For this article I contributed data analysis and visuals. The semi-small multiple line charts below were created with D3.js and CSS flex-box. The data were cleaned and grouped together using Python's Pandas library. Live link: https://www.nbcnews.com/tech/internet/coronavirus-pandemic-drove-life-online-it-may-never-return-n1169956

CORONAVIRUS

The coronavirus pandemic drove life online. It may never return.

What passes for normal life now happens almost entirely online.

March 28, 2020, 5:18 AM CDT

By Jason Abbruzzese, David Ingram and Sawyer Click

For many Americans, a typical day right now might look something like this: Roll out of bed and check the smartphone. Open up a laptop and file for unemployment benefits through a website. Set up an online education portal for children out of school. Check in with a doctor through a telemedicine portal. Read news on Twitter. Buy groceries through Amazon. Watch stories on Instagram. Binge on Netflix. Connect with a group of friends on a Zoom video chat.

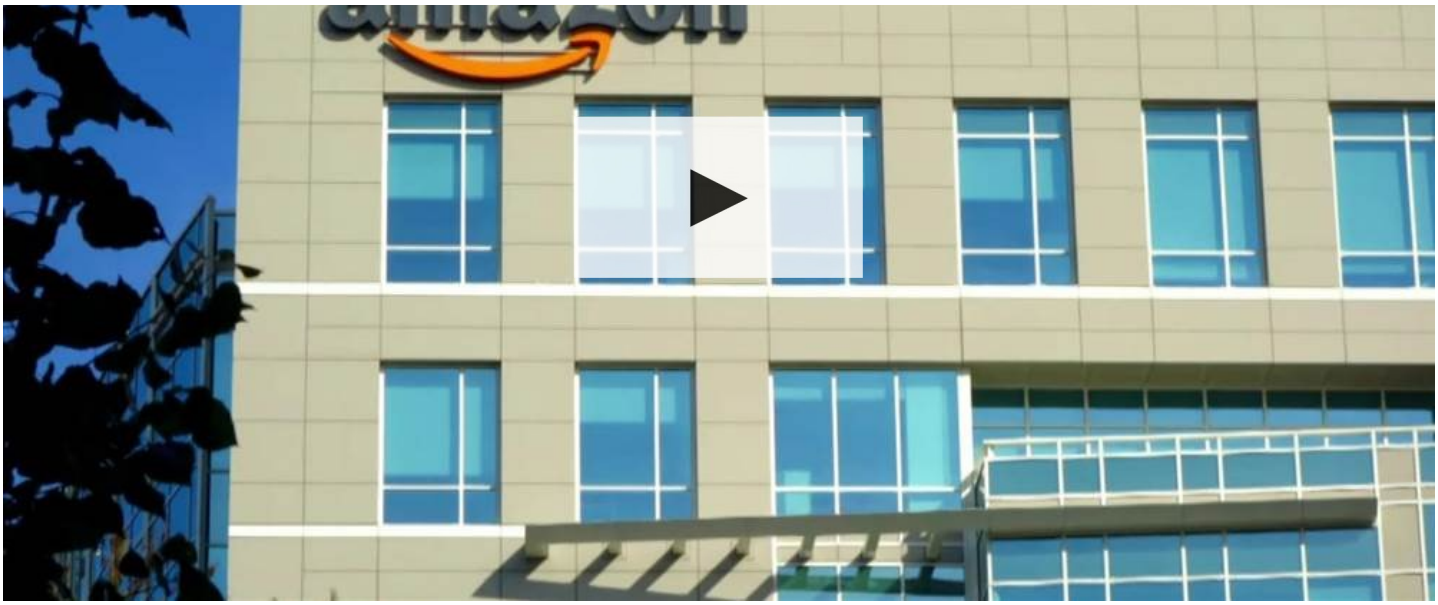
What passes for normal life now happens almost entirely online.

The coronavirus pandemic is unlike any other global emergency in recent history. Millions of people in the U.S. and around the world are confined to their homes with no definite idea of when they will be able to resume life as they knew it. Staying home has taken on the kind of patriotic duty usually reserved for times of war.

The major question will be whether "normal life" ever returns.

"What I've found as a historian is that emergencies, for example like World War I, World War II, the Great Depression, they tended to accelerate rather than necessarily innovate new kinds of relationships, new kinds of ways of life," said Robert Kargon, a professor of the history of science at Johns Hopkins University.

Amazon to hire 100K workers amid online order surge



"My argument has been that essentially these kinds of emergencies accelerate trends that already exist in society," he said. "We've already seen how the internet is impinging on all kinds of activities in terms of work, leisure and so forth, and I think this is going to intensify it and it's going to change certain things."

Full coverage of the coronavirus outbreak

The internet has in recent decades become embedded in almost everything (try to find a product for which there's not an internet-connected version). But it was primarily used to augment daily life for most people. Some younger people referred to themselves as "extremely online," but for most it wasn't the center of their lives.

During the great coronavirus lockdown of 2020, millions of Americans are extremely online. Data from internet services show massive increases in daily use. Assurances from internet services and infrastructure companies that they are able to handle so much of life's moving online have become closely followed.

When Netflix suffered problems Wednesday, some heralded it as another step closer to apocalypse.

Danny Makki
@Dannymakkisyria

Breaking: Netflix is reportedly down and with that the apocalypse draws closer

12:43 PM · Mar 25, 2020

344 108 people are Tweeting about this

"In an emergency, technology can be fast-tracked," said Amber Case, a researcher at the Institute for the Future, a nonprofit in Palo Alto, California, that does long-term forecasting. She said she expects a boost of research into technologies around online education and distributed computing, and she predicts that the experience of learning more things online will have wide ripple effects offline.

"I'm hoping we'll see a next generation of teachers who are rock stars" specializing in teaching via video, she said. "A lot of people are going to learn how to cook really, really well."

These shifts couldn't have happened during previous national emergencies, like the Sept. 11 attacks nearly two decades ago. Smartphones didn't exist yet, and neither did social media, streaming services or easily accessible videoconference calling.

In the days of dial-up modems, often only one device within a home could be on the internet at a time, and it might tie up the phone line.

> The past decade saw a huge explosion in “productivity” software that didn’t seem to actually increase productivity but is now totally vital in this crisis.
>
> – Matthew Yglesias (@mattyglesias) March 27, 2020

Joe Bak-Coleman, a Ph.D. student at Princeton University who studies collective behavior and how technology influences society, said the ability to move so much of life online is a recent development – and one that has been particularly crucial because of the nature of the response to the coronavirus outbreak.

"Only in the last five years have we had [widespread adoption of] technology like Skype and Zoom that allow us to do many of our jobs online," Bak-Coleman said. "Relative to other pandemics, the ability to take our society online, at least portions of it, helps us so much."

The kind of shift the country has gone through in the past few weeks doesn't happen without some pain points. People are finding they need to set limits, that their connection to technology can't be constant all day, every day, or else their brains won't get a chance to rest.

"We're stuck kind of in a period of teenage where we've all been told to go to our room," Case said. "We

have to rewrite our relationship to technology, and we're breaking it."

The online shift may also exacerbate inequality. Millions of Americans don't have access to fast broadband internet. Some 44 percent of adults with household incomes below $30,000 a year don't have home broadband services, the Pew Research Center said last year. And in some places, high-speed broadband isn't available at any price, because providers haven't built the service.

"Where those networks do not exist – where Americans do not have choices for high-capacity services – social distancing is much harder on people, if not outright impossible," the Electronic Frontier Foundation said in a statement emphasizing the importance of the internet to the pandemic response.

The internet is so much of life in 2020 that the American Library Association is asking federal regulators for permission to deploy Wi-Fi hot spots using bookmobiles so they can support neighborhoods that have relied on libraries that are now closed.

Data from internet and entertainment services paint a stark picture of a country pushed online.

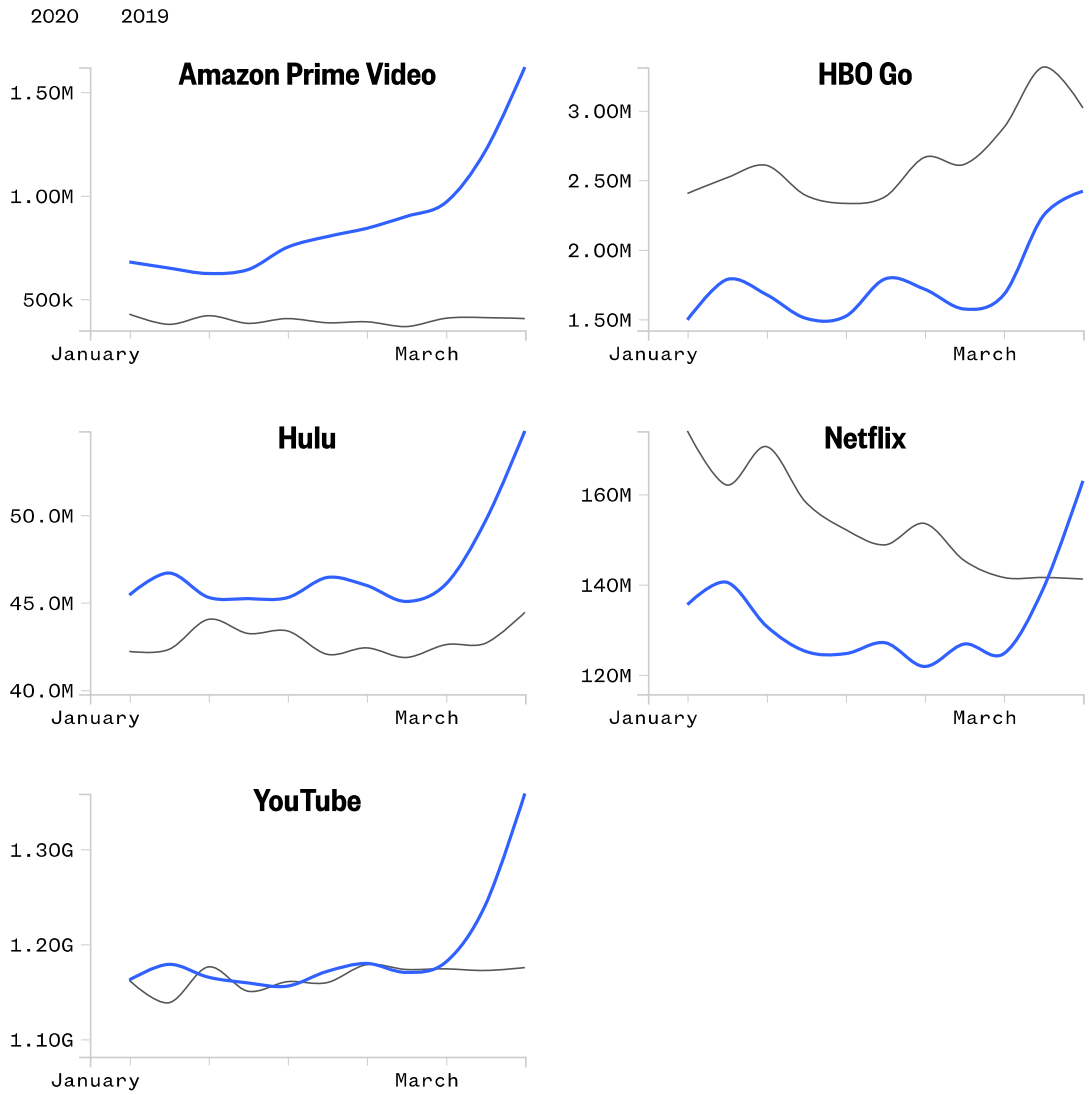
HBO said Tuesday that time spent on its streaming service HBO Now was up more than 40 percent from its four-week average, and competitors like Amazon Prime Video and Netflix also are seeing big increases in traffic, according to data from the research firm SimilarWeb.

"Escapism and forgetting what's going on for a second is also what's keeping some people sane," said Carolina Milanesi, a tech industry analyst at the research firm Creative Strategies.

Just about every consumer technology company has reported similar upticks. Facebook said that in places hit hardest by the virus, voice and video calling has more than doubled on two apps it owns, Messenger and WhatsApp. "We are experiencing new records in usage almost every day," executives wrote in a blog post.

U.S. streaming sites seeing coronavirus bumps in traffic

Per-week traffic to streaming sites, January to March, compared to the same time period in 2019.



Notes

Weeks start on Monday.

Source: NBC News analysis of traffic data provided by SimilarWeb.
Graphic: Sawyer Click / NBC News

Companies that specialize in work-focused software have also reported a dramatic shift. Zoom has been beefing up its 17 data centers. Slack and Microsoft are reporting surges in demand for software often used by people working from home. Twitter said millions more people are using its service even as the economic downturn has cast a cloud over its ad business.

Even the pandemic response is increasingly happening online.

Mike Ryan, executive director of the World Health Organization's Health Emergencies Program, said Wednesday that health officials were using connected software like never before to share information around the world about clinical trials, case studies and predictive modeling.

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"This is probably the first pandemic of the 21st century in which the full power of information technology, social media [and] artificial intelligence is being applied to almost every aspect of this response," Ryan said at the WHO's daily briefing on the pandemic.

Now industry and regulators just need to be sure that internet service remains running at a level near what people expect.

Internet service providers have expressed confidence that they can handle the extra load, although the picture in Europe may not be encouraging. Amazon, Netflix and YouTube have agreed to cut the quality of their streaming videos in Europe to avoid putting too much strain on networks there. Facebook and Instagram did the same in certain regions, and Sony slowed gaming downloads.

Ookla, a company that measures internet performance, said this week that it had begun to detect slower download speeds in the U.S. on both fixed and mobile broadband.

But others haven't detected a slowdown. Cloudflare, a company that provides internet security and infrastructure services, said the only disruptions it has noticed have been isolated to specific internet service providers or in Europe.

"The internet was built for this," Cloudflare CEO Matthew Prince said, adding that the electric grid or transportation networks couldn't withstand similar surges. "I can't think of any other public utility that, if you had somewhere between a 20 and 100 percent increase in use, which is what we're seeing right now, that it would continue to function."

The biggest change may not end up being how much time we spend online but rather how people spend it.

Sherry Turkle, a professor of the social studies of science and technology at the Massachusetts Institute of Technology, said she's been struck by the creativity and thoughtfulness with which some people have put themselves online during the outbreak.

She pointed to the cello player Yo Yo Ma and the actor Patrick Stewart, who have broadcast themselves practicing their crafts.

"Every group I'm in is trying to reinvent itself in an online form," she said. "You see people trying to find something of themselves that they can use as the medium to express themselves."

Turkle, who wrote "Alone Together," which details how technology can connect but also isolate people, said the move online could end up changing what it means to be online.

"Will people say, 'You know, I don't want to use this screen for nonsense anymore'?" she said. "Will we reach for the best of us? Maybe that will be the legacy."

Jason Abbruzzese

Jason Abbruzzese is the senior editor for technology news at NBC News Digital.

David Ingram

David Ingram covers tech for NBC News.

Sawyer Click

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NEWS MSNBC TODAY

Zero Waste, Zero Chance

New York wasted enough to fill its landfill contribution twice in 2019. Only 3 cities in the US produced more trash per capita.

We can do better.

WE COMMISSIONED
Global Research Partners to conduct the research for this project. There were around 1 million people living in Manhattan, Brooklyn, Queens, Staten Island and Bronx.

GO ON
https://zero-waste.com/

New York is trying to live its life as the trash capital of the world by going zero waste. Can the city do it? Can it do it in time?

Over the past few years and years, the city has demonstrated a lot the way through the implementation of waste management initiatives for residents and businesses. Yet, the city's 2019 waste data, which is the most recent data in terms of waste, the city has confirmed a difference that its initial plans in the world has succeeded at - going zero waste, meaning the city has succeeded in its goal.

But since that ambition was conceived, quite a lot has changed. Some roads, according to an analysis of the Department of Sanitation's monthly tonnage data, have been bumpy. Yet, the city's 2019 waste data shows that its contribution has dropped and continued to drop over the length of more than 5000 tons of daily consumption.

Recycling and waste production in 2019

- Recycling
- Waste

The management of 11 million people, 3 million tourists and 500 million visitors in 1986. The local government had grown from 2 to 5 per cent. Yet, the city's waste data shows that it has been able to reduce its waste production. It has decreased its waste production by 5 per cent, which is a significant reduction in the amount of waste produced by consumers.

A similar trend emerged in the Bronx, where the tariff contribution has only inched down 3% since 2009. The Point in the side of New York's zero waste dreams is that the city's waste production has dropped by 5 per cent, which means that New York, through the planning and policies in place, has contributed to a better benefit or information to handle the waste. Each year the city drops off its garbage to the landfill, the city's waste data shows that it has been able to reduce it. In the fiscal year 2019, the tonnage was the city's lowest ever, at 1.1 million tons, or 1 million tons per year.

Yet, the data shows that the city has achieved the diversion rate, the rate at which waste is diverted from the landfill through programs like recycling. The city's recycling rate goes from 20% in 2009 to 21% in 2019, according to estimates. Although the city's waste data shows that it has been able to reduce its waste by 20% in a different time period of consumption, residents produced 800 lbs of trash per person in the fiscal year, or 2 lbs. Yet, from the Fiscal year 2019.

At this rate, the city will not hit its zero waste goal by 2030.

Since you opened this

1 in 5 people

pounds of trash has been discarded

These neighborhoods - which make up about a tenth of New York City's population - produced 1.1 million tons of trash, or 1 million tons per year, in 2019. Annually, New Yorkers produce more than 2 million tons of trash and recycling, according to a 2016 study of waste firms in the world's largest cities.

More than 70% of that goes to landfills, to incinerators or to waste, making New York the greatest producer of trash in the world. But New York doesn't have a landfill in its city limits, so it ships its trash to other states. The city's waste data shows that it has a different time period of consumption. residents produced 800 lbs of trash per person in the fiscal year, or 2 lbs. From the Fiscal year 2019.

At this rate, the city will not hit its zero waste goal by 2030.

Recycling changes

- 1 person
- 1 pound
- 1 pound
- Cost to Recycle

"These community outreach programs have been successful and account for much of the city's change, but the initiatives aren't potential at the city's change."

CENSY targets neighborhoods with historically low diversion rates, and it has a dedicated team of language speakers, according to Espinosa.

"Target poverty was tailored was poorer than city."

Each of these 29 districts increased its diversion rate, and most are altogether thriving away now.

But when it came to districts that are recycling less, the first three districts were in Lower Manhattan, Staten Island and Brooklyn.

Four of the five districts are significantly more affluent than the rest of the city, according to Census income data.

"Hugh Lorne defended a decision to hold a meeting in Staten Island's 2019 when the first two cities of Brooklyn and the Bronx.

Manhattan's community districts (ranks 1, containing Wall Street, Old Greenwich, Tribeca, Tudor City, Chelsea) Park and Hoboken - recorded the greatest drop with a little more than a 10 percentage point, equal to thousands of tons of waste.

They're also extremely wealthy, with median incomes of more than $100,000, more than twice that of the city.

IN THE DARK

The Department of Sanitation has based most of its monthly reports on estimates, and it has been difficult to get a clear picture of what residents are throwing away, according to the Department's head, Kate Gilmore.

Moving forward, the budget calls for an increase in funds allocated for outreach and enforcement specifically to target the worst zones in violation of zero waste laws, as the Fair districts with diversion rates. Here, these events are waiver in affiliate with the Department of Sanitation, and the Department of Sanitation, which is responsible for collecting and disposing of the city's waste.

Occasionally, CENSY will hand an event that's more in the spotlight, other hold in Brooklyn's Bushwick neighborhood, which is home to a large Latin community. Attendees are given with a massive event in Union Square. The event has been typical a shelter away, recycling channeled gentes, bicycle repair, Zoodoo rolls on Zoodoo and Zoodoo.

In school, Espinosa's community, Jackson Heights, is a Latin community, and it's a sector in diversion rate, it's religious, district, Latin's, still based were.

To clarify, these weekly distinctive events are not the largest diversion rate in the city. Generally, the weather is a district, to the more that is recycles. But over the last few years, the Department of Sanitation has been conducting outreach in neighborhoods has expanded their campaign to curb, while diversion rates in less affluent areas have been the most. Yet, the city's waste data shows that it has been able to reduce its waste.

Recycling rate changes ranked by 2019 rates

Bronx Brooklyn Manhattan Queens Staten Island

2009/2019 recycling rates

0% 10% 20% 30%

The Department of Sanitation recognized in the 2018 status report that it would have to take more steps to reach its goal of zero waste by 2030.

New York's City Council declared in June 2018 that the city was in a state of climate emergency. The city's waste data shows that it has been able to reduce its waste in a different time period of consumption, residents produced 800 lbs of trash per person in the fiscal year, or 2 lbs. From the Fiscal year 2019. The city's waste data shows that it has been able to reduce its waste.

In the more than a thousand landfills, recycling, distraction, recycling and waste, residents produced 800 lbs of trash per person.

The economy must shift from ultra-energy-intensive production to a more regenerative or energy democracy that benefits our people, environment and a clean, renewable energy economy. Our goal is to create a new economy that is more equitable and inclusive and protects the most vulnerable from climate-fueled disasters in that sweepings. Form our dependent ground and destructive unbelievable growth in the economy, and instead, we must create a new economy that is more equitable and inclusive and protects the most vulnerable.

The actual collection, recycling, distraction, recycling and waste, residents produced 800 lbs of trash per person.

ENVIRONMENTAL INFLUENCERS

Nicole Crowdsong, the Bronx Recycling Coalition's director, is one of the city's further in a given. Officially, and it's a bronx, and it's belonging to the city's 63 million residents.

Crowdsong, who's been with the coalition since 2009, has educated about the city's waste and recycling problem for years. Her goal is to make it easier for the city's people - and of all the kind - refuse. Crowdsong, a Bronxy New Yorker and a project manager for the Bronx Recycling Coalition, is a Bronx native. She's lived and bronx in education and recycling.

After a layoff in summer 2018, Crowdsong, an Astoria resident, shifted to freelance work. She let her subject focus shift to where she worked closely with clients in the Bronx, Brooklyn and Queens, and Staten Island.

"I always keep pointing it off here that I feel like the universe was pinging me that deeper along the way," Crowdsong said. "I knew I just felt it in the layoff as a sign from the universe that at that point was second, screaming at me to follow my passion and do what I was meant to do, which was to do this work."

It was Goldfinger, and she realized that the work she was doing was a mix of management and organizing. But she wanted to do more. She knew if the city wanted to reach its goal of zero waste by 2030, it would need to do more than just the bare bones, she dreamed of holding the mayor's feet to the fire and pushing for change.

She had called Berkey Solly becoming zero waste, recycling waste billing, and recycling waste billing, and recycling waste billing, and recycling waste billing, and recycling waste billing, and recycling waste billing.

In August 2019 Berkey Solly joined the Bronx Recycling Coalition as a senior fellow. Fellow seeking to the change she started to seek. The star founded Zero Waste Chance, a nonprofit that aims to help people, organizations and businesses become members on the Greens.

Right off the bat, they carried with the Department of Sanitation's nonprofit. The Department of Sanitation's nonprofit, Zero Waste Chance, is a nonprofit that aims to reach zero waste. The foundation aspirations to "reduce waste and promote greener forward promoting environmental sustainability, including Nation's steps, beach cleanups, and environmental education."

The coalition's mission is to "reduce waste and promote greener forward." Berkey Solly, with the goal of developing an urban resort initiative. Everybody want to make a substantive difference, it seems and crowdsong Solly, Crowdsong said.

In February, the Workshop Series started with the Foundation as a part of the city's Zero Waste Chance initiative. The Workshop Series, which is a part of the Zero Waste Chance, Foundation's Zero Waste Chance initiative, is a part of the city's Zero Waste Chance.

Additionally, Crowdsong said her audience is primarily made up of those who have an interest in the environment and sustainability, and that's a good thing. "We are all in the city's diversion numbers. Crowdsong estimates that there are about 1,000 people.

Crowdsong said the Bronx Recycling Coalition's mission is to "reduce waste and promote greener forward."

MY CONTRIBUTION: I fully reported and developed this piece as an intern on NBC News Digital's data and graphics team. It's the most deeply sourced article the team has written. The animated map was first developed in Observable and then re-created in regular JavaScript using Scrubber to animate. The line chart was created using an in-house D3.js starter kit. Live link: https://www.nbcnews.com/news/us-news/yachting-crowd-was-gearing-booming-2020-sailing-season-then-coronavirus-n1202231

CORONAVIRUS

The yachting crowd was gearing up for a booming 2020 sailing season. Then the coronavirus happened.

The Bahamas deployed warships to enforce its port restrictions, one of several new hindrances to a big boat lifestyle.

David Geffen's yacht, the Rising Sun, is more than 450 feet long. It has another yacht, Rising Sun Cat, that docks inside. Gregory Rec / Portland Press Herald/Getty Images file

May 9, 2020, 7:46 AM CDT

By Sawyer Click

If you were one of the lucky Americans to own a yacht before the coronavirus shut down the country, you were probably on the water.

In the first three months of the year, the average yacht sailed farther than the year before, according to an NBC News analysis of MarineTraffic boat-location data of 514 U.S.-flagged yachts at least 90 feet long.

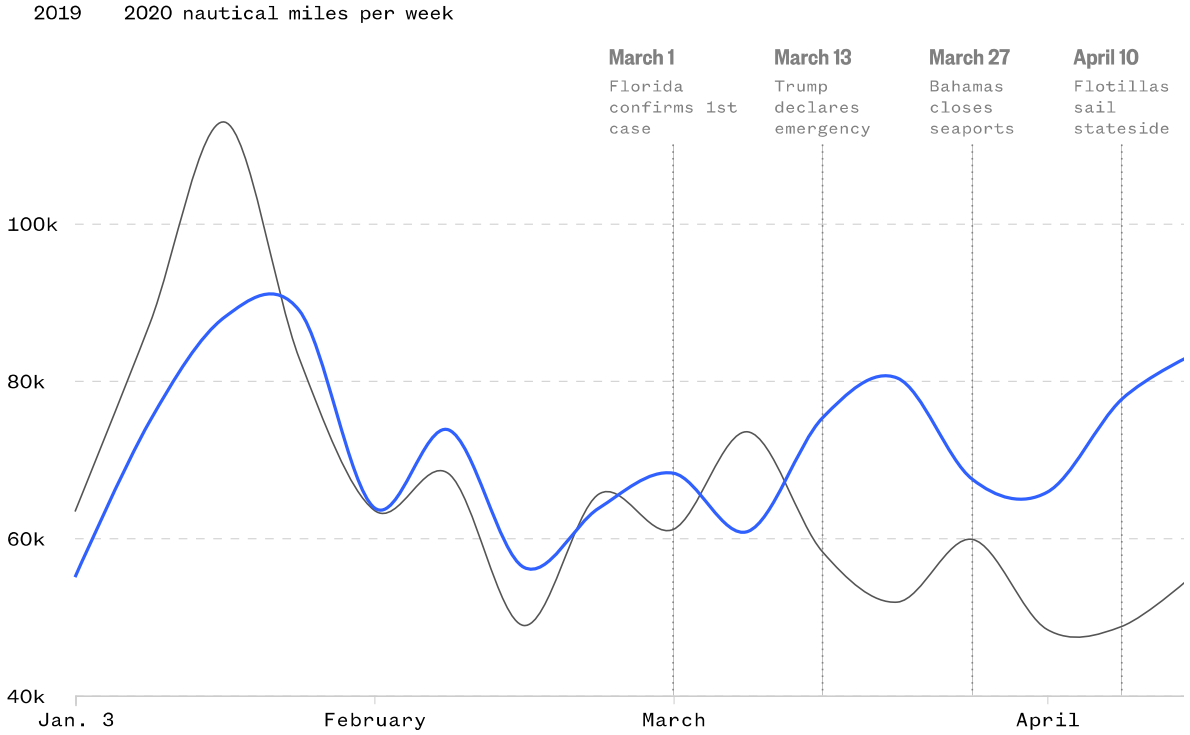
For the billionaire David Geffen, that meant sailing around the South Pacific on Rising Sun, his longer-than-a-football-field superyacht, which includes another boat, the Rising Sun Cat, which docks inside. Like-

minded superyacht owners followed suit, ditching the perils of sheltering at home – customer limits at grocery stories and trading designer clothes for toilet paper, among other struggles – for life at sea.

But after President Donald Trump declared a national emergency on March 13, ship travel plummeted. What looked like a big season ahead for the yachting crowd turned anything but as the coronavirus spread, shelter-in-place orders were issued and island coastal borders were tightened.

Anchors down

Superyachts started sailing back stateside in the wake of the coronavirus pandemic.



Notes

Weeks start on Friday.

Source: NBC News analysis of MarineTraffic ship data.
Graphic: Sawyer Click / NBC News

Superyachts are generally at least 90 feet long, according to several superyacht club managers in Florida. The vessels typically have a paid crew on board and come with multiple bedrooms and lounging areas.

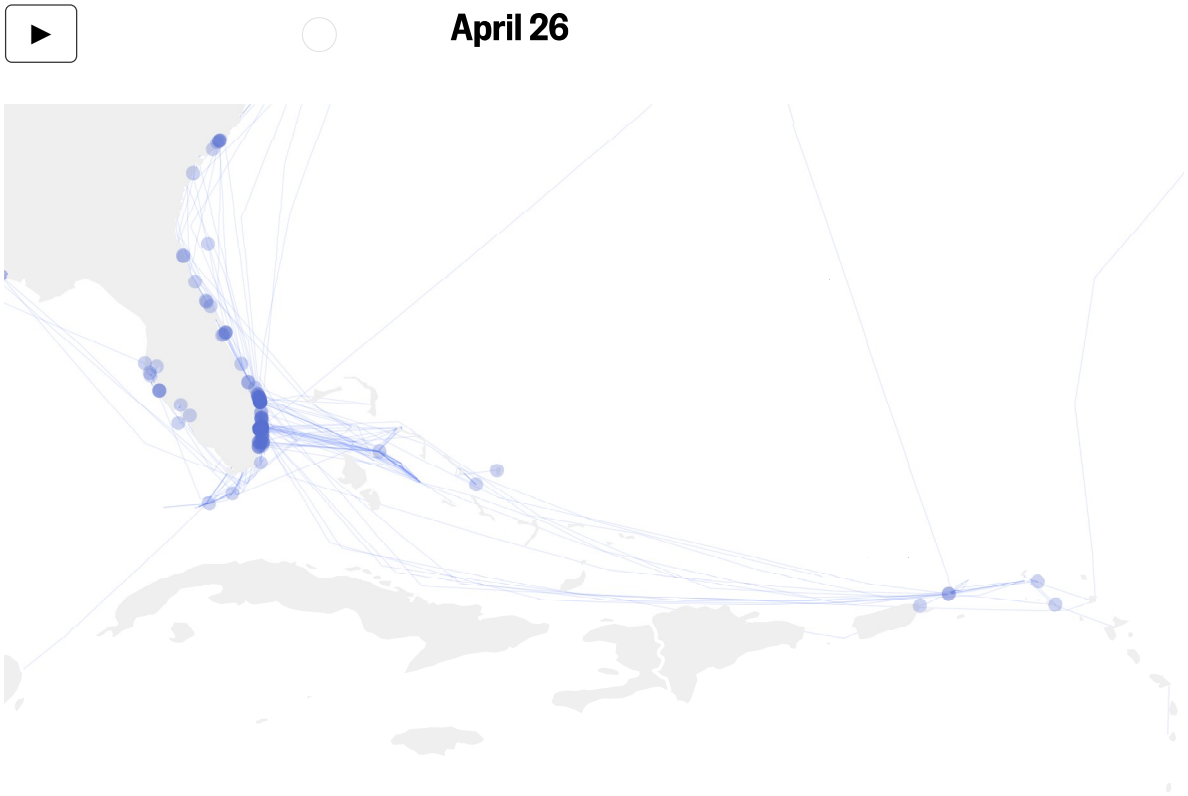
“You know it when you see it,” said Enrique Quintero, the general manager at the superyacht club Prime Marina in Miami.

For superyacht owners, the go-to spots before the national emergency declaration were the Florida Keys, the Bahamas and the Caribbean: paradises that had little-to-no confirmed coronavirus cases and were still mostly open. Yachting season for the region was at its peak for the year, with nearly 65 superyachts stretched throughout the region. After Trump’s declaration, four-fifths of the ships set sail for the U.S. At the same time in 2019, there were three times as many U.S.-flagged yachts in the Caribbean.

As states began to issue stay-at-home orders and the country ground to a halt, the yachting season became less about leisure and more about finding somewhere to shelter in place.

Superyachts head home

In the weeks following Trump's declaration of a national emergency, four-fifths of the superyachts in the Caribbean sailed to the mainland U.S.



Source: NBC News analysis of MarineTraffic ship data.
Graphic: Sawyer Click / NBC News

"A lot of people had that idea that, 'Oh, I'm going to jump on my boat'"

Phil Brassington, a Florida-based shipwright who specializes in long-term sailing equipment, has worked late nights and weekends since February to keep up with increased customer demand. Though some of his customers made it to sea, several puttered out around the Keys, stuck stateside because of travel restrictions. From yacht shipwrights to yacht salesmen, work in the industry has picked up as affluent customers come calling.

"I've been very busy, because as COVID-19 unfolded, a lot of people had that idea that, 'Oh, I'm going to jump on my boat and leave,'" Brassington, who has lived with his wife and two children on their catamaran for the last few years, said.

Related

COVID TRACKER

These states have the most coronavirus cases. See the day-by-day breakdown.

Among those eager to escape the pandemic was Brian Harmon, 57, a retired restaurateur and chef. As coronavirus case numbers began to ramp up in mid-March, Harmon made plans to leave the mainland on his catamaran, Salty Dreams.

"I was not going to participate in the insanity," said Harmon, who lives on Florida's mainland when he's not sailing. "So I decided that I thought the best way to a quarantine would be to hop aboard Salty Dreams and get off land."

— David Geffen's yacht Rising Sun at dock in Portland, Maine, in 2013.
Gregory Rec / Portland Press Herald/Getty Images file

Within a week he had built a crew solicited from an online sailing forum and had cast off for the Florida Keys. In the weeks since, he's spent most of his time fishing, tinkering with the boat and watching "Peaky Blinders"on Netflix when there's an internet connection. His crew consists of a married couple from upstate New York in it for the experience. The wife, an attorney, works by phone whenever she can and the husband is often away on Harmon's dinghy exploring.

In mid-April, after a month or so at sea, Harmon was out of groceries and had to turn around as popular islands in the Keys restricted travel. At Key West, the dockmaster held onto Harmon's driver's license while he deboarded for an hour to get gas and groceries. At Marathon, he wasn't allowed to leave his boat at all. The inconsistency and lack of freedom drove him to turn Salty Dreams around for a slow-paced float back to mainland Florida.

Despite droves of boats such as Salty Dreams sailing home, yacht salesmen are keeping busy, according to Michael Costa, a salesman based in California. His company, SeaNet, deals in selling whole yachts and shares of yachts, akin to a timeshare.

In the past few weeks, he's seen an increase in families drawn to the fractional ownership program, which

has a price tag starting at $250,000. Most customers, Costa said, are interested in weekend getaways.

“I think that people are looking at private yachting as a very interesting alternative in this environment,” Costa said. “People are rethinking their vacation trips to Europe or having to travel long distances as it relates to getting on a plane.”

Ports close, add restrictions

Most islands in the Caribbean, such as the Bahamas and the U.S. Virgin Islands have implemented restrictions similar to those in the Florida Keys, allowing few ships out and fewer in. Yachters have been left with two options: shelter-in-place until the waters open or retreat stateside.

The island clusters are gathering spots for a majority of superyachts outside the U.S. After seaports began closing in the Florida Keys in late March, many superyachts set sail toward islands in the Caribbean, which started closing soon after.

Bahamian Prime Minister Hubert Minnis sent in warships from the Royal Bahamas Defense Force in early April to prevent unauthorized ships from traveling the islands without written permission.

For Katie Gasper, 39, who has been living at sea for years with her husband and 11-year-old son aboard a 65-foot yacht, the crackdown meant staying put.

Gasper, a former physician assistant and current stay-at-yacht mom, and her family were in the U.S. Virgin Islands in mid-March, a day after the Islands confirmed its first coronavirus case. If it weren’t for prior docking reservations, the family wouldn’t have been allowed in.The island’s shelter-in-place rules are similar to those stateside: Nonessential businesses have temporarily closed, restaurants are limited to takeout and delivery, and gatherings of more than 10 people are prohibited.

Related

COVID TRACKER

Map of how many coronavirus cases have been confirmed across the country

They’re still allowed to travel on land throughout St. Thomas, but the limitations have started to bite at their day-to-day schedule. Since March, their typical day isn’t that different than before the pandemic: biking, homeschooling, board games and yoga. Gasper said the most uncomfortable difference is the lack of human contact.

“We don't really hang out with people,” Gasper said. “Drinking at sundown is a really big thing for sailors. We've done it only once in the past three or four weeks with friends of ours that are an older couple. We

just sat 6 feet apart from each other on the dock getting drunk."

The Gaspers are staying put until further notice, postponing a loosely planned trip that would have taken them through the Panama Canal and toward Australia, where Gasper's husband dreamed of staying for a few months. She said the family feels safer docked in the islands than they would stateside, largely because of the distance between themselves and coronavirus hot spots.

The port they're docked in, Charlotte Amalie, had been crowded for weeks, Gasper said. But after the island's social distancing measures went into effect, the superyachts cleared out and headed for Florida's beaches, which Gov. Ron DeSantis opened portions of two weeks later.

"It was kind of just like business as usual here," Gasper said. "A lot of the megayachts were coming and going and partying. Now many of the boats are returning to the U.S. prematurely. They're either sailing up there or being shipped on freighters up there. It's emptied out quite a bit."

Sawyer Click

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Artificial Intelligence Helps to Decode Mysterious Earthquake Swarms

Seismologists use software to uncover complexity of fault systems; work could yield insights into how earthquakes originate

A strong earthquake in Croatia on March 23 caused widespread damage, injured more than 20 people in the capital, Zagreb, and was followed by a series of aftershocks.

PHOTO: DARKO BANDIC/ASSOCIATED PRESS

MY CONTRIBUTION:
For this article I produced the map and two scatter plots. The map was created in QGIS and fine-tuned in Illustrator to match WSJ style. The plots were both developed in an Observable notebook with D3.js and pulled into Illustrator to be cleaned.

Live link:
https://www.wsj.com/articles/artificial-intelligence-helps-to-decode-mysterious-earthquake-swarms-11592998200

By Daniela Hernandez / Graphics by Sawyer Click and Alberto Cervantes

June 24, 2020 7:30 am ET

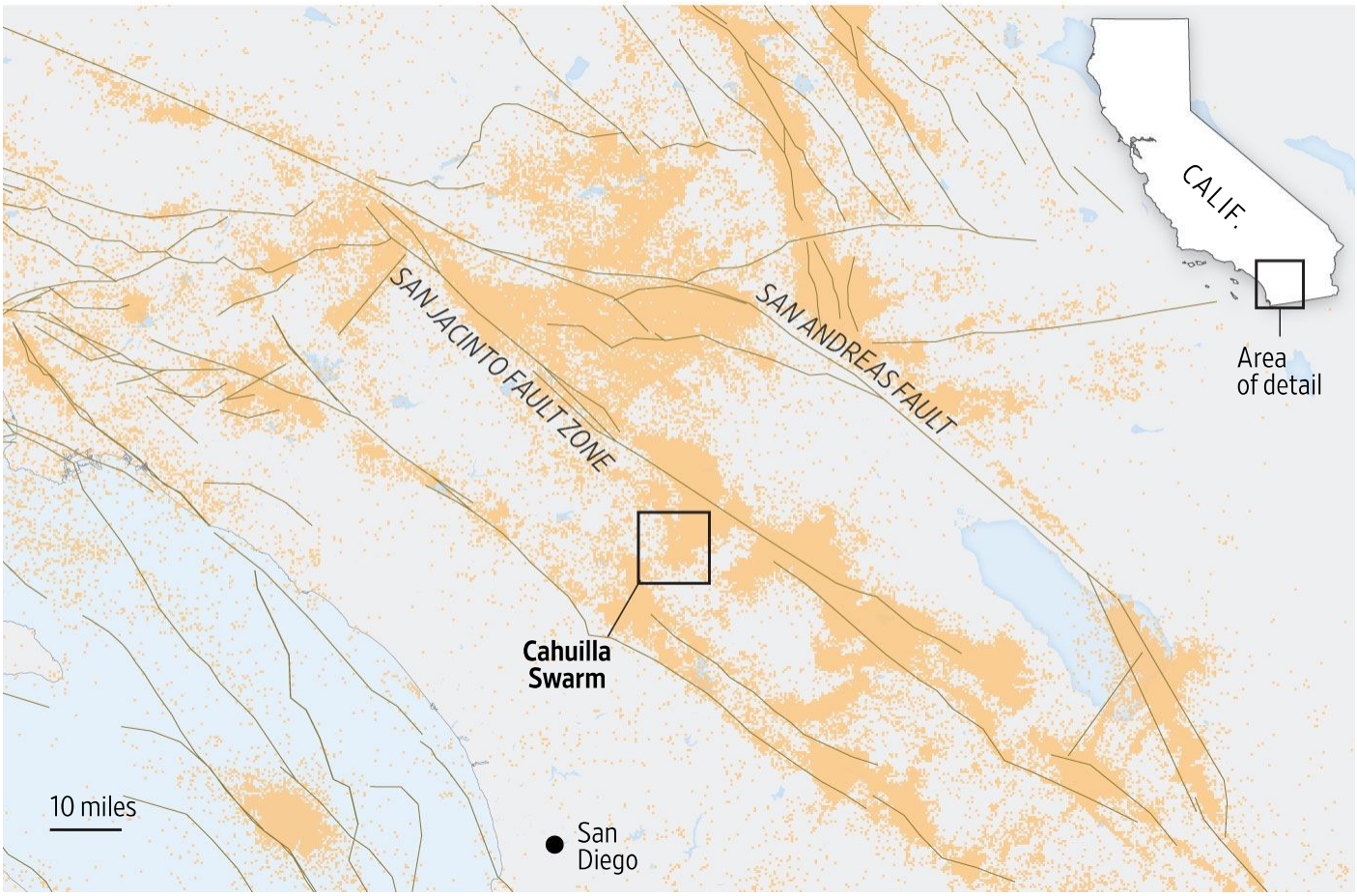
In 2018, seismologists at the California Institute of Technology got several emails asking about a flurry of small earthquakes near Cahuilla in Southern California. What was going on underground? How long might the tremors last?

The scientists started looking at data streaming in from satellites, plus a variety of sensors that measured earthquake intensity and the deformation of the earth's crust, according to Elizabeth Cochran, a U.S. Geological Survey seismologist working with Caltech. The initial analysis came up empty.

Earthquakes in the Region, 2016-19

Earthquake epicenter occurence

Fault



Source: Zachary Ross, California Institute of Technology

That is when Zachary Ross, a Caltech seismologist who specializes in applying artificial intelligence to earthquake data, decided to input the measurements into an AI algorithm he had written.

The software yielded one of the most detailed descriptions to date of so-called earthquake swarms—unpredictable strings of quakes, often low-intensity—across time and space.

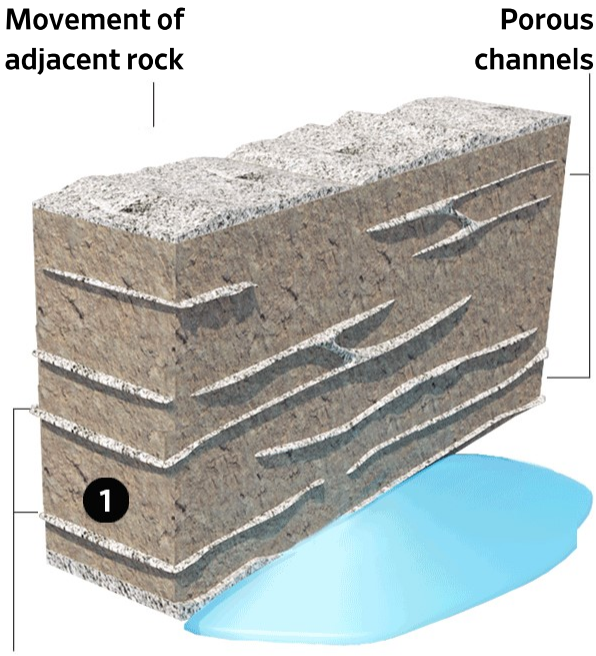
The analysis, described in a study published this month in the journal Science, could help scientists better understand the complex set of dynamic processes underground that culminate in earthquakes, seismologists said.

The earthquakes people are most familiar with, including Tuesday's 7.5-magnitude quake off the Pacific coast of Mexico that rattled the country's capital, happen when two tectonic plates slip past each other.

The Makings of an Earthquake Swarm

As fluid fills a fault zone, it makes it easier for slabs of rock to slip.

1. The rock in the fault zone is porous, like a sponge
2. At the base, there is an underground reservoir of fluid that's initially sealed



3. A crack allows that fluid to seep into the fault
4. The fluid acts as a lubricant that makes it easier for the fault to slip

Source: Science Magazine

In reality, that explanation is an oversimplification of what is happening beneath our feet, said Angela Chung, an earthquake early-warning system project scientist at the University of California, Berkeley's Seismology Lab. The behavior of fault zones, where earthquakes originate, is much more complex, but researchers still have little insight into the geological processes that give rise to that complexity, she and other experts said.

Unlike aftershocks—events following a single large earthquake that decrease in frequency and intensity with time—swarm activity is usually very erratic. Scientists often describe swarms as mysterious and elusive. Each one is unique.

They tend to happen where the ground is warm—near volcanoes, for instance. The consensus is that earthquake swarms are a byproduct of other geological processes, scientists said, including the movement of water, magma or gases underground and aseismic slip, the creeping movement of faults too slow to cause shaking.

"It's not really clear why [earthquakes] happen exactly," said Dr. Chung, who wasn't involved in the swarm work. "It can be a useful step to understand what starts an earthquake sequence."

The Cahuilla swarm described in the Science study originated along a 330-foot cracked region roughly 5 miles below the surface and 9 miles from one of

California's major fault zones.

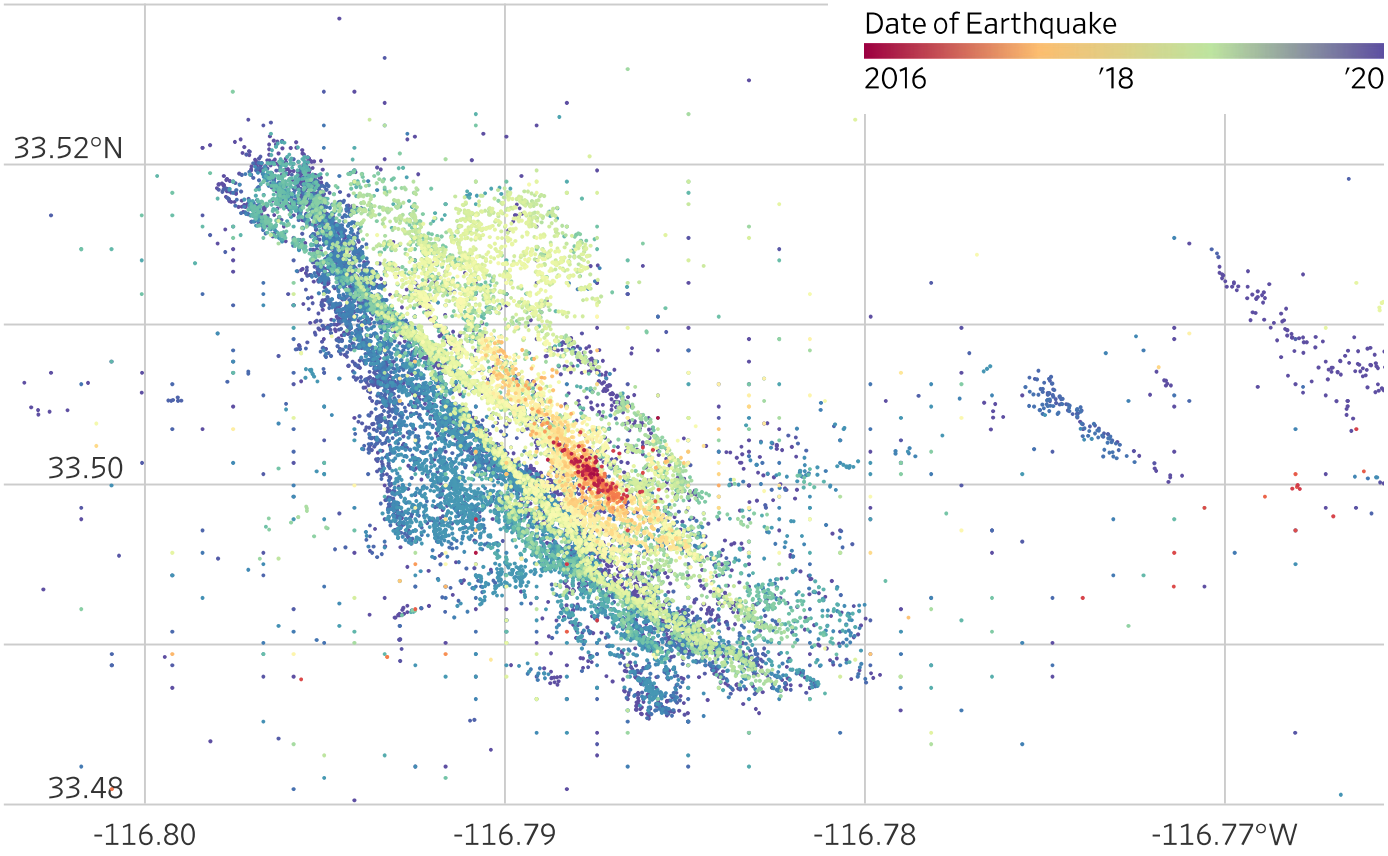
SHARE YOUR THOUGHTS

Have you experienced an earthquake? Share your story below.

The swarm started in 2016 and lasted roughly four years, radiating out from this original spot to extend over an area of roughly 6 square miles. Its duration was far longer than other swarms recorded with modern tools, the authors said.

Where the Cahuilla Swarm Spread

The swarm started in 2016 and lasted roughly four years, radiating out from an initial point (red) to extend over an area covering roughly 6 square miles.



Source: Zachary Ross, California Institute of Technology

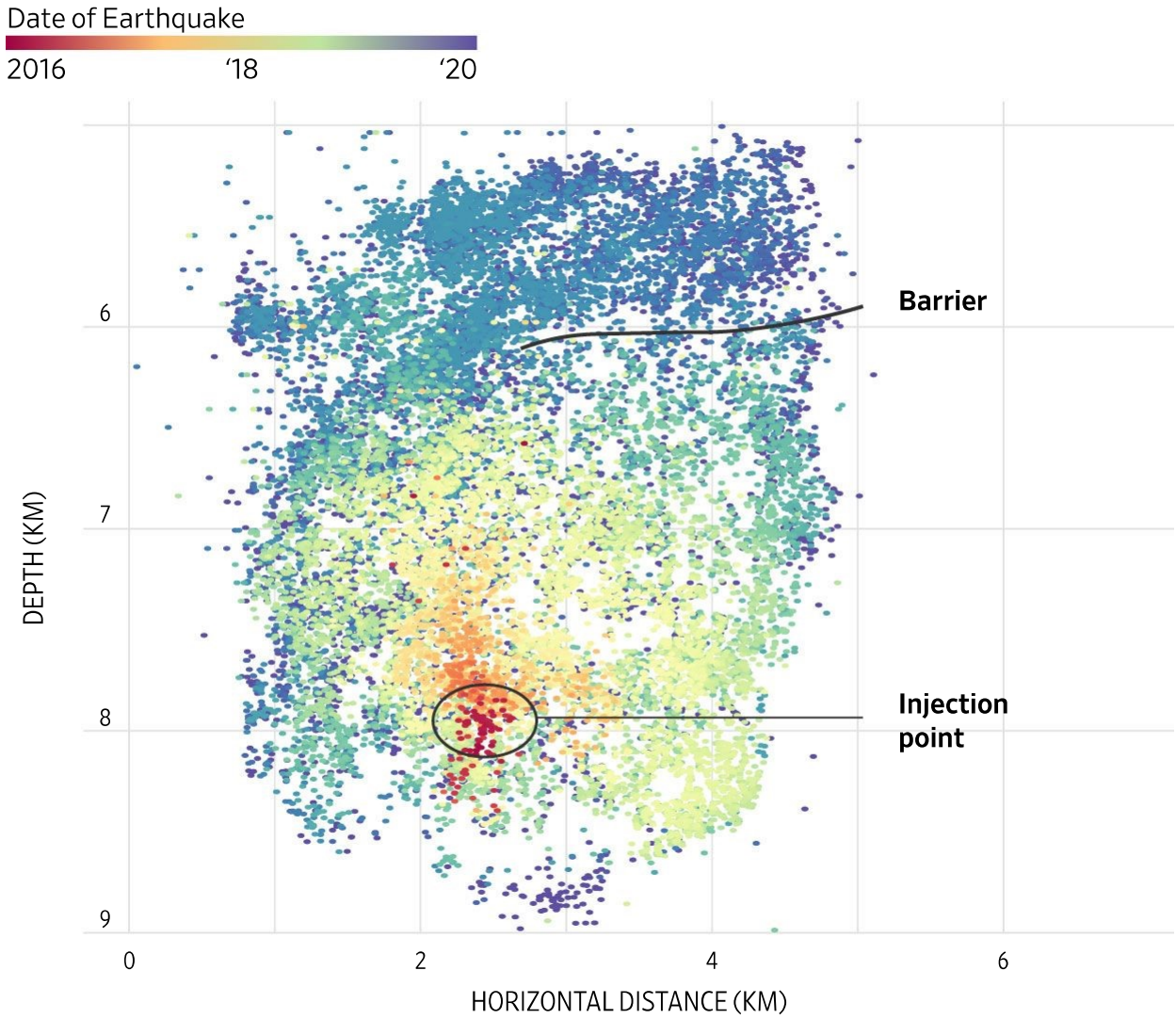
A fracture in the porous rock below allowed an unknown fluid—perhaps water or a gas—to migrate up and fill in the gaps, as water fills the holes in a sponge, Dr. Ross said. The fluid, which migrated along the fault zone, acts as a lubricant that makes it easier for adjacent slabs of rock to slip past one another. When they do, that generates earthquakes. The larger the slip, the bigger the quake's magnitude.

Dr. Ross's AI system scanned earthquake recordings, logged the time the temblors occurred and pinpointed their locations. The software detected more than 22,000 earthquakes ranging from magnitude 0.7 to 4.4. They were mostly tiny and imperceptible, both to humans and less-sophisticated methods of analysis, according to the authors.

"These smaller earthquakes are happening all the time, which means they're filling in gaps between all the larger ones," said Dr. Ross. "It's connecting the dots better."

Underground Cross-Section of the Cahuilla Swarm

A fracture in the rock allowed fluid to migrate up (injection point). Less fluid flowed into sections of the rock that were less porous, decreasing the chance of earthquakes (barrier zone).



Note: The horizontal and vertical axes are not proportional.
Source: Zachary Ross, California Institute of Technology

That is important because seismologists don't fully understand the geological

recipe of events that leads to large earthquakes.

"Every time there's a large-magnitude earthquake....they always seem to surprise us," said Alicia Hotovec-Ellis, a volcano seismologist at the USGS's California Volcano Observatory, who studies volcanic earthquake swarms but wasn't involved in the new study. "Being able to resolve some of these heterogeneities in the fault structure and places where slip is allowed to happen might be really useful in trying to anticipate what shaking might look like for earthquakes in the future."

The use of AI in seismology is still new, but interest is growing, scientists said. The researchers plan to study other previously recorded swarms to understand how long they last and what geological events caused them.

Write to Daniela Hernandez at daniela.hernandez@wsj.com

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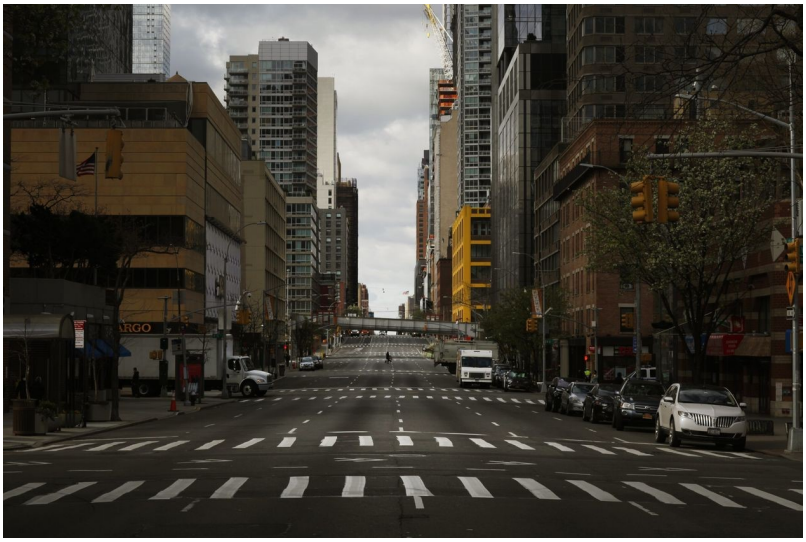
WORLD

Covid-19's Environmental Benefits Evaporate as World Reopens

Carbon emissions sank as lockdowns took hold world-wide, but now they are rebounding fast



Lockdowns across the world such as the one in New York City contributed to a fall in global carbon emissions.

PHOTO: JEHAD NGA FOR THE WALL STREET JOURNAL

MY CONTRIBUTION:
As a part of a series on sustainability, I created this line/area chart that shows various scenarios of emissions. It was developed in an Observable notebook with D3.js and pulled into Illustrator.

Live link:
https://www.wsj.com/articles/covid-19s-environmental-benefits-evaporate-as-world-reopens-11594290145

By Sarah McFarlane
July 9, 2020 6:22 am ET

For climate scientists, the pandemic has made one thing clearer: the difficulty of reducing carbon emissions.

Emissions sank when factories were shut down, planes grounded and cars parked, as people stayed home to slow the spread of the coronavirus, but they are now rebounding fast as economies reopen.

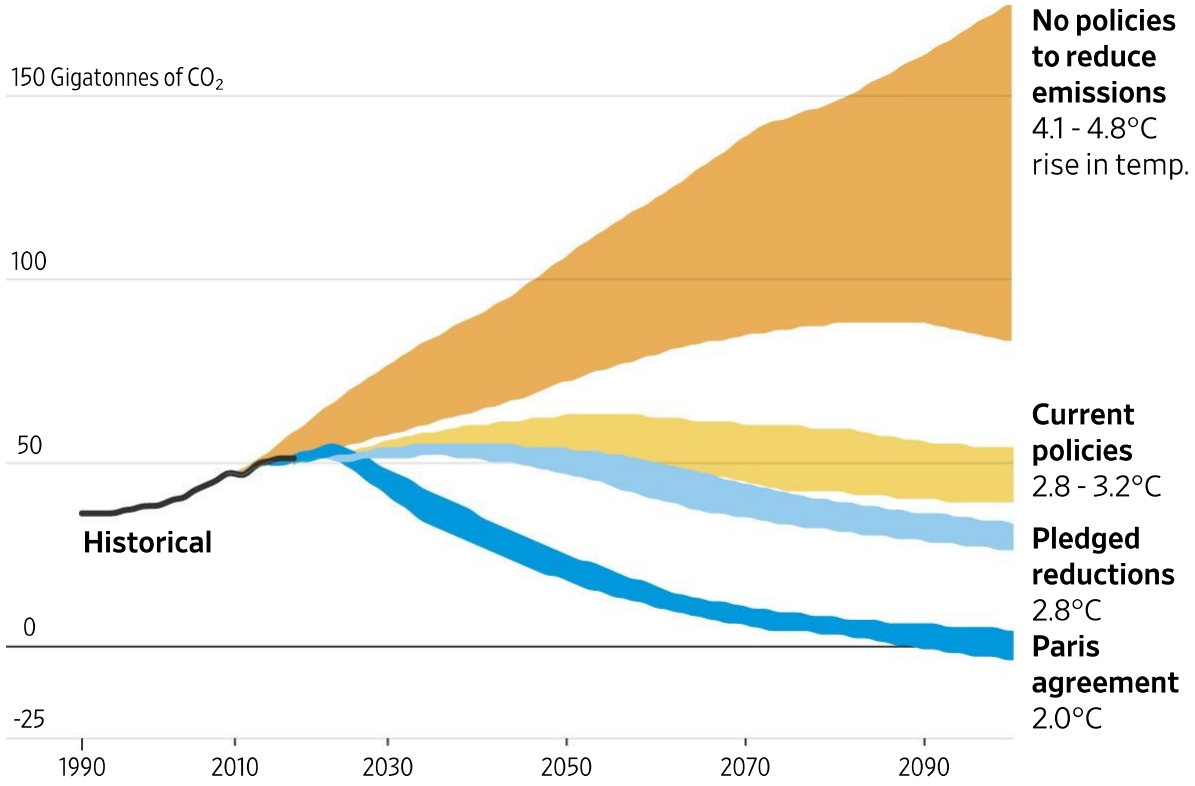
When two-thirds of the world's population was under lockdown in early April, carbon emissions were down 17% compared with average daily emissions last year, according to a study by a group of climate scientists published in the journal Nature Climate Change. By June 11, the drop was 5%.

"We're getting to this by stopping all activities, not structural changes, so when people go back to work there's no reason these emissions wouldn't go shooting back up," said Corinne Le Quéré, a professor of climate change science and policy at the U.K.'s University of East Anglia, who led the study. For a lasting impact, governments need to encourage low-emissions technologies such as electric vehicles, she added.

Warming Up

Global temperatures are expected to rise unless carbon emissions are reduced.

CO_2 emissions and projected temperature increases under various scenarios



Source: Climate Action Tracker
Sawyer Click/THE WALL STREET JOURNAL

Governments have put more effort into reducing emissions since the 2015 Paris climate accord, under which they agreed to limit global temperature increases to less than 2 degrees Celsius, with an ambition to cap them at 1.5 degrees. Since then, emissions have continued to rise, and the U.S. has said it is withdrawing from the deal.

Emissions are typically monitored on a monthly and annual basis, but scientists say the pandemic has accelerated efforts to move toward a system of daily reporting. To do that, they are tapping proxy data, such as measuring road traffic

via daily requests for driving directions on Apple Inc.'s maps app and TomTom NV statistics, and using data transmitted by smart meters to gauge residential electricity demand.

Scientists wanted to measure the impact lockdowns were having on global emissions and how long it would take to return to pre-lockdown levels.

"The virus will fundamentally change carbon cycle science, it already has in that we're focusing on real-time carbon emissions," said Rob Jackson, chair of the Global Carbon Project, which produces annual data focused on emissions from fossil fuels and land use.

SHARE YOUR THOUGHTS

What do you think the world has learned about carbon emissions during the pandemic? Join the conversation below.

"We were struck by how ill-prepared we were to make real-time estimates," Mr. Jackson said. "What we weren't as creative about was using [proxy] data sources like cellphone data."

Scientists say that greater use of that data—while not as accurate as more direct sources—has allowed them to track the pace of the fall in emissions and the subsequent rebound.

"I think that is useful and sobering for the realization of the challenge," said Sverre Alvik, program director for energy transition at Norway-based consulting firm DNV GL.

The United Nations Environment Programme says global emissions need to fall 7.6% a year until 2030 to be on track to meet the Paris goals.

The world is set to exceed that target this year, with the International Energy Agency forecasting carbon emissions to fall 8% to 30.6 gigatons—the lowest level in a decade. However, many scientists expect the fall to be short-lived given it has been induced by a health crisis rather than a planned, permanent change to emissions-emitting activities.

For instance, emissions fell 1% during the 2009 economic downturn but rebounded 6% the following year, according to IEA data, as governments pumped

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trillions of dollars into their economies to stimulate growth.

This year, governments have committed $12 trillion to reinvigorating economies, with around 5% earmarked for climate-friendly initiatives, according to a report by BloombergNEF in June.

Scientists say their newfound ability to rapidly assess changes to emissions could be helpful for future policy.

Most of the recent drop in emissions came from surface transport, where activity fell 50%, and industry, where it dropped 35%, according to the report by climate scientists. Aviation saw the largest drop in activity at 75%, but it only generates 2.8% of global emissions. Ordinarily, the largest contributor to carbon emissions is industrial production at 44%, followed by electricity generation at 22%, and road and rail transport at 21%.

"It's shown us a few of the sectors that are more elastic in the sense that they can be rapidly targeted like transport," said Richard Allan, professor of climate science at the University of Reading.

Scientists also say behavioral shifts during the pandemic have shown that governments, companies and individuals can make changes quickly that curb emissions, and that recent momentum could be used to bring about lasting reductions.

However, the extent to which people work from home more frequently, reduce international travel and opt to walk or cycle after the pandemic—and the impact of those actions on emissions—isn't yet clear. The rebound in emissions indicates that it may be limited, scientists say.

There is also pushback from some businesses that don't want to change their behavior, saying they need to focus on jobs and reviving activity rather than climate objectives.

"We see that the forces in both directions are equally strong, and we don't see yet that this will hasten the energy transition," DNV's Mr. Alvik said.

Write to Sarah McFarlane at sarah.mcfarlane@wsj.com

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