Testimony

# Observed Impacts, Future Risks, and Adaptation Solutions

## Highlights from the Recent Intergovernmental Panel on Climate Change (IPCC) Working Group II Report

Robert J. Lempert

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Testimony presented before the Minnesota House of Representatives Committee on Climate and Energy Finance and Policy on March 10, 2022

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*Observed Impacts, Future Risks, and Adaptation Solutions: Highlights from the Recent Intergovernmental Panel on Climate Change (IPCC) Working Group II Report*

Testimony of Robert J. Lempert[1]
The RAND Corporation[2]

Before the Committee on Climate and Energy Finance and Policy
Minnesota House of Representatives

March 10, 2022

Good morning, Chair Long, Vice Chair Acomb, and Minority Lead Swedzinski. My name is Robert Lempert. I am a principal researcher at the RAND Corporation in Santa Monica, California, where my research focuses on climate risk management and decisionmaking under uncertainty. I am also a coordinating lead author for the Intergovernmental Panel on Climate Change (IPCC) Working Group II's contribution to the Sixth Assessment Report.[3] This report, which focuses on the impacts of and adaptation and vulnerability to climate change, was released last Monday, February 28. I welcome this opportunity to be here today to discuss with you the report and its findings. I will provide a brief overview of the IPCC and the process of developing assessment reports, share key findings from the recently released report, and identify strategies that state governments could consider as adaptation measures.

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[3] Working Group II, *Climate Change 2022: Impacts, Adaptation and Vulnerability*, Geneva: Intergovernmental Panel on Climate Change, 2022.

## The Intergovernmental Panel on Climate Change

Let me start with summarizing what the IPCC is and its aims. The IPCC brings together scientists from around the world to assess for policymakers the current state of scientific knowledge regarding climate change, its potential consequences, and what is known about potential actions that might be taken to address those consequences. The IPCC was founded in 1988 by the United Nations and since then has conducted six assessment cycles, one about every six years, to provide the latest updates.

This current sixth assessment cycle has three main reports. The first came out last August and focused on current observed changes in the climate system and described how the climate might change in the future. The third report, scheduled to come out in April, focuses on options for reducing the greenhouse gas emissions that cause climate change. The second report, released last week and the subject of today's discussion, focuses on the observed impacts of climate change on human and natural systems, the risks from future changes, and how human society and natural systems might adjust to reduce these risks and become more resilient.

An IPCC report is a significant effort. To be as comprehensive as possible, the IPCC report has 270 authors from 67 countries (see Figure 1). About 60 percent of the authors are from developed countries and about 40 percent are from developing countries. About 60 percent are men and 40 percent are women. About a quarter hail from North and Central America and the Caribbean. Together, we read and discussed more than 34,000 scientific papers. To be as transparent as possible, the IPCC produced four interim drafts and solicited review comments on each. Overall, we received and responded to more than 62,000 review comments from scientists around the world.

**Figure 1. Report by the Numbers**


SOURCE: IPCC Working Group II, "Climate Change 2022: Impacts, Adaptation and Vulnerability," press conference, February 22, 2022, slide 2, https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_PressConferenceSlides.pdf.

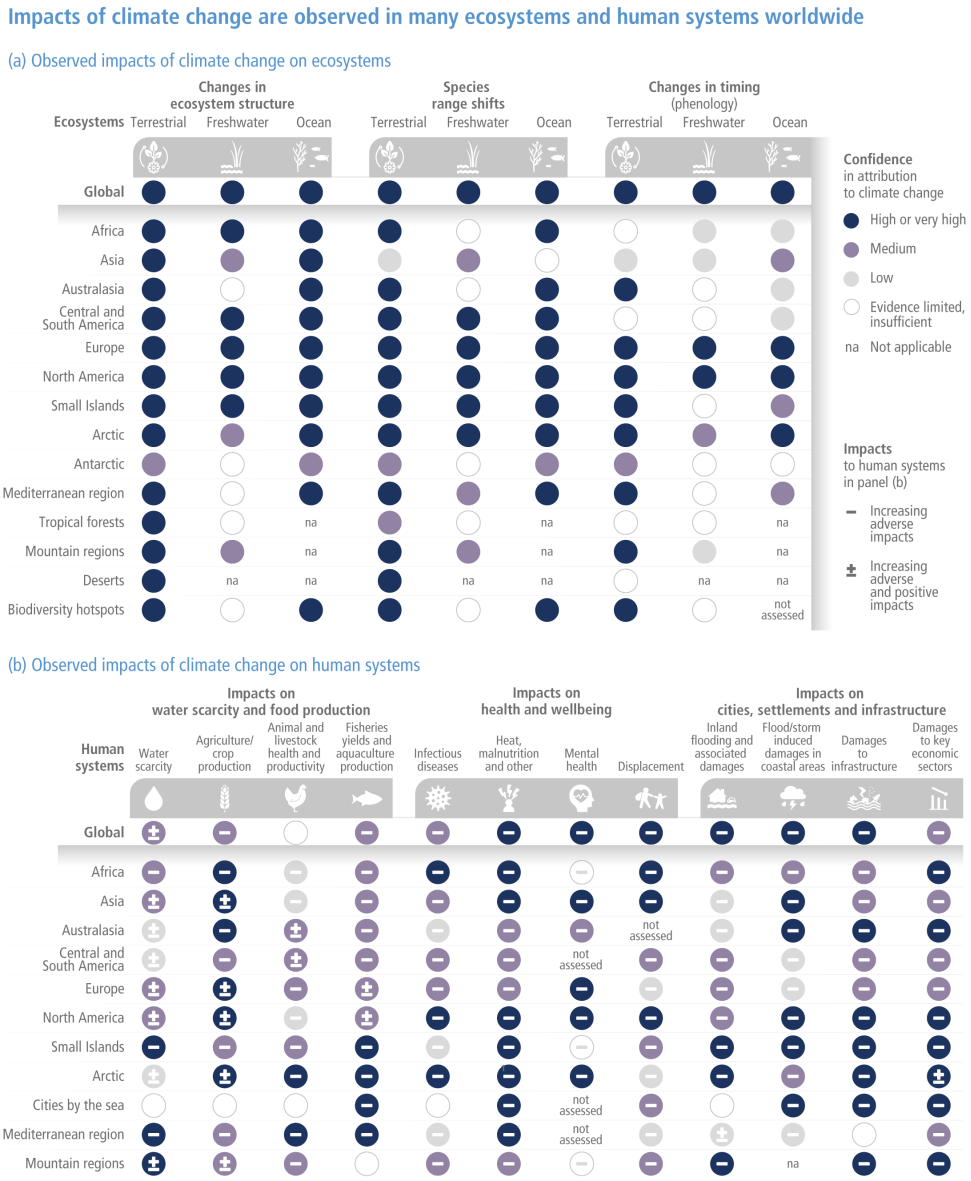
## Findings from the Working Group Two Sixth Assessment Report

The Working Group II's contribution to the Sixth Assessment Report assesses observed impacts, projected risks, and adaptation solutions. I'll start with the impacts and risks.

### *Observed Impacts and Projected Risks*

The impacts of climate change have arrived and are widespread, pervasive, and in some cases irreversible. In California, where I live, we are experiencing drought and wildfires. Minnesota and the American Midwest are experiencing increased-intensity rainfall events, increased flooding, adverse impacts on water quality, increased soil erosion, decreased crop yields and agricultural productivity, and increased heat mortality. As shown in Figure 2, current impacts from climate change are being felt in every corner of the world and affect everyone. This chart shows impacts on human systems—in particular, water scarcity and food production, health and well-being, and cities, settlements, and infrastructure. Climate change is also affecting natural systems worldwide. For example, here in North America, scientists have observed with high confidence changes in the structure of terrestrial, freshwater, and ocean ecosystems; many species shifting their ranges northwards; and many species changing the timing of their annual cycles. Overall, the impacts have hit natural ecosystems and the poor and disadvantaged the hardest. The report also finds that these observed impacts are just the tip of the iceberg. The risks to humans and ecosystems from climate change are virtually certain to increase in the years ahead.

