

CLIMATE CHANGE AS A PUBLIC AND POLICY ISSUE

As a public and policy issue, climate change boils down to four overarching questions: 1) is climate changing? 2) are people causing climate to change? 3) if so, how serious are the risks to society? and 4) what are the strengths and weaknesses of our different risk management options?

After decades of intensive scientific research, the first, second, and fourth questions all have straightforward answers. The third question is, and will almost certainly remain, characterized by deep uncertainty with apparently divergent views among relevant subject matter experts. As a result, climate policy represents a complex risk management challenge.

Climate is changing. The scientific conclusion that climate is changing is overwhelming because there are many separate lines of evidence that all agree and that have been verified by many different experts. Think of it this way: if you feel heat, smell smoke, hear a fire alarm, and see flames then you have independent confirmation from four senses that there's a fire. The evidence is conclusive. The same is true for climate change. The evidence that climate is changing comes from more than a dozen independent measurements including 1) temperature increases in the air measured over land and the oceans using thermometers, 2) temperature increases in the air measured by satellites, 3) warmer ocean temperatures (i.e., greater heat content), 4) melting glaciers throughout the world (the vast majority), and 5) species moving where they live and shifting the timing of key life events (e.g., migration, reproduction, and periods of activity). These and other independent lines of evidence demonstrate that climate is changing.

People are causing climate to change. Multiple independent lines of scientific evidence demonstrate this as well. First, the warming influence of greenhouse gases is clear based on laboratory experiments, evidence from past changes in climate due to greenhouse gases, and the role of greenhouse gases on other planets (e.g., the fact that Venus is much hotter than Mercury despite being farther from the sun). Additional lines of evidence relate to the patterns of climate change underway. These patterns match the characteristics expected from greenhouse gases well and do not match the characteristics we would expect from the other factors that could change climate, such as the sun, volcanoes, aerosols, land-use patterns, or natural variability.

Think of it like a who-done-it where the list of suspects is the potential causes of climate change. Critically, each suspect has its own fingerprint. Scientists have worked hard to identify the potential causes of climate change and the patterns of change they would produce. The changes in climate that we've witnessed over the last several decades match the fingerprint of greenhouse gases and not any of the other suspects. That, in addition to what we know about greenhouse gases, is conclusive evidence that humans are causing climate to change.

The societal consequences of climate change in the decades ahead are hard to predict because exactly how climate will change and how capable human society will be at absorbing climate impacts are issues characterized by deep uncertainty. This deep uncertainty will almost certainly remain for the foreseeable future.

For example, different experts appear to assess climate risks differently. Some experts think the consequences of climate change over the next several decades are likely to be small. They tend to foresee some combination of stabilizing climate feedbacks; lower sensitivity of physical systems, biological resources, and social institutes to climate changes; and greater capacity for human society to deal with climate impacts. This latter capacity results, in part, from humanity's considerable scientific and technological capabilities.

Other experts see climate change as an extremely serious risk to society because the changes in climate expected over the next several decades are faster than anything the world has experienced since the start of human civilization and will take us to climate conditions that are entirely unprecedented for our society. Relatively small changes in climate have, at times, had large consequences on societies locally or regionally, illustrating the potential for serious consequences of climate change. Furthermore, the physical characteristics of the planet, biological resources on which we depend, and the social systems that we have developed are all heavily adapted to existing climate conditions.

This divergence of views among experts exacerbates what would already constitute a difficult risk management challenge. Even in the absence of deep uncertainty over climate change's consequences, policy responses necessarily integrate both objective information about the climate system and our

relationship with it and subjective value judgments—most notably, whether we are more averse to the risks of changes in climate or the policy responses.

In a very general sense, climate policies fall into four broad categories: 1) reducing greenhouse gas emissions—often called mitigation; 2) efforts to increase society’s capacity to cope with climate impacts—adaptation; 3) attempts to counteract some climate change impacts through additional, deliberate manipulation of the Earth system—geoengineering or climate engineering; and 4) knowledge-base expansion—efforts to better understand climate change, its implications, and society’s options.

Policies from each category of response have potential to reduce climate change risks, create new sources of risk, or create additional benefits unrelated to climate change (co-benefits). The risk management approaches sometimes overlap and can be used in different combinations. Indeed, comprehensive risk management almost certainly would involve a family of responses. For example, reducing emissions is a little like disease prevention (e.g., exercise, eat well, don’t smoke). Adaptation

is like managing illness (e.g., take medicine to cope with symptoms and alleviate problems). Geoengineering is a little like organ transplantation—best avoided but potentially better than the alternative even if you happen to be the first (or only) patient.

Claims made in public discourse that are at odds with expert assessments generally aren’t credible. The suggestion that climate isn’t changing or that people aren’t causing climate to change fall into this category. Those who downplay the potential for serious climate change impacts or who claim that serious consequences are certain to occur are also on shaky ground. The argument (routinely made in public discussions) that climate policy will lead to economic disaster is also highly dubious as would be the suggestion that there are no potential downsides to climate policy. Keeping track of these basics—all well established through comprehensive scientific assessments by the relevant subject matter experts—can help us all navigate messy public discussions about climate change and how we might choose to respond.

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