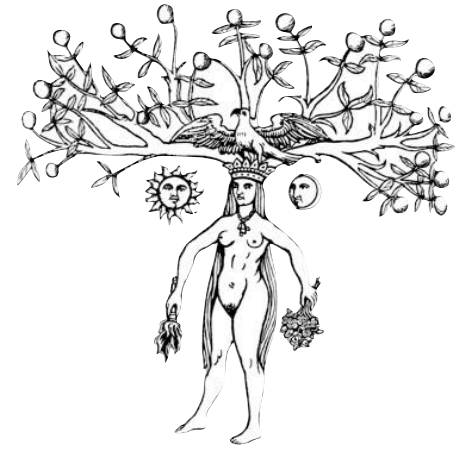


# Scientists Have a Moral Obligation



to clearly warn humanity of any catastrophic threat and to **“tell it like it is.”** On the basis of this obligation...we declare, with more than 11,000 scientist signatories from around the world, clearly and unequivocally that **planet Earth is facing a climate emergency.**

Exactly 40 years ago, scientists from 50 nations met at the First World Climate Conference (in Geneva 1979) and agreed that alarming trends for climate change made it urgently necessary to act. Since then, similar alarms have been made through the 1992 Rio Summit, the 1997 Kyoto Protocol, and the 2015 Paris Agreement, as well as scores of other global assemblies and scientists' explicit warnings of insufficient progress (Ripple et al. 2017). Yet greenhouse gas (GHG) emissions are still rapidly rising, with increasingly damaging effects on the Earth's climate. An immense increase of scale in endeavors to conserve our biosphere is needed to avoid untold suffering due to the climate crisis (IPCC 2018).

Most public discussions on climate change are based on global surface temperature only, an inadequate measure to capture the breadth of human activities and the real dangers stemming from a warming planet. Policymakers and the public now urgently need access to a set of indicators that convey the effects of human activities on GHG emissions and the consequent impacts on climate, our environment, and society

[...]

The climate crisis is closely linked to excessive consumption of the wealthy lifestyle. The most affluent countries are mainly responsible for the historical GHG emissions and generally have the greatest per capita emissions. In the present article, we show general patterns, mostly at the global scale, because there are many climate efforts that involve individual regions and countries. Our vital signs are designed to be useful to the public, policymakers, the business community, and those working to implement the Paris climate agreement, the United Nations' Sustainable Development Goals, and the Aichi Biodiversity Targets.

Profoundly troubling signs from human activities include sustained increases in both human and ruminant livestock populations, per capita meat production, world gross domestic product, global tree cover loss, fossil fuel consumption, the number of air passengers carried, carbon dioxide (CO<sub>2</sub>) emissions, and per capita CO<sub>2</sub> emissions since 2000. Encouraging signs include decreases in global fertility (birth) rates, decelerated forest loss in the Brazilian Amazon, increases in the consumption of solar and wind power, institutional fossil fuel divestment of more than US\$7 trillion, and the proportion of GHG emissions covered by carbon pricing. However, the decline in human fertility rates has substantially slowed during the last 20 years, and the pace of forest loss in Brazil's Amazon has now started to increase again. Consumption of solar and wind energy has increased 373% per decade, but in 2018, it was still 28 times smaller than fossil fuel consumption (combined gas, coal, oil). As of 2018, approximately 14.0% of global GHG emissions were covered by carbon pricing, but the global emissions-weighted average price per tonne of carbon dioxide was only around US\$15.25. A much higher carbon fee price is needed (IPCC 2018). Annual fossil fuel subsidies to energy companies have been fluctuating, and because of a recent spike, they were greater than US\$400 billion in 2018.

Especially disturbing are concurrent trends in the vital signs of climatic impacts. Three abundant atmospheric GHGs (CO<sub>2</sub>, methane, and nitrous oxide) continue to increase, as does global surface temperature. Globally, ice has been rapidly disappearing, evidenced by declining trends in minimum summer Arctic sea ice, Greenland and Antarctic ice sheets, and glacier thickness worldwide. Ocean heat content, ocean acidity, sea level, area burned in the United States, and extreme weather and associated damage costs have all been trending upward. Climate change is predicted to greatly affect marine, freshwater, and terrestrial life, from plankton and corals to fishes and forests. These issues highlight the urgent need for action.

Despite 40 years of global climate negotiations, with few exceptions, we have generally conducted business as usual and have largely failed to address this predicament. The climate crisis has arrived and is accelerating faster than most scientists expected. It is more severe than anticipated, threatening natural ecosystems and the fate of humanity. Especially worrisome are potential irreversible climate tipping points and nature's reinforcing feedbacks (atmospheric, marine, and terrestrial) that could lead to a catastrophic “hothouse Earth,” well beyond the control of humans. These

climate chain reactions could cause significant disruptions to ecosystems, society, and economies, potentially making large areas of Earth uninhabitable.

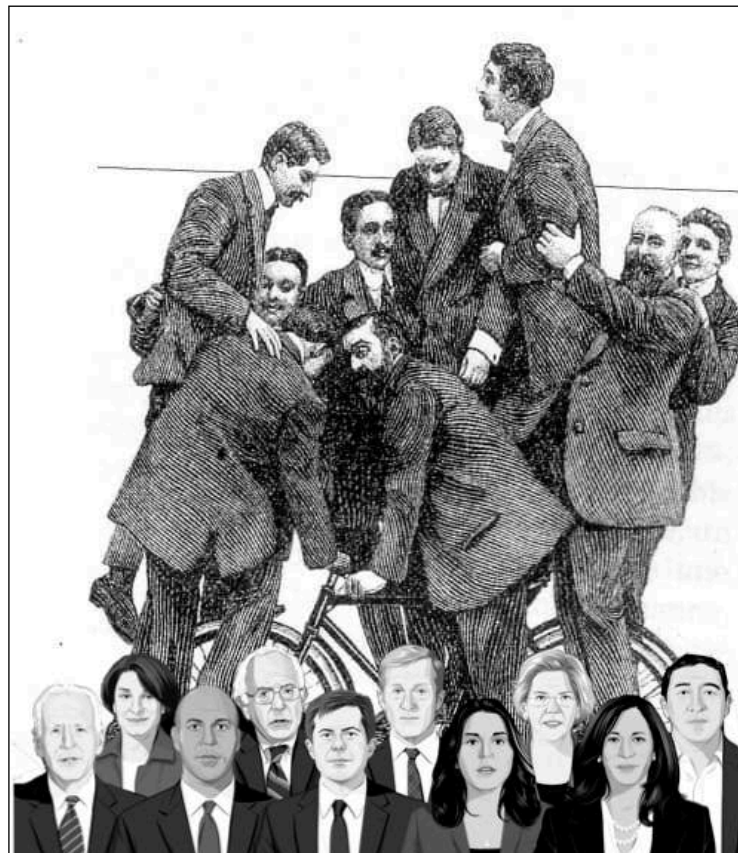
To secure a sustainable future, we must change how we live, in ways that improve the vital signs summarized by our graphs. Economic and population growth are among the most important drivers of increases in CO<sub>2</sub> emissions from fossil fuel combustion, therefore, we need bold and drastic transformations regarding economic and population policies. We suggest six critical and interrelated steps (in no particular order) that governments, businesses, and the rest of humanity can take to lessen the worst effects of climate change. These are important steps but are not the only actions needed or possible.

## Energy

The world must quickly implement massive energy efficiency and conservation practices and must replace fossil fuels with low-carbon renewables and other cleaner sources of energy if safe for people and the environment. We should leave remaining stocks of fossil fuels in the ground and should carefully pursue effective negative emissions using technology such as carbon extraction from the source and capture from the air and especially by enhancing natural systems (see “Nature” section). Wealthier countries need to support poorer nations in transitioning away from fossil fuels. We must swiftly eliminate subsidies for fossil fuels and use effective and fair policies for steadily escalating carbon prices to restrain their use.

## Short-lived pollutants

We need to promptly reduce the emissions of short-lived climate pollutants, including methane (figure 2b), black carbon



(soot), and hydrofluorocarbons (HFCs). Doing this could slow climate feedback loops and potentially reduce the short-term warming trend by more than 50% over the next few decades while saving millions of lives and increasing crop yields due to reduced air pollution. The 2016 Kigali amendment to phase down HFCs is welcomed.

## Nature

We must protect and restore Earth's ecosystems. Phytoplankton, coral reefs, forests, savannas, grasslands, wetlands, peatlands, soils, mangroves, and sea grasses contribute greatly to sequestration of atmospheric CO<sub>2</sub>. Marine and terrestrial plants, animals, and microorganisms play significant roles in carbon and nutrient cycling and storage. We need to quickly curtail habitat and biodiversity loss, protecting the remaining primary and intact forests, especially those with high carbon stores and other forests with the capacity to rapidly sequester carbon (proforestation), while increasing reforestation and afforestation where appropriate at enormous

scales. Although available land may be limiting in places, up to a third of emissions reductions needed by 2030 for the Paris agreement (less than 2°C) could be obtained with these natural climate solutions.

## Food

Eating mostly plant-based foods while reducing the global consumption of animal products, especially ruminant livestock, can improve human health and significantly lower GHG emissions (including methane in the “Short-lived pollutants” step). Moreover, this will free up croplands for growing much-needed human plant food instead of livestock feed, while releasing some grazing land to support natural climate solutions (see “Nature” section). Cropping practices such as minimum tillage that increase soil carbon are vitally important. We need to drastically reduce the enormous amount of food waste around the world.

## Economy

Excessive extraction of materials and overexploitation of ecosystems, driven by economic growth, must be quickly curtailed to maintain long-term sustainability of the biosphere.

We need a carbon-free economy that explicitly addresses human dependence on the biosphere and policies that guide economic decisions accordingly. Our goals need to shift from GDP growth and the pursuit of affluence toward sustaining ecosystems and improving human well-being by prioritizing basic needs and reducing inequality.

## Population

Still increasing by roughly 80 million people per year, or more than 200,000 per day, the world population must be stabilized—and, ideally, gradually reduced—within a framework that ensures social integrity. There are proven and effective policies that strengthen human rights while lowering fertility rates and lessening the impacts of population growth on GHG emissions and biodiversity loss. These policies make family-planning services available to all people, remove barriers to their access and achieve full gender equity, including primary and secondary education as a global norm for all, especially girls and young women.

## Conclusions

Mitigating and adapting to climate change while honoring the diversity of humans entails major transformations in the ways our global society functions and interacts with natural ecosystems. We are encouraged by a recent surge of concern. Governmental bodies are making climate emergency declarations. Schoolchildren are striking. Ecocide lawsuits are proceeding in the courts. Grassroots citizen movements are demanding change, and many countries, states and provinces, cities, and businesses are responding.

As the Alliance of World Scientists, we stand ready to assist decision-makers in a just transition to a sustainable and equitable future. We urge widespread use of vital signs, which will better allow policymakers, the private sector, and the public to understand the magnitude of this crisis, track progress, and realign priorities for alleviating climate change. The good news is that such transformative change, with social and economic justice for all, promises far greater human well-being than does business as usual.

**We believe that the prospects will be greatest if decision-makers and all of humanity promptly respond to this warning and declaration of a climate emergency and act to sustain life on planet Earth, our only home.**

- 11,258 scientist signatories from 153 countries

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To view the Alliance of World Scientists website  
<https://scientistswarning.forestry.oregonstate.edu>



## MUIR WALKER: Fire & Fury - The Best We Can Do?

In the early afternoon of October 15th, two days after a mid size earthquake, a giant holding tank of an undetermined substance, located at the NuStar facility in Crockett, blew it's top. Black smoke quickly rose and enveloped the entire vicinity. The workers, who were supposed to set up emergency responses, dropped everything and ran for their lives. When the firefighters arrived, they found the gates to the facility closed and had to bash them down to get in. The tanks were so close together, the fire quickly spread from one tank to another almost causing an explosion of massive proportions, if the fire spread to the Phillips 66 refinery, located next door. State investigators had to get a court order to be able to determine the cause of the blaze. Refineries and storage facilities are not required to have regular safety inspections. Some of these pipes have been in service for longer than 30 years. They are not required to have evacuation or early warning plans. Similar explosions have occurred in Kentucky, Pennsylvania and West Virginia this year. The likely culprit, aging pipelines, not replaced in a timely manner and further exacerbated by high sulphur content oil, more commonly known as tar sands.

Let's put this myth that the companies cannot afford safer conditions to rest. NuStar, the company with the exploding tanks, is valued at over 6 billion dollars. In the second quarter of 2019, they took in 169 million dollars, adjusted to a net income to 54 million. The Phillips 66 plant in Crockett, located in a high density population area made a profit of 2.2 billion dollars in the last quarter of 2018, surely they have enough money to re-locate to a less populated area or at the least, clean up those pipes and install meaningful alert systems and medical programs available. Less than a week later PG&E who took in 564 million in the third quarter alone last year and a grand total of 5.5 billion for the year, decided to shut off power to millions of people in an attempt to keep their aging infrastructure from causing major fires during high wind circumstances, due to their failure to maintain equipment and replace older transformers. PG&E has paid no federal income tax for the last 10 years. Both corporations have made copious amounts of money but decided to pass the profits onto their corporate bosses and preferred stock holders. Governor Newsom, who presides over the 5th largest economy of the world responded by begging another billionaire, Warren Buffet, to take over the company. Surely, we can do better than this.

- Muir Walker