

Heat-Trapping Gas Passes Milestone, Raising Fears



Chris Stewart/Associated Press

The average carbon dioxide reading surpassed 400 parts per million at the research facility atop the Mauna Loa volcano on the island of Hawaii for the 24 hours that ended at 8 p.m. on Thursday.

By JUSTIN GILLIS *The New York Times* May 10, 2013

The level of the most important heat-trapping gas in the atmosphere, carbon dioxide, has passed a long-feared milestone, scientists reported Friday, reaching a concentration not seen on the earth for millions of years.

Scientific instruments showed that the gas had reached an average daily level above 400 parts per million — just an odometer moment in one sense, but also a sobering reminder that decades of efforts to bring human-produced emissions under control are faltering.

The best available evidence suggests the amount of the gas in the air has not been this high for at least three million years, before humans evolved, and scientists believe the rise portends large changes in the climate and the level of the sea.

“It symbolizes that so far we have failed miserably in tackling this problem,” said Pieter P. Tans, who runs the monitoring program at the National Oceanic and Atmospheric Administration that reported the new reading.

Ralph Keeling, who runs another monitoring program at the Scripps Institution of Oceanography in San Diego, said a continuing rise could be catastrophic. “It means we are quickly losing the

possibility of keeping the climate below what people thought were possibly tolerable thresholds,” he said.

Virtually every automobile ride, every plane trip and, in most places, every flip of a light switch adds carbon dioxide to the air, and relatively little money is being spent to find and deploy alternative technologies.

China is now the largest emitter, but Americans have been consuming fossil fuels extensively for far longer, and experts say the United States is more responsible than any other nation for the high level.

The new measurement came from analyzers atop Mauna Loa, the volcano on the big island of Hawaii that has long been ground zero for monitoring the worldwide trend on carbon dioxide, or CO₂. Devices there sample clean, crisp air that has blown thousands of miles across the Pacific Ocean, producing a record of rising carbon dioxide levels that has been closely tracked for half a century.

Carbon dioxide above 400 parts per million was first seen in the Arctic last year, and had also spiked above that level in hourly readings at Mauna Loa.

But the average reading for an entire day surpassed that level at Mauna Loa for the first time in the 24 hours that ended at 8 p.m. Eastern Daylight Time on Thursday. The two monitoring programs use slightly different protocols; NOAA reported an average for the period of 400.03 parts per million, while Scripps reported 400.08.

Carbon dioxide rises and falls on a seasonal cycle, and the level will dip below 400 this summer as leaf growth in the Northern Hemisphere pulls about 10 billion tons of carbon out of the air. But experts say that will be a brief reprieve — the moment is approaching when no measurement of the ambient air anywhere on earth, in any season, will produce a reading below 400.

“It feels like the inevitable march toward disaster,” said Maureen E. Raymo, a scientist at the Lamont-Doherty Earth Observatory, a unit of Columbia University.

From studying air bubbles trapped in Antarctic ice, scientists know that going back 800,000 years, the carbon dioxide level oscillated in a tight band, from about 180 parts per million in the depths of ice ages to about 280 during the warm periods between. The evidence shows that global temperatures and CO₂ levels are tightly linked.

For the entire period of human civilization, roughly 8,000 years, the carbon dioxide level was relatively stable near that upper bound. But the burning of fossil fuels has caused a 41 percent increase in the heat-trapping gas since the Industrial Revolution, a mere geological instant, and scientists say the climate is beginning to react, though they expect far larger changes in the future.

Indirect measurements suggest that the last time the carbon dioxide level was this high was at least three million years ago, during an epoch called the Pliocene. Geological research shows that the climate then was far warmer than today, the world's ice caps were smaller, and the sea level might have been as much as 60 or 80 feet higher.

Experts fear that humanity may be precipitating a return to such conditions — except this time, billions of people are in harm's way.

“It takes a long time to melt ice, but we're doing it,” Dr. Keeling said. “It's scary.”

Dr. Keeling's father, Charles David Keeling, began carbon dioxide measurements on Mauna Loa and

at other locations in the late 1950s. The elder Dr. Keeling found a level in the air then of about 315 parts per million — meaning that if a person had filled a million quart jars with air, about 315 quart jars of carbon dioxide would have been mixed in.

His analysis revealed a relentless, long-term increase superimposed on the seasonal cycle, a trend that was dubbed the Keeling Curve.

Countries have adopted an official target to limit the damage from global warming, with 450 parts per million seen as the maximum level compatible with that goal. “Unless things slow down, we'll probably get there in well under 25 years,” Ralph Keeling said.