**Figure 2. Observed Impacts on Human Systems**



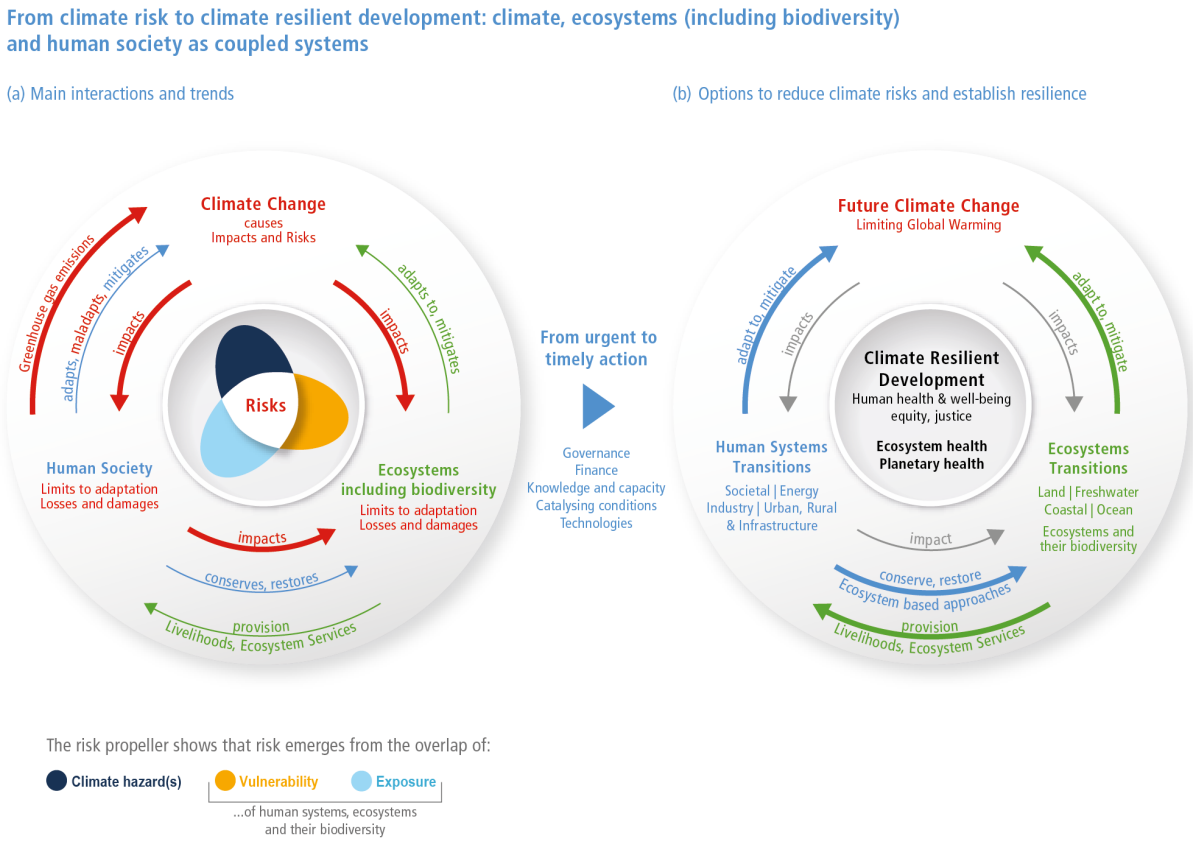

SOURCE: Working Group II, *Climate Change 2022: Impacts, Adaptation and Vulnerability; Summary for Policy Makers*, Geneva: Intergovernmental Panel on Climate Change, 2022, Figure SPM.2, https://www.ipcc.ch/report/ar6/wg2/figures/summary-for-policymakers/figure-spm-2.

In many areas, the science had advanced significantly since the last IPCC assessment report, in 2014—for instance, the science of what is called *attribution*. Scientists can now do a better job of *attributing* a particular extreme climate event and the damages it causes to human-caused climate change. This often provides scientific validation for the perception that the climate is

changing. It also might have significant policy implications, such as for liability and financial risk management, going forward.

The 2022 report also highlights the improved understanding of the interconnections among human society, ecosystems, and the climate. As shown in Figure 3, human activities cause climate change, which in turn affects society and ecosystems. Humans affect ecosystems, which have intrinsic worth and provide services to humans. Understanding these interconnections both improves understanding of risks and suggests new and more-effective ways of reducing these risks.

