



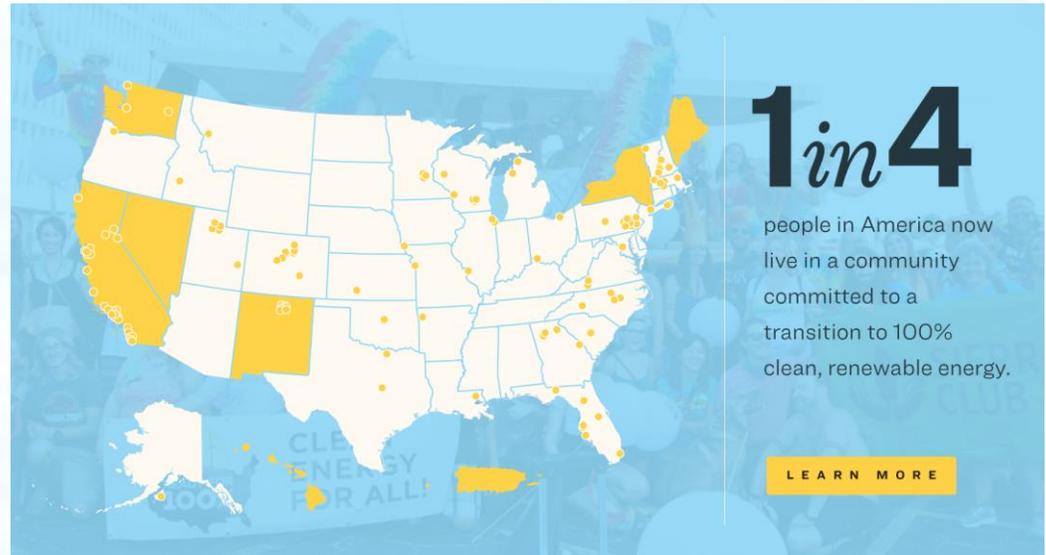
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dispatches from the wild, weird world of humanity and its biosphere

By Sam Matey, December 18 2019

2019 in Review: States for 100% Renewable Energy. On January 1, 2019, only two states-California and Hawaii-were committed to reaching 100% clean energy (renewables plus nuclear, i.e. not contributing to climate change) by 2050 or earlier, in line with the targets needed to



avoid catastrophic climate change. Then, over the course of 2019, the states of Washington, Nevada, New Mexico, New York, and Maine, along with the commonwealth of Puerto Rico passed legally binding bills committing them to 100% carbon free electricity by 2050 (or earlier: 2040 for New York, and 2045 for New Mexico). Now, one in four Americans-including this writer-lives in a state or city committed to 100% clean energy. And this movement to fight for the future is spreading! Next year, there could be a lot more to follow. Illinois and Oregon nearly passed 100% renewable bills in 2019, but didn't quite make it, while Virginia, New Jersey, and Colorado all have governors pushing for it (for example, by signing executive orders setting non-binding goals of reaching 100% clean energy) and could get bills passed in the future. Leaders in Minnesota and Maryland are also planning to move forward on this issue. All of this action on 100% renewable energy is in addition to the US Climate Alliance (24 states and Puerto Rico committed to the Paris Agreement emissions reduction targets, though some haven't got all the way to 100% clean energy pledges yet) and We Are Still In, an array of businesses, cities, tribes, churches, colleges, and other entities committed to fulfilling Paris emissions reduction targets. Furthermore, perhaps most inspiringly of all, these American projects are serving as an example for subnational leaders around the world. 2019 saw local leaders from Vietnam and South Africa unite to pledge action to reduce their carbon emissions, while similar efforts founded earlier in Japan (members include Kyoto, Yokohama, Sapporo, and dozens more cities, prefectures, and businesses), Mexico (the state of Jalisco and the cities of Monterrey and Guadalajara), and Argentina continued their teamwork. Though the Trump Administration persists in its hideous fossil fuel-worship and disregard for basic facts, these state-level actions mean that America still has something to be truly proud of when it comes to the fight against climate change. For more, see sierraclub.org/ready-for-100/commitments, tinyurl.com/sebwzhu, alliancesforclimateaction.org/, and usclimatealliance.org/,



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2019 in Review: Climate in the 2020 Race. Donald Trump has been worse than an utter failure on climate change: he's actively fought to increase carbon emissions, appointing coal lobbyists to lead the EPA, giving fossil fuel companies regulatory carve-outs that they didn't even ask for, and cyberbullying teenage climate activists on Twitter. On the other side of the partisan fence, though, 2019 has seen an unprecedented commitment to action to address the climate crisis. All 15 Democrats currently running for President acknowledge the scientific reality of climate change and want to rejoin the Paris Agreement. And most of them, including all of the 7 who have qualified for the December 19th debate (Biden, Sanders, Warren, Buttigieg, Klobuchar, Steyer, and Yang) have strong, well-written climate plans. Amazingly, all of these 7 candidates are committed to striving for 100% clean energy for America by 2050! This is a historic level of commitment to climate action, showing that at least one side of America's partisan divide understands what's at stake.



However, while the Democratic field has been uniformly admirable overall, one candidate has stood out for their comprehensive strategy. Senator Elizabeth Warren of Massachusetts (pictured) has eleven (yes, eleven!) different in-depth plans to address different aspects of the climate crisis, from the "Green Apollo" program for clean energy R&D to her 100% Clean Energy for America plan to the Blue New Deal for ocean conservation and marine sustainable development. Every one of them shows a profound understanding of both the importance of climate change and the scope and limits of presidential and congressional powers to address it. Here's a sample passage from the Blue New Deal. "Land-based farmers have long been supported by the USDA, but in a world of rising seas, increasing ocean temperatures, and ocean acidification, we must expand that support to include ocean farming as well. Algae and seaweed are the trees of our oceans, absorbing carbon and helping to reduce ocean acidification and pollution locally, and are valuable sources of nutrition. We must cultivate them just as we would any forest or aboveground ecosystem that naturally absorbs carbon dioxide." The thought that a politician whose climate plans have that level of commitment and detail is one of the front-runners for the US Presidency fills this writer with happiness-and is why this newsletter endorses the Warren campaign for the presidency.

In sum, absolutely any Democrat would be a thousand times better for the climate (and for America in general) than Donald Trump. But Elizabeth Warren has the potential to be ten thousand times better. For more, check out

<https://elizabethwarren.com/plans/climate-change>.



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Action on Plastics. 2019 also saw unprecedented action on another environmental challenge: plastics pollution. The Ocean Cleanup's revolutionary System 001/B successfully began collecting plastic from the Great Pacific Garbage Patch, while their autonomous, solar-powered Interceptor systems are currently being deployed in some of the world's most plastic-polluted rivers (Pictured: Boyan Slat, founder and leader of The Ocean Cleanup, with Interceptor 002 on the job in Malaysia). On the other side of the problem, reducing plastic output, 2019 saw an array of jurisdictions ban some or all single-use plastics (though many of the bans will take effect in a year or two). These included the European Union, the nations of Thailand, Costa Rica, Canada, Panama, and Tanzania, the Indian state of Tamil Nadu, and the American states of New York, Connecticut, Delaware, Maine, Oregon, and Vermont (joining pre-2019 bans in California and Hawaii). And awareness of moving away from single-use plastics rose, with reusable water bottles, straws, and silverware catching on. Plastic pollution is a major environmental problem, that's already harming our oceans' food webs and ecosystems. This year, we started the initiatives necessary to solve this problem. Great news! For more, check out <https://theoceancleanup.com/> and tinyurl.com/k2wp36c.



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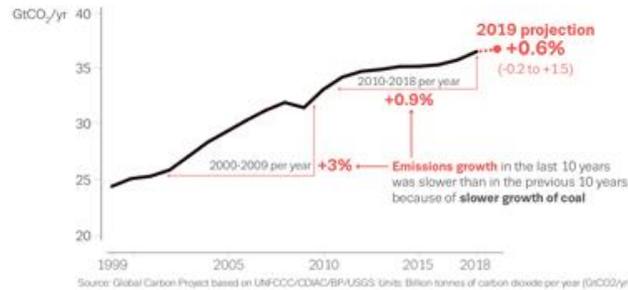
2019 in Review: Global Carbon Emissions. A new report from the Global Carbon Project international research consortium gives a picture of where human civilization is in terms of greenhouse gas emissions for 2019. The researchers found that by the end of this year, industrial activities and the burning of coal, oil, and natural gas around the world will have pumped 36.8 billion metric tons of carbon dioxide (CO₂) into the atmosphere, rising to 43.1 billion tons from all human activities when emissions from agriculture and deforestation are factored in. However, the good news is that the rate of growth is the slowest yet-emissions rose by 0.6% in 2019, compared to 2% in 2018 and an average of 3% from 2000 to 2009. In short, on a planetary perspective, we're still pushing in the wrong direction, but ever more slowly. (Note: this article appeared in the last issue of

this newsletter, but is reprinted here as it thematically fits with a review of major events and trends in 2019). Hopefully, perhaps as soon as next year, we'll start moving in the right direction, towards net zero carbon emissions. For more on this fascinating and hugely important story, see tinyurl.com/rhwcek and globalcarbonproject.org/.

Global Carbon Budget 2019

CO₂ emissions grow amidst slowly emerging climate policies

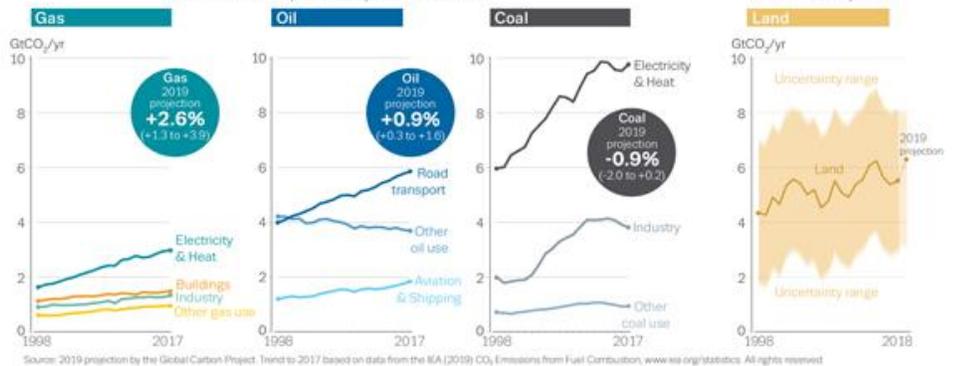
Fossil CO₂ emissions grow more slowly... but do not yet decline



CO₂ emissions need to decline rapidly to net-zero around mid-century to pursue the Paris Agreement 1.5°C goal

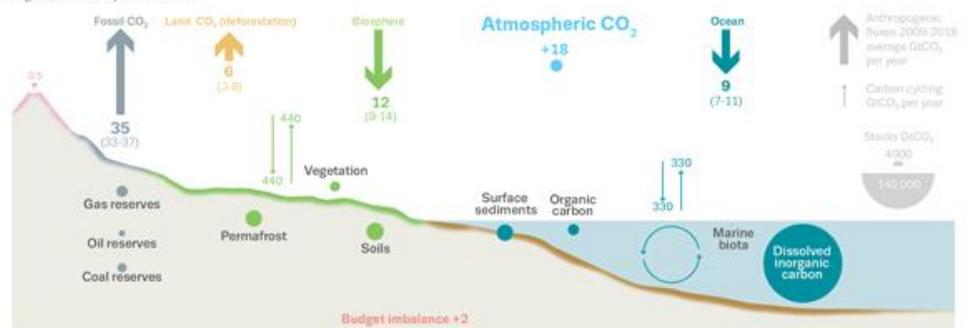
Natural gas and oil now drive global emissions growth

Continued support for low-carbon technologies needs to be combined with policies that phase out fossil fuels.



The rise in atmospheric CO₂ causes climate change

The global carbon cycle 2009-2018



Copyright produced by the Global Carbon Project based on Friedlingstein et al. Earth System Science Data (2019).
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GLOBAL CARBON PROJECT UEA University of East Anglia European Commission



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2019 in Review: Reforestation Efforts. Reforestation is one of the most across-the-board positive things that we can do for the world. Trees build themselves out of carbon dioxide, their roots hold soil together to reduce erosion, they shelter an array of wildlife, and make the land around them moister and cooler through shade and evapotranspiration. Tree-planting both contributes a little to greenhouse gas reduction at a global level and makes the immediate surrounding area more resilient to climate change at a local level. While the destruction of the



priceless Amazon Rainforest accelerated due to Bolsonaro's malignity in 2019, many other nations and organizations worked to increase Earth's tree cover. President Muhammadu Buhari of Nigeria wrote an op-ed in Scientific American titled "Trees for Peace," in which he pledged to work to plant 25 million trees to combat desertification and climate change in northern Nigeria. Encouragingly, Mr. Buhari acknowledged the importance of avoiding monocultures and ensuring that locally adapted trees are planted to form diverse, functioning ecosystems. (See tinyurl.com/yx6fem2q). New Zealand has pledged to plant an incredible one billion trees by 2028 (see tinyurl.com/y2ahlw9q). Madagascar set a goal of reforesting 40,000 hectares per year (see tinyurl.com/rmza9gg)...just as the Madagascar Biodiversity Partnership announced the planting of their 3 billionth tree through their innovative community-led programs. Abiy Ahmed, the amazing reformist Prime Minister of Ethiopia (and 2019 Nobel Peace Prize winner for his ending of a long-running border conflict with Eritrea), held a "National Tree Planting Day" on July 29, 2019, in which citizens across Ethiopia planted over 353 million trees, mostly native species with some introduced fruit trees, in 12 hours. (Pictured: Abiy Ahmed planting a tree.) That tally derives from the government's official count, and has not been independently verified, meaning that the true total may be somewhat lower. What is certain is that many millions were planted, and Ethiopia (whose forest cover, once 35%, is now at under 4%) will benefit greatly. For more, see tinyurl.com/stvkceg.

And among the infinitudes of the Internet, the viral #teamtrees movement (see, started by renowned YouTuber Jimmy "Mr. Beast" Donaldson has so far raised over 18.9 million USD for the Arbor Day Foundation, an NGO serving as the world leader in funding reforestation. (Notably, the Arbor Day Foundation is one of the funders of the reforestation efforts of the Madagascar Biodiversity Partnership, where this writer worked from July to October 2019). For all of these projects, care will need to be taken to ensure that the right trees are planted in the right place, and that local ecosystems are supported and maintained by the reforestation efforts. Still, the fact that reforestation has shot so far up the political and social agenda is spectacular news!



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2019 in Review: Greta Thunberg and Climate in the Culture. 2019 saw an unprecedented awareness of climate change among ordinary citizens, thanks in no small part to the incredible work of 16-year-old Swedish climate activist Greta Thunberg, planetary voice of conscience and messenger of action. September, during the New York City special climate summit, at which Greta urged world leaders to step up for their people's futures, both TIME magazine and The Economist rolled out special issues on climate change. In December, Greta Thunberg became TIME magazine's youngest-ever Person of the Year. This new awareness of the climate crisis will have ripple effects throughout the culture, and is already inspiring youth activists worldwide. For more on the incredible saga of Greta Thunberg, see <https://time.com/person-of-the-year-2019-greta-thunberg/>.



2019 in Review: International Climate Policy. Despite this new momentum, the UN's climate talks at COP 25 in Madrid were a monumental disappointment. The hoped-for agreement on standards for a carbon market, an international system of payments to incentivize projects like renewable energy and reforestation, was sabotaged by a coalition of the pro-pollution federal governments of Australia, Brazil, Saudi Arabia, and-abominably-Trump's halfway-out-the-door America. Shamefully, this means in 2019, the world's biggest forum for action on climate change ended (to quote The Economist) in a sad splutter. UN Secretary-General Antonio Guterres said "The international community lost an important opportunity to show increased ambition on mitigation, adaptation & finance to tackle the climate crisis. But we must not give up, and I will not give up. I am more determined than ever to work for 2020 to be the year in which all countries commit to do what science tells us is necessary to reach carbon neutrality in 2050 and a no more than 1.5 degree temperature rise." A lot of hopes now ride on COP 26, to be held in Glasgow in November 2020, where-in the best case scenario-the carbon market will be worked out and nations will present new, tougher emissions reduction policies. An EU-China climate summit at Leipzig in September 2020, if it goes well, could provide the basis for that. For the full story, see tinyurl.com/rt4rsr8 and tinyurl.com/unhll42.



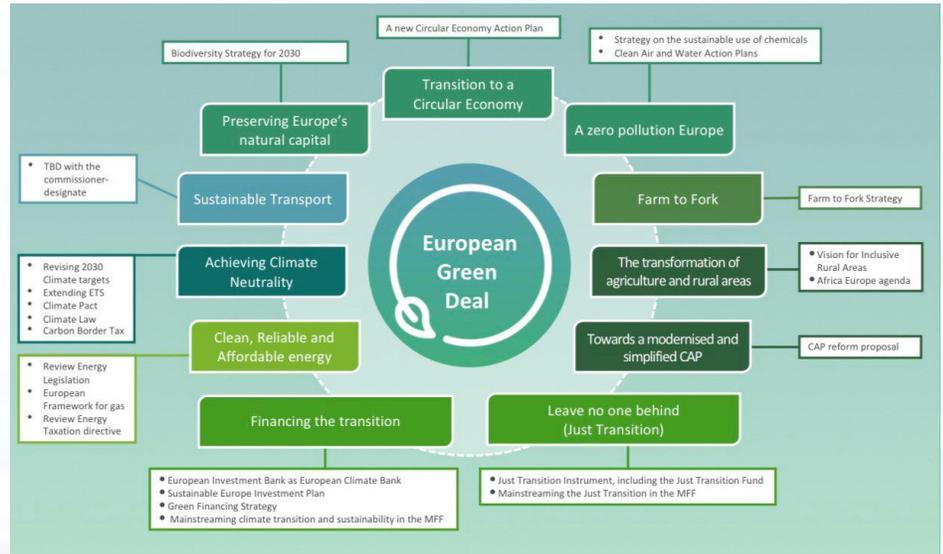
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2019 in Review: The European Green Deal. There was, however, one particularly big win on climate policy in the leadup to COP 25. On the heels of the European Investment Bank's pledge to end funding for fossil fuel projects by 2021, the EU took another giant step towards a good Anthropocene on December 11th, European Commission President Ursula



van der Leyen released the European Green Deal, a list of 50 far-reaching policy measures to be enacted to fight climate change and build a better relationship between Europe and Earth's biosphere. This is worth looking into in detail, as a truly momentous thing has happened here. The leadership of the European Union (which, if ranked as one country, would have the second-largest economy in the world after the USA and have the third-highest population after China and India) has just committed to passing essentially what American progressive politicians are still dreaming of-a Green New Deal. Among the highlights: by March, the European Commission will present the European Climate Law, which will enshrine an EU-wide target of reaching net-zero greenhouse gas emissions ("climate neutrality") by 2050. Also set for March are a new EU Industrial Strategy, to position the continent to capitalize on and move forward the emerging green and digital economic transformations, and an EU Circular Economy Action Plan to build a clean, waste-free economy. By summer 2020, the Commission will set an emissions reduction target for 2030, between 50% and 55% below 1990 levels. (As of 2018, the EU had reduced its emissions by 23% below 1990 levels, while sustaining economic growth). Excitingly, the EU Green Deal also plans for carbon tariffs, financially penalizing imports from countries who don't match the EU's emissions reduction targets-potentially leading to a ripple effect of climate action spreading to industries around the world who want to sell to Europe. So far, all EU members but Poland have agreed to the climate-neutral 2050 target (not coincidentally, Poland has the highest domestic coal production in Europe), and their government may yet be convinced with financial assistance to ease the economic transition, as provided for by the Deal's Just Transition Mechanism. And there's a lot more, with plans for nearly every industry! With luck, 2020 legislation will begin the creation of the modern world's first climate-neutral continent!

For more, see ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en. For the full text (worth a read!) see tinyurl.com/vlplq5l. For Politico's take, see politico.eu/article/the-commissions-green-deal-plan-unveiled/.



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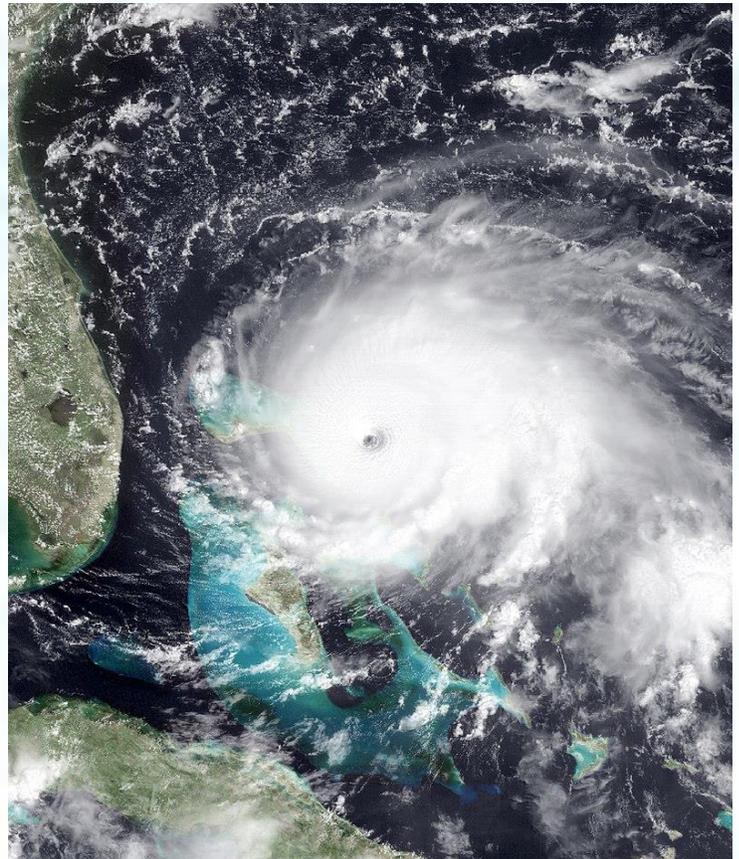
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2019 in Review: Wildfires, Floods, Storms, and Heat. All around the world, 2019 was the year that climate change irrevocably shifted from being a potential danger of the future to a painful condition of the present.

The American Midwest has been experiencing unprecedented flooding of the Missouri and Mississippi Rivers since March 2019, with states of emergency declared in North Dakota, Iowa, and Nebraska and, according to *The New York Times*, over 14 million people directly affected. (For more, see [nytimes.com/interactive/2019/09/11/us/midwest-flooding.html](https://www.nytimes.com/interactive/2019/09/11/us/midwest-flooding.html)). In June and July 2019, more than 100 wildfires ranged above the Arctic Circle, in Alaska, Siberia, and Greenland, burning through peatlands, producing vast clouds of soot, releasing 50 megatons of carbon dioxide in June alone. (For NASA's report on this, see [tinyurl.com/slp7gto](https://www.tinyurl.com/slp7gto)). Throughout the year, wildfires raged through the Amazon Rainforest, with devastating consequences for biodiversity and local peoples. They were both fed by deforestation and encouraged further deforestation, often ignored by Brazilian President Jair Bolsonaro (who has tragically taken to blaming environmental groups and *actual firefighters* for the blazes). (For more, see [tinyurl.com/txzq7mg](https://www.tinyurl.com/txzq7mg)). And as this article is being written, in December 2019, the Australian state of New South Wales is facing immense bushfires that have destroyed 724 homes, killed 6 people, shrouded Sydney in smog, burned through 2.7 million hectares of land (10,424 square miles, an area larger than Vermont), and emitted 195 million tonnes of CO2 since August (For more, see [tinyurl.com/sz225vx](https://www.tinyurl.com/sz225vx) and [tinyurl.com/uwp7rk9](https://www.tinyurl.com/uwp7rk9)).

In March, Intense Tropical Cyclone Idai killed at least 603 people in Mozambique, Zimbabwe, and Madagascar, and devastated the Mozambican city of Beira, displacing over 160,000 people. Six weeks later, in April, the weaker but still damaging Cyclone Kenneth also hit Mozambique. In August and September, Hurricane Dorian (pictured) became the worst disaster in the history of the Bahamas, with sustained winds of 185 miles per hour (tied for strongest ever observed in the Atlantic), a death toll of at least 73 people (likely many more), a bill of billions in damages, and the dubious honor of making 2019 the fourth straight year in which a Category 5 hurricane had formed in the Atlantic—a record. In October, Typhoon Hagibis struck Japan, killing at least 80 people and causing over \$1 billion in damages. (Note that scientists





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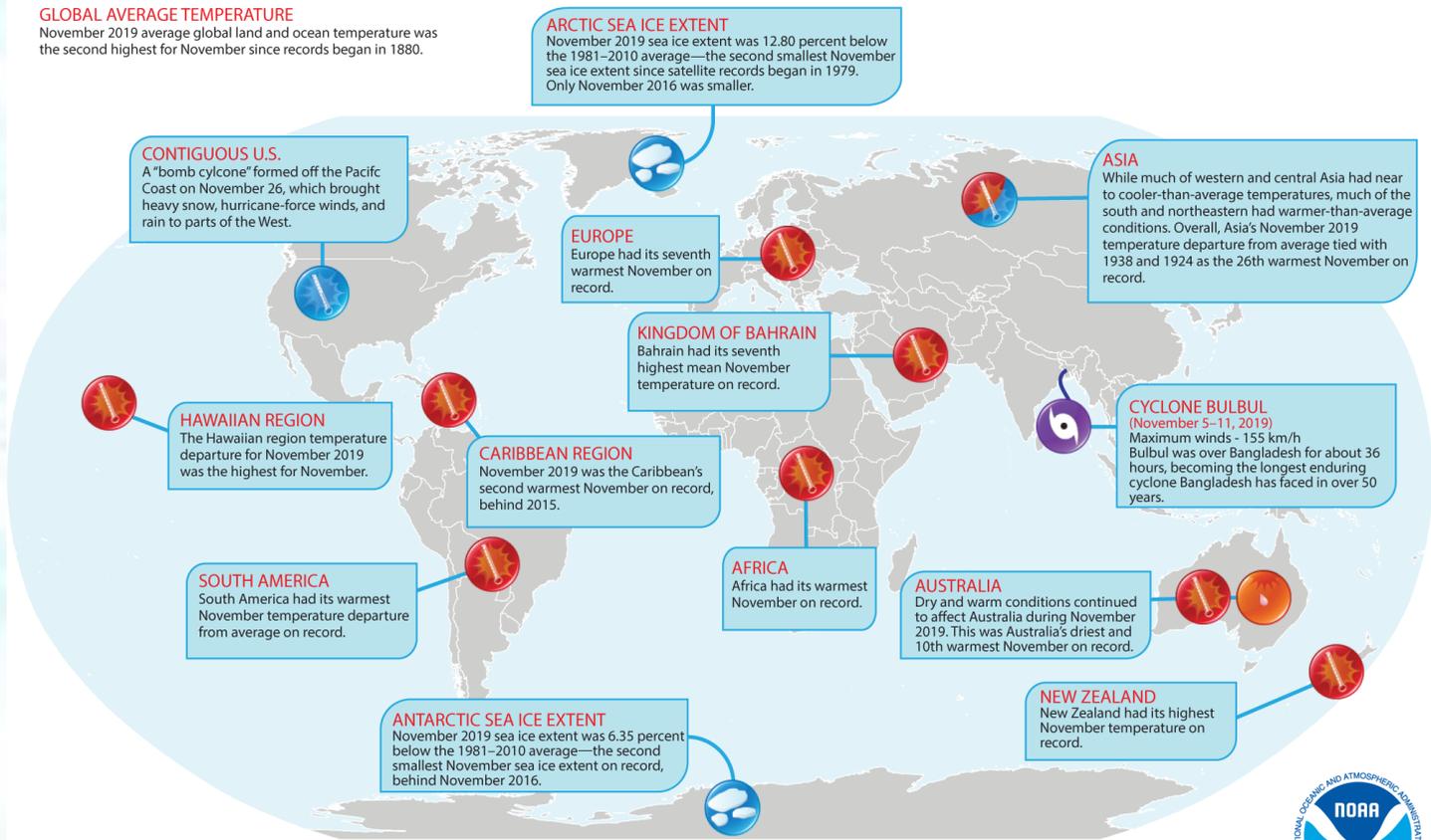


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agree that while climate change does not appear to be causing more cyclonic storms, it is making the storms that do form more powerful). For more on Idai and Kenneth, see tinyurl.com/u23be2o and tinyurl.com/y6naheqh. For more on Dorian, see tinyurl.com/qktup7d. For more on Hagibis, see tinyurl.com/yyzcmhww.

Selected Significant Climate Anomalies and Events November 2019



Finally, America’s National Oceanic and Atmospheric Administration (NOAA) reported that November 2019 was the second-hottest November since records began in 1880, and, not coincidentally, both the Arctic and Antarctic saw the second-smallest November sea ice extent on record. For South America, Africa, and Hawaii, it was the hottest November ever, and the world average sea surface temperature for 2019 was the second-hottest on record. (See the NOAA map of November climate anomalies above). The hottest November on record, for comparison, was November 2015, and the five hottest Novembers on record have all occurred since 2013. (For more, see www.noaa.gov/news/november-2019-was-2nd-hottest-on-record-for-planet). Climate change isn’t something we’re trying to avoid anymore—it’s here. The question now is whether we let it get worse and worse, or we take action to slow and eventually reverse it.



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2019 in Review: Clean Meat. Two companies, Beyond Meat and Impossible Foods, are now producing plant-based proteins that taste very similar to meat, with Beyond Meat's burgers made primarily from pea protein and Impossible Foods' burgers made primarily from soy and potato protein. Commissioned life cycle assessments found that Beyond and Impossible burgers were much better for the planet than conventional burgers. The production of one Beyond Burger (pictured) uses 99% less water, 93% less land, and emits 90% fewer greenhouse gases than a beef burger, while the making of one Impossible Burger uses 87% less water, 96% less land, and emits 89% fewer greenhouse gases. (See www.beyondmeat.com/about/ and impossiblefoods.com/mission/lca-update-2019/). A switch from beef to these burgers would be a spectacular step towards sustainability of humanity within the planetary system. This year, that process may have begun. (United Nations Environment notes that raising cattle for meat is a major source of greenhouse gas emissions and consumer of water resources. UN Environment also recently named Beyond Meat and Impossible Foods "Champions of the Earth." For more, see tinyurl.com/tfvjlv4. Also note that with proper regenerative agriculture techniques, raising cattle can have positive environmental impacts. However, the vast majority of American



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beef production, which the above comparisons are based on, uses a wasteful, carbon-intensive slaughterhouse-feedlot system centered on Concentrated Animal Feeding Operations, or CAFOs, that produce vast quantities of manure and greenhouse gases. For a glimpse at what planet-friendly beef cattle can look like, see tinyurl.com/y7q284fl).

In 2019, Beyond or Impossible-brand clean meat products were rolled out at Carl's Jr, Dunkin Donuts (with Beyond Sausage sandwiches), and, most famously and successfully, Burger King (with the Impossible Whopper, pictured). KFC tested Beyond Fried Chicken at an Atlanta-area restaurant in August, and discovered that it had a huge new hit, with the entire stock selling out in five hours. Subway is testing Beyond Meatball Marinara subs and Little Caesar's is testing the Impossible Supreme pizza. In August, food service titan



Sodexo launched an Impossible Burger menu at over 1,500 US locations. Even McDonald, that titan of on-demand beef, is testing the "P.L.T" (Plant, Lettuce, and Tomato, a Big Mac-style Beyond Burger) in Ontario. Even regional specialties are making the transition! In 2019, renowned polymath and Philadelphia native Questlove started a business selling a classic Philly cheesesteak made with Impossible clean meat. And nationwide, supermarkets from Safeway to Publix to Harris Teeter to Wegmans to Whole Foods have begun stocking Beyond and/or Impossible meats in the meat aisle-including Maine's iconic Hannaford's chain. However, this is likely just the start of the clean meat revolution. Good Catch Foods is bringing clean meat to the seafood market with their authentic-tasting vegetarian tuna (pictured, available now at Whole Foods), crab cakes, and fish patty analogues, made from legumes and algae oil. Even more excitingly, plant-based meats might eventually be seen simply as a bridge to lab-grown meats-real cow, chicken, fish or whatever tissue, but grown from cells in a nutrient medium in a lab, with no slaughterhouses or feedlots involved. This technology already exists and is nearly ready for market: both Memphis Meats and New Age Meats are planning to bring cell-grown meat to stores in 2021.



The rise of plant-based meats is one of the best developments of 2019 and is a rapidly growing trend. There's a long way to go-Americans alone eat about 50 billion burgers per year-but massive potential reward. This could herald a bold new future for how human civilization gets its protein, and be a big part of a shift to a more sustainable Anthropocene For more on the epic potential and rising momentum to replace carbon-intensive slaughtered-animal products with plant-based clean meat, check out an in-depth market report on the future of meat from tinyurl.com/ydj2765e.



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2019 in Review: A Year of Progress, Much More to be Done. In

conclusion, 2019 was an extraordinarily eventful year, and one that will have great repercussions, positive and negative, for the future of the fight against climate change-and, by extension, the course of human civilization in the 21st century. It is true that lot of bad and disheartening things happened this year. Unnatural disasters raged around the world. Studies found that ecosystems from the Amazon to coral reefs were in danger. The leaders of America, Brazil, and Australia stuck their heads in the sand and denied the existence of climate change while big swathes of their nations were literally on fire. However, 2019 also saw progress that would have been thought inconceivable as recently as the last decade. In 2009, milestones like a plant-based Whopper, massive government-sponsored reforestation programs worldwide, seven states committed to 100% renewable energy, and one party's presidential candidates all committed to climate action (remember, back then even Obama supported an "all of the above" energy policy that included fossil fuels) would have been dismissed as environmentalist pipe dreams. 2019 may be remembered in the distant future as the year the people of Earth finally grasped en masse the importance of action on climate change.



This writer believes that human civilization can, and (though it'll be a difficult fight) will eventually take the measures needed to stop climate change, ease our atmosphere's fever, and, someday, let the ice refreeze and the oceans sink back to their normal level again. As UN Secretary-General Antonio Guterres said, "the signals of hope are multiplying. Public opinion is waking up everywhere. Young people are showing remarkable leadership and mobilization." And to quote Paul McCartney: "We can work it out together, we'll get through this somehow."

It is understandable, even reasonable, when learning of a world-spanning transformation outside any one individual's control and with potentially dire consequences, to be afraid. But do not give in to despair. How humanity reacts to climate change will be one of the defining stories of our civilization, up there with the Neolithic transition to agriculture, the Columbian Exchange, the Industrial Revolution, and World War II. We-everyone alive today-will help write that story with our actions as consumers, voters, and citizens of the world. Activists and scientists and progressive politicians and innovative business owners and ordinary people across the planet are working to solve the climate crisis and build a good Anthropocene. Everyone and anyone can and should be part of this. Swap out a meat meal for a vegetable one-or one from Beyond Meat or Impossible Foods. Take public transport, walk, or bike instead of driving. Most importantly of all, use your rights as a citizen of a democracy to vote for candidates who acknowledge the reality of the climate crisis and have strong plans of action. And, finally, as an inoculation against despair, please check out this list of positive changes in 2019 [tinyurl.com/sz7633l](https://www.tinyurl.com/sz7633l)