Yet many countries, including China and the United States, have refused to adopt binding national targets. Scientists say that unless far greater efforts are made soon, the goal of limiting the warming will become impossible without severe economic disruption.

“If you start turning the Titanic long before you hit the iceberg, you can go clear without even spilling a drink of a passenger on deck,” said Richard B. Alley, a climate scientist at Pennsylvania State University. “If you wait until you're really close, spilling a lot of drinks is the best you can hope for.”

Climate-change contrarians, who have little scientific credibility but are politically influential in Washington, point out that carbon dioxide represents only a tiny fraction of the air — as of Thursday's reading, exactly 0.04 percent. “The CO₂ levels in the atmosphere are rather undramatic,” a Republican congressman from California, Dana Rohrabacher, said in a Congressional hearing several years ago.

But climate scientists reject that argument, saying it is like claiming that a tiny bit of arsenic or cobra venom cannot have much effect. Research shows that even at such low levels, carbon dioxide is potent at trapping heat near the surface of the earth.

“If you're looking to stave off climate perturbations that I don't believe our culture is ready to adapt to, then significant reductions in CO₂ emissions have to occur right away,” said Mark Pagani, a Yale geochemist who studies climates of the past. “I feel like the time to do something was yesterday.”

- Will
- NY

To think it was only 40 years ago when a dire Time article, citing the research of respected climate scientists, warned of an oncoming ice age. Crisis averted! With global warming the new threat, there's no need to worry about all the ice.

In all seriousness, it's foolhardy to think climate models are precise. That doesn't mean global warming isn't real or not a concern, but the end-of-the-world prophecies are a gross exaggeration. As much as both sides try to deny it, this debate is rooted more in politics than science. Just as it is silly to deny the potential impact of a warming climate on our way of life, it is equally absurd to subscribe to the most dire theories. Let's be honest, 99.99% of us do not intimately understand the science involved, but that doesn't mean an unskeptical appeal to authority is required. Global warming has become a cottage industry, so let's also not be naïve.

- Jose Lopez
- Argentina

Climate change is yet another pressing issue area where the Obama administration has been unable to move the needle. There was much hope that things would be different under Pres. Obama but sadly little action. Lofty rhetoric again trumped by political fumbling. Without strong US leadership little of major impact can be expected on climate issues.

- D. Fitzgerald
- Illinois

Those Republican cows in our Congress continue to contribute to the problem with their anti-intellectual stand on the pollution of our environment by we, humans!! Get rid of those stinking cows in our Congress. Vote the Republican polluters out of Office!

- richard schumacher
- united states

Now we'll hear from the deniers and anti-environment apologists on the one hand, and on the other from those who think we can solve the problem by reducing Earth's population or by becoming vegetarians. Things are going to get shockingly bad before they start getting better.

- William O. Beeman
- Minneapolis, MN

Senator James Inhofe has called global warming a hoax. He is not the only one representing the interests of big petroleum on this matter. These barons of industry, including the Koch Brothers apparently don't care about the planet or the future of humanity. Their only concern is with their short-term profits peddling fossil fuels. These are among the most venal, evil people on the planet, who should be resisted by the public--including resisting the shills they support for public office.

- ng
- NM

400ppm, folks, and rising!! Please remember... we mustn't pass 350ppm. "I feel like the time to do something was yesterday," says the Yale geochemist, but I feel like the time to do something was in the 1970's. We were warned. We were! Why aren't we in the streets, people?!? Now, I keep thinking of the lyrics made popular during the cold war: "I hope the Russians love their children, too," and seriously wishing that Big Fossil Fuel execs, media moguls, billionaires, and heads of government worldwide (especially BHO) loved their children, too. The so-called "terrorists" aren't the real enemy, it's those in positions of power who could curb greenhouse gas emissions tomorrow, but are increasing them instead. If they love their children, they have an odd way of showing any care for their future.

- mannyv
- oregon

News flash: the amount of human activity is highest that it's even been, at levels unseen for millions of years! The only solution to this problem is to reduce the amount of human activity.

Action item: keep everyone poor except us.

- Sam
- CA

I'll be happy when we face the first tangible consequences of climate change. At this moment in time to the religious quacks and other science-deniers we may finally say "what now??" with 100% certainty instead of only 98% certainty. This moment will be bittersweet, though, because in exchange for being proven definitively, once and for, that we are correct, we are left with a climate already spiraled out of control.

- Andrew
- Philadelphia, PA

While I think this is a crisis, I also suspect that the Earth will "self-correct" and restabilize. Unfortunately, I think that self-correction will wipe out much of civilization and yield incredible suffering for much of the population, human and otherwise, of our fragile planet.

- Eman
- Waldwick, NJ

Those who deny that global warming is a man-made problem have so much in common with Nero in so many ways. And because of them, the neo-Neros, the whole world as we know it is destined to go the way of the once Great Roman Empire. Though originally meant in a different context, this is literally the case of "where there is no vision, the people will perish."

Why don't some people comprehend that accumulation of money is useless when your dead? It's time to stop fiddling and get on the case. Yet, it won't happen because of the love of the almighty dollar. Like crack addicts, those who love making money at the expense of the environment need to get what they crave, even if their actions kill everyone and themselves in the process. Not rational, but "rational man" is a fiction.

- John Burke
- New York

Temperatures have not risen now for 16 years, which so totally undermines the warming alarmists' dire warnings made 16, 20 and more years ago that they keep moving the goal posts: "It's coming...Just you wait..." The "contrarians" -- better known as level-headed people not taken in by overwrought "green" enthusiasts relying on dubious science -- have won. CO2 emissions in the US are down markedly, but not due to economy-killing "alternative" schemes but due to abundant, cheap, clean-burning natural gas replacing coal -- gas produced by new, advanced technologies that "environmentalists" are furiously working to suppress or outlaw. The EU and Japan are backing away from their earlier embrace of suicidal green schemes. Solar panel companies everywhere are going bankrupt. No one wants an electric car, even with outlandish public subsidies. And the annual global climate change conferences have become pointless rituals issuing meaningless repetitious statements.

Game's up. The "green" movement might be able to achieve some significant improvements in our way of life if it were not obsessed with this increasingly ridiculous unicorn hunt.

- ME
- U.S.

I'm tired of the coldest winter hottest summer global warming mainstream arguments. People are so misinformed on a very complex subject. In a country where science seems to be of little concern of so many, why would I listen to anyone but a scientist about the realities of global warming?

Global warming is happening, and carbon dioxide, as well as many other compounds, are a great part of the cause. So what are the sinks and sources of carbon dioxide?

- M H Settelen
- Merrickville

The key question to be asked of the Chief Climatologists of the G20 is with the spike in CO2 levels, has there been a detectable & worrying decrease in Insolation? The remedy surely would be to Electrify all surface transportation, BNSF must be seen on the prelude each day to the NewsHour on PBS to have 'Pantographs' atop their locomotives & immediately we must shift Trucking to Electric Rail!

- Amala
- NYC

Don't give up NY Times! Keep the pressure on with evidence based reporting. Thank you!

- EFBarasch
- Sac City

I will never take any Conservative or Libertarian seriously until they confront this very real issue. The only way it can be dealt with without Big Government and Regulation is that everyone in the world go Solar as fast as possible and there is nothing that raises the dander of Conservatives and many Libertarians more than the single phrase: "Solar Power". They will never admit that they were wrong about Al Gore. Never.

- ME
- U.S.

Is the survival of the human race about the good getting a lucky break, or does hard work and a good attitude really pay off sometimes? As a student I've felt to many times that good research only makes a difference if it gets a lucky break.

- ChrisXL
- Palo Alto

NYT Pick

The real issue here is selfishness. Only by consuming wantonly a significant proportion of this planet's stored carbon reserves have we been able to create and seemingly perpetuate our standard of living. Air conditioning, transportation and synthetic materials that give us comfort in the short run are all built on the relative cheapness of extracting carbon from the earth and burning it. How can we possibly wean ourselves off that seeming life line? The carbon supply that provides for us is actually killing us. Who will willingly give up our luxuries?

- jctab40
- California

CO2 levels, ozone depletion, acidification, desertification, toxins, rapid species extinctions, overpopulation, etc. We passed the point of no return on all of these issues by the late 20th century. Those who brayed warnings about the treatment of the Earth to us would no doubt realize that we failed to heed the warnings.

When Homo sapiens goes extinct, it will take the Earth millions of years to cover the ravages of our species. Anything that happens from the any increase in raping and pillaging the Earth is our own fault.

- NJ
- Lansing, MI

This article makes no estimate of how much carbon our activities have put into the atmosphere year to year and in turn how much is being sequestered. Sure, human activities put millions of tons of carbon into the atmosphere each year above and beyond the baseline amount if there were no humans. Do we need to rely on questionable million year comparisons to measure atmospheric CO2 across the past 50 or 100 years? I doubt we still argue that human activity releases CO2 at an increasing and continuous level and that a proportion of it is not stored by the earth's biological sequestration process. Get on with it, self-interest and extremism have been driving both sides of this debate for too long. Readers simply want to know how much carbon dioxide, as a percentage of overall atmospheric carbon dioxide, is added to the atmosphere each year. Will the oracle atop Mauna Loa provide some additional perspective? Surely a 41% increase in atmospheric CO2 since the industrial age is worth an article in the Times all by itself! Lets put the dinosaurs to rest!

- Siobhan
- New York
- Verified

We need something like OWS--maybe Occupy Earth.

- Mickey O
- Forest Grove, Oregon

Conservative politicians who oppose any attempt to deal with climate change always insist, despite overwhelming evidence, that the underlying science is flawed. It would be far more honest to simply admit that short-term economic gains and avoidance of any sacrifice deserve more priority than the condition of the planet in 25 or 50 years.

Meanwhile, Congress grapples helplessly with self-inflicted crises like sequestration and debt limits. Uniquely among western democracies, these same politicians successfully goad voters into divisive controversies over issues like gun regulation, the alleged "border crisis" and a woman's right to control her own body. Genuine crises like global warming, chronic unemployment and extreme disparities of wealth are purposely ignored.

As the latest data show, nature always has the last move.

- Susan
- Piedmont, California

We human beings are behaving as all other life forms behave. We reproduce until something stops us. This is true of horses, dandelions, bacteria and everybody else.

We have done this, and now there are too many of us for the ecosystems to support. What happens when any life form does this is population crash. It has happened to us before. It will probably happen again, as it always has.

Human generated global climate change is just one of the effects. We probably cannot stop it. The only question left is, which of the many candidates will be the immediate agent of the crash?

- Observer
- Washington

Global warming as a result of greenhouse effect was accepted as a fact by scientists at least 30 years ago - when Al Gore was in junior kindergarten.

But this goes on and on - the same kind of "arguments".

1. Global warming has nothing to do with human development - let's blame sun or God.
2. Who said that global warming is bad? It's not. I like to be warm.

It's already taking its toll in some places in Australia - several droughts in a row, farming collapses. I wonder when it will happen across US Great Plains. It will be interesting to watch this show.

- Casual Observer
- Los Angeles

Even if we were to stop generating such high amounts of carbon dioxide in industry and from deliberate burning of cleared forest, it would take decades to cycle out of the air.

In addition to reducing the use of fossil fuel to drive turbines to make electricity and to power transportation we need to reduce the burning down of forests and to reverse the process by growing new forests. Converting carbon dioxide into wood and plants can act as a sink, a way to re-allocate the resource from gaseous to solid and further sinks for it.

It will take time and money but the method is sound.

- martin weiss
- mexico, mo
- Verified

Exactly. There are synergies that can work for us.

One example to my admittedly biased view, is hemp.

This plant was Diesel's choice for fuel in his first engines. It grows on marginal land unsuited for agriculture. It sequesters carbon.

Hemp oil, I've read, does not produce the carcinogenic residues petroleum does.

It is more efficient as paper than forests.

Biodegradable and edible, it could replace plastic bags.

Farmers could grow their own diesel fuel.

It is sustainable in our energy independence.

There are many other options not forbade by finance and private interests, like the Koch Brothers, who level forests for toilet paper.

We're ignoring the forests for the trees. New paradigms, new priorities compel relinquishing old entrenched institutions. Cultural lag is catching up with the science and finance is not.

- emm305
- SC

I read Paul Erlich's *The Population Bomb* in 1971. His numbers didn't turn out as predicted, but there is a population time bomb. It drives and/or exacerbates the use of fossil fuels.

Since Keeling began his measurement in the '50s, we have worked so hard to help people with vaccines and food aid and millions of people have lived and reproduced who would not have if nature had been allowed to take its course.

If we don't face the population problem, we can't face the carbon dioxide problem. Of course, the CO2 problem will ultimately take care of the population problem...

- John Isom
- Eureka, CA

A population problem? Sure: seven billion, headed towards 10 billion, is something to worry about.

But we should not forget that there is an over-consumption problem. It starts with each of us and our footprint:

Does your car get 21 mpg or 41 mpg? And better: do you ride the bus or a bicycle most of the time? Do you consume wines and apples and kiwi fruit shipped half way around the world? Do you own 17 sweaters rather than seven?

Americans live highest on the hog than any other people on Earth. We need several Earths to sustain American levels of consumption for all seven billion of us.