**Figure 3. New Understanding of Interconnections**



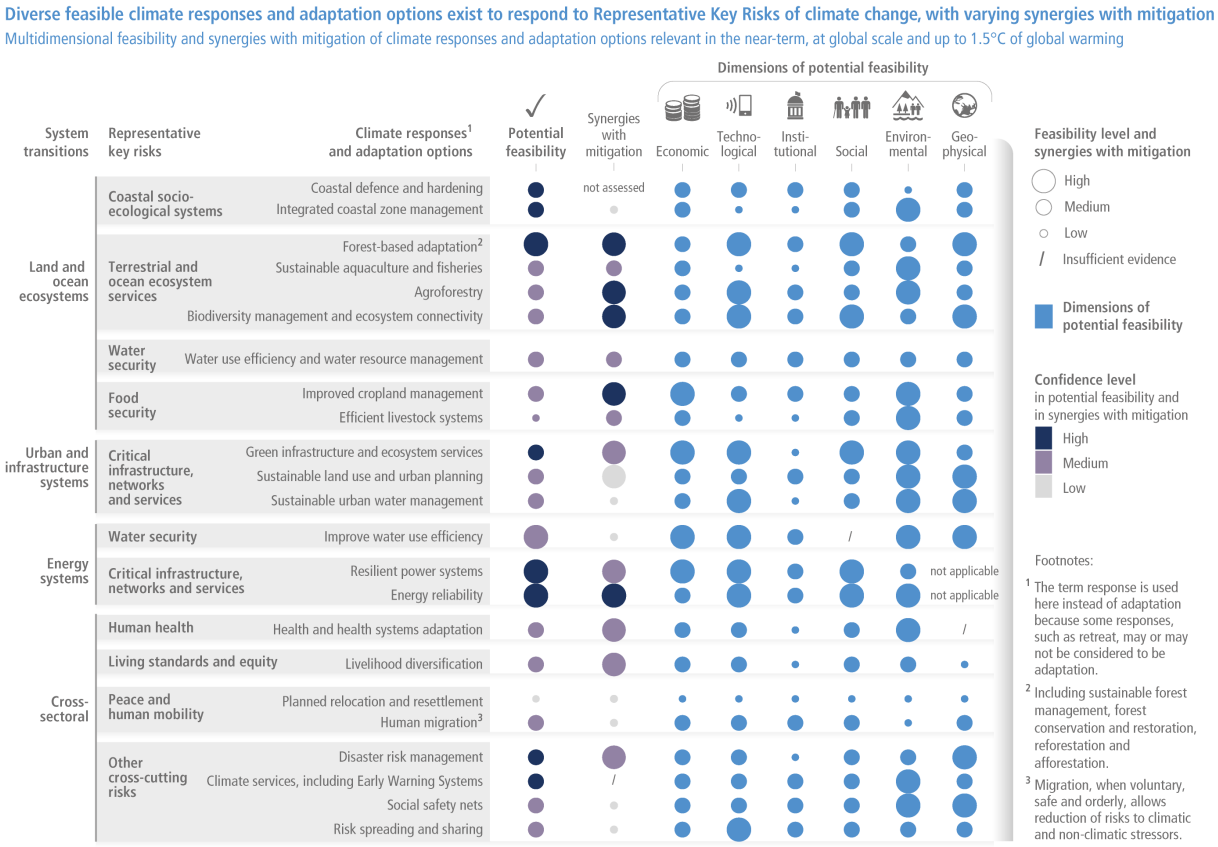

SOURCE: Working Group II, *Climate Change 2022: Impacts, Adaptation and Vulnerability; Summary for Policy Makers*, Geneva: Intergovernmental Panel on Climate Change, 2022, Figure SPM.1, https://www.ipcc.ch/report/ar6/wg2/figures/summary-for-policymakers/figure-spm-1.

## *Adaptation Solutions*

Compared with previous assessments, this IPCC report has a strong focus on solutions, with a focus on adaptation—that is, people and natural systems adjusting to the impacts of climate

change. Adaptation planning and implementation are increasing around the world. The report finds many examples of adaptation that successfully reduces risk, enhances resilience, and generates co-benefits. For instance, enhancing natural water retention by restoring wetlands and rivers, along with land-use planning that moves development out of flood plains, can reduce flood risk while also providing recreational areas and enhancing biodiversity. As shown in Figure 4, the report assesses a wide range of adaptation options—according to their effectiveness, their feasibility, and the extent to which they have the potential to produce outcomes that are fair to everyone involved.

**Figure 4. The Effectiveness and Feasibility of Adaptation Options**




SOURCE: Working Group II, *Climate Change 2022: Impacts, Adaptation and Vulnerability; Summary for Policy Makers*, Geneva: Intergovernmental Panel on Climate Change, 2022, Figure SPM.4, https://www.ipcc.ch/report/ar6/wg2/figures/summary-for-policymakers/figure-spm-4.

But the report also describes where adaptation is falling short.

First, most adaptation to date has been incremental, focused on current rather than future climate change, