

Climate change science in a skeptical era
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The scientific evidence for human-caused climate change is increasingly strong, with a foundation in several lines of independent evidence and a number of “fingerprints” that isolate human causes from other factors. The actual amount of climate change in coming decades is still uncertain, with important contributions to uncertainty coming from limitations in the current generation of climate models and from imprecise information on future emissions of heat-trapping gases. We can, however, define the range of possible future climates, and constrain the probabilities associated with different outcomes, in a way that is useful for managing risks of future impacts. These risks include many kinds of impacts, including impacts associated with sea level, heat waves, water resources, and climate variability. Many of the impacts are likely associated with climate extremes. Some are likely consequences of the velocity of climate change.

The schedule for smart actions on responding to climate change depends on a number of time scales. The rate of temperature change is important, but so are the time scales of ecological and societal responses. The rate of climate change sets a pace for spatial shifts in species and ecosystems and for development of adaptation strategies by individuals, enterprises, and nations. Critical interactions with the underlying rate of climate change come from the rate at which affected systems perceive that climate is changing and convert that perception into action. Other critical interactions come from the time required to retire existing infrastructure and to develop, deploy, and scale new technologies, with costs and benefits that depend strongly on temporal and spatial scale.

The scientific understanding of climate change, its velocity, and its impacts continues to increase. This increased knowledge can support improvements in the way we plan and adapt. But delays in decisions about action on climate change can come at the expense of lost opportunities, greater impacts, and increased economic costs.