

Climate Change 1: The Present Crisis in 2021

There is now overwhelming evidence, and an overwhelming scientific consensus, that climate change is real and is caused primarily by greenhouse gas emissions due to fossil fuels. Over the last 150 years, humans have been digging up and burning fossil fuels, and we are now adding 51 billion tons of greenhouse gases to the atmosphere each year. This has already increased the CO₂ content of the atmosphere by over 50%. CO₂ traps the heat that would otherwise be radiated into space, and consequently warms the Earth.

The danger of this has been well understood by scientists for the last 50 years and clearly apparent for the last 30. The Earth has now warmed by 1.1°C since 1850, and by 2100 this change will increase by about a factor of 4 if no action is taken. The 2021 IPCC^{1,2} report is a “Code Red for humanity”; by 2050 we will certainly pass 1.5°C, and will also pass 2.0°C unless major changes are made this decade to bring CO₂ emissions to net zero by 2050. We have seen the clear evidence of climate change in the U.S. for many years, but especially in the recent summer of 2021-- in the record-breaking high temperatures, in enormous forest fires in California and Colorado, in the destruction and flooding from Hurricane Ida, and in the worsening drought and water scarcity in the west and southwest. It is important to realize that climate effects will continue to worsen until we have eliminated, not merely reduced, the CO₂ emissions that are driving this change. And we have little time left to prevent even more serious long-term damage to our climate.

The situation is critical now in part because (a) the CO₂ concentration in the atmosphere is now at a level higher than at any time in the last 2 million years, (b) the rate of increase in temperature and in CO₂ levels is historically unprecedented, and (c) we are approaching several critical points where feedback effects could significantly accelerate these changes. For example, the thawing permafrost will release large quantities of frozen CO₂, and the reduced albedo (reflectivity of the Earth) due to diminishing ice coverage in the arctic and upper northern hemisphere will increase the absorption of sunlight by the Earth. These effects make the increasing temperatures more severe and harder to control. Our climate is already in uncharted territory, and there is a significant risk that rising temperatures and sea levels will be even worse than the current forecasts.

The challenge is to eliminate CO₂ emissions without endangering the reliability or low costs of electrical power. This can be done by first building vastly increased renewable energy sources (wind and solar), and by expanding the U.S. electrical grid to allow long-distance transmission of electrical power between existing regional networks. The Clean Energy Jobs Act recently passed in Illinois is a major step in providing the former. The Biden infrastructure plan addresses both of these priorities nationally. These are the first and most critical steps, and need to begin immediately.

It is extraordinarily difficult to reverse the damage that has been done to our climate, since atmospheric CO₂ persists for thousands of years. It may be possible to begin this during the latter half of this century, after net CO₂ emissions are eliminated, but the process will be very slow and expensive. This makes it imperative to bring CO₂ emissions down as fast as possible, and to achieve net zero emissions of greenhouse gases by 2050. The U.S. needs to be a leader in this effort.

1. <https://www.sierraclub.org/sierra/code-red-for-humanity-un-warns-accelerating-climate-crisis>
2. 2021 Report by the International Panel on Climate Change (IPCC), Summary for Policymakers: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf