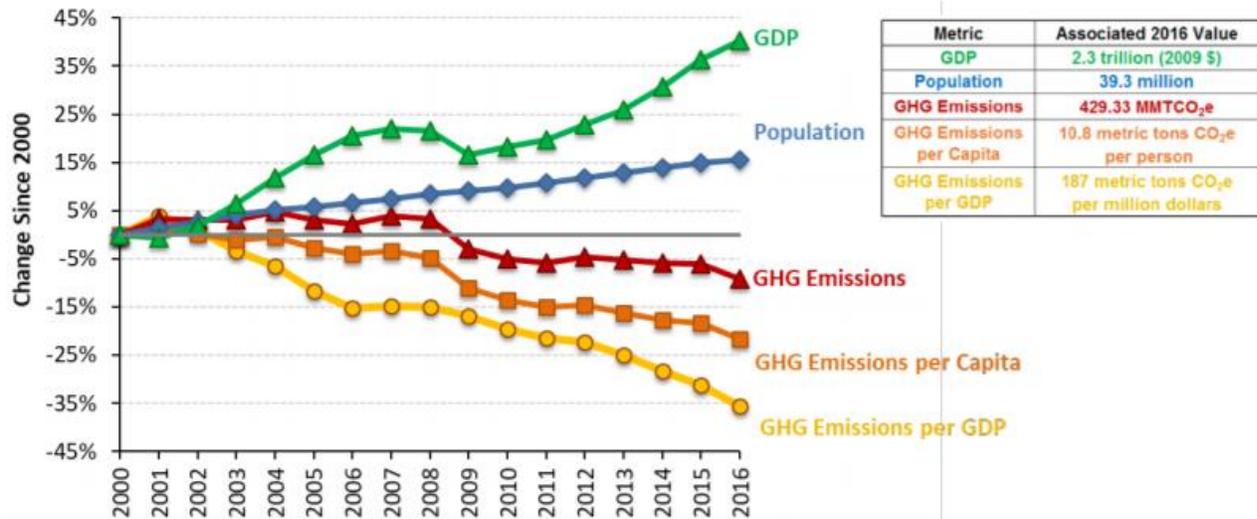


the weekly anthropocene



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

Figure 1a. Change in California GDP, Population, and GHG Emissions Since 2000



USA: California. In a historic accomplishment, the state of California is now emitting less climate change-causing greenhouse gases than it did in 1990. On July 11th, the California Air Resources Board (ARB) published a greenhouse gas inventory describing this and other amazing accomplishments. Since 2004, California's greenhouse gas (GHG) emissions have declined by 13%, while the economy grew by 26%. In the year 2016 alone, solar electricity generation in California grew by 33%, while natural gas fell by 15%. California also now produces twice as many economic goods and services for the same amount of greenhouse gas emissions as the rest of the nation. "California set the toughest emissions targets in the nation, tracked progress and delivered results," said California Governor Jerry Brown. California Senator Kamala Harris concurred, tweeting "Incredibly proud of California - proving once again that you can combat climate change and have a strong economy." These results mean that California has hit its 2020 emissions reduction targets several years early. Next up, reducing emissions to 40% below 1990 levels by 2030. While the national government goes backwards, California's action on climate change is setting an example for the nation and the world. Spectacular news! Thanks to the ARB for the awesome graph. For more on this epic story, see goo.gl/Y6swfQ.

USA: Puerto Rico. As Puerto Rico works to recovering from the devastation wrought by Hurricane Maria in September 2017, the commonwealth is moving towards decentralized renewable energy to create a safer, more resilient grid. On June 20th, the Puerto Rican government passed a law privatizing their grid, allowing private companies to generate power for the grid and opening the doors to investment in renewable energy infrastructure on the island. Earlier, in May, Puerto Rico Energy Commission adopted a regulation legalizing "microgrids,": banks of batteries and power line networks often powered by renewable energy that serve only a small collection of homes and businesses. This gives individual towns or even neighborhoods control over their own power supply, freeing them from the creaky, hurricane-vulnerable, and fossil fuel-powered main grid. Great news! For more on this story, check out goo.gl/8qpeMR. For more on microgrids (also known as mini-grids) check out goo.gl/ix7CFm.



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USA: Kentucky. In the 1990s, Kentucky's first mountaintop-removal mine ran out of coal. The proprietor filled it back in with mining rubble, and it's now an unused expanse of brush. Now, wildlife biologist David Ledford is hoping to turn the area into the Appalachian Wildlife Center, a 12,500-acre wildlife research and education center. Ledford and his team have already raised \$35 million for the project, and are working on uprooting invasive species,



installing a new grassland ecosystem, and constructing a visitor center. They've also airlifted elk (*Cervus canadensis*) into the area with help from the state government (pictured) and are hoping that the land becomes an ecotourism center that boosts the struggling local economy. Thanks to Ledford for the photo. For more on this awesome story, check out goo.gl/mexsbT.

USA: Supreme Court. On July 9th, President Trump chose D.C. Court of Appeals Judge Brett Kavanaugh as his nominee to succeed retiring Supreme Court Justice Anthony Kennedy. If confirmed by the Senate, Kavanaugh would create a conservative majority on the court, potentially imperiling several tenets of environmental law (in addition to having a potentially huge impact on issues outside the scope of this newsletter, such as healthcare law, reproductive rights law, and presidential immunity from prosecutions). As a lower court justice, Kavanaugh has consistently worked to undermine environmental protections. Although he does not appear to be an anti-science ideologue in the vein of deceased Supreme Court Justice Antonin Scalia (Kavanaugh has acknowledged the reality and importance of climate change), his deregulatory philosophy has resulted in his writing a slew of decisions seeking to limit the power of the Environmental Protection Agency to limit greenhouse gas emissions. During the Obama Administration, he wrote opinions in three separate cases regarding the EPA's authority under the Clean Air Act, in all cases seeking to disempower it. In 2012, he authored a decision that would have invalidated EPA rules regarding air pollution that crosses state lines (i.e. nearly all air pollution), which was fortunately overturned by the Supreme Court. If confirmed by the Senate, Kavanaugh would threaten Americans' rights to clean water, clean air, and a stable climate, and strip away government authority to protect those rights. Fortunately, his confirmation is a long way from complete. We urge readers who are Maine residents to contact Senator Susan Collins (a key swing vote) to share their take on Kavanaugh's nomination. She can be emailed through the form at collins.senate.gov/contact and the League of Conservation Voters' petition at p2a.co/G3BShLp. Her Portland office phone number is 207-780-3575. For more on this story, see goo.gl/fL1yw7.



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New Connections: Coral Reefs and Poop. In a fascinating new study published in the prestigious journal *Nature*, a hitherto unknown ecosystem connection has been revealed; how seabird poop helps keep coral reefs functioning. Many tropical islands near coral reefs have been plagued by invasive rats, which often eat seabirds and their eggs. To see how this impacted the local ecosystem, a team of researchers analyzed twelve islands in the Chagos Archipelago, a British possession in the Indian Ocean. (Pictured, a Chagos coral reef). As the archipelago contained six rat-free and six rat-infested islands, it provided a “natural laboratory” to examine the differences. The researchers



found that on the islands without rats, there were (unsurprisingly) more seabirds. This meant that there was more seabird poop, which meant that there was more nitrogen, a fertilizer, in the soil. Surprisingly, this nitrogen had a substantial impact on the surrounding ocean: macroalgae, turf algae, and sea sponges were nourished by it, and fish life was 50% more abundant near rat-free islands than rat-infested islands. Fish grazing of algae (a vital ecosystem function that provides a base for new coral to grow) was also 3.2 times higher near rat-free islands. "The results of this study are clear." said Professor Nick Graham of Lancaster University, leader of the new study. "Rat eradication should be a high conservation priority on oceanic islands. Getting rid of the rats would be likely to benefit terrestrial ecosystems and enhance coral reef productivity and functioning by restoring seabird derived nutrient subsidies from large areas of ocean. It could tip the balance for the future survival of these reefs and their ecosystems." This study describes another example of the complex and surprising web of connections that underlie the functioning of ecosystems around the world and adds to the body of knowledge that will help humanity manage and preserve these ecosystems in the Anthropocene. Thanks to the Chagos Conservation Trust for the picture. For more, check out goo.gl/r7rmdo.

New Power Sources: Ammonia Reverse Fuel Cells. Ammonia is a common chemical formed from hydrogen and nitrogen, commonly produced in mass quantities for use as a fertilizer. Now, several innovative researchers are working on “reverse fuel cells” (pictured, a component) that use renewable energy to convert atmospheric nitrogen and hydrogen from



water into ammonia. (They're called reverse fuel cells because fuel cells normally try to create energy from a fuel, rather than use energy to create a fuel). If the ammonia is burned to generate power later (a process which emits no carbon dioxide) this technique would essentially “bottle” renewable energy, making it much easier to store and transport a greenhouse gas-free energy source. As Australia has great potential for solar and wind development, Australian government agencies have shown especial interest in developing this new method of exporting their power, with CSIRO (the Australian science agency) funding several interesting experiments. "Ammonia is the key enabler for exporting renewables," says David Harris, a CSIRO research director "It's the bridge to a whole new world." Although yields for ammonia reverse fuel cells are currently low, this avenue of research has the potential to transform the world energy landscape. For more on this fascinating story, check out *Science* magazine's in-depth article on the prospective “ammonia economy” at goo.gl/viGsbN.



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New Threats: Lyme Disease and Forest Ecology. Lyme disease, spread through the bite of infected blacklegged ticks (*Ixodes scapularis*) is the most frequently reported vector-borne disease in America. Now, the results of a long-term study published in the journal *Ecology* have found that the ecology of local forests is critical in determining the risk of contracting Lyme disease in a given area. Several factors come into play in this system. Small mammals like white-footed mice (*Peromyscus leucopus*, pictured)



are excellent hosts for ticks, and high rodent populations lead to more infected ticks. The study found that factors that influence the number of small mammals also influence the prevalence of Lyme disease. Acorn booms lead to a high population of rodents and thus more ticks, and the presence of their main predators, bobcats, opossums, and foxes, were all associated with a reduction in infected ticks. The study also identified coyotes as another factor that drove up the number of ticks (coyotes compete with rodent predators but don't eat many rodents themselves). The researchers warn that human development can break up forests into fragments, driving out rodent-eating predators and resulting in too-high numbers of tick-bearing rodents. "Diverse, intact carnivore communities can help suppress nymphal tick infection by limiting rodent populations. Forests that have been overexploited or fragmented by development cannot support mid-sized predators like foxes and bobcats, and populations of small mammals expand unchecked." says Taal Levi of Oregon State University, a lead author on the new study. These new results offer more evidence that the way humans manage the wild areas around them is vital for the success of our own communities. Thanks to the Cary Institute Photo Archive for the picture. For more, check out goo.gl/y2m8hY.

Ireland. In an inspiring step, Ireland has become the first country in the world to commit to divesting from fossil fuel companies. On July 12th, the lower house of the Irish Parliament passed a bill committing the nation to selling off all \$350 million worth of fossil fuel investments in its \$9.3 billion national investment fund. As the bill enjoyed support from all political parties, it will likely soon become law. "The [divestment] movement is highlighting the need to stop investing in the expansion of a global industry, which must be brought into managed decline if catastrophic climate change is to be averted," said Thomas Pringle, who introduced the bill, to the Guardian newspaper. "Ireland, by divesting, is sending a clear message that the Irish public and the international community are ready to think and act beyond narrow short-term vested interests." Hopefully, this will spur on divestment movements in the rest of the world. For more on this awesome story, check out goo.gl/q3FqPa.

Australia. A new species of venomous snake has been discovered on Australia's wild Cape York Peninsula, and been given the euphonious name of the Cape York bandy-bandy (*Vermicella parscauda*, pictured). Bandy-bandies are a group of specialized burrowing snakes that feed exclusively on blind



snakes, another specialized group. "Every species is precious and we need to protect them all, since we can't predict where the next wonder-drug will come from," said Dr. Bryan Fry of UQ, co-discoverer of the Cape York bandy-bandy. "The discovery of this enigmatic little snake is symptomatic of the much more fundamental problem of how little we know about our biodiversity and how much may be lost before we even discover it." Fascinating news! For more, see goo.gl/NvmX4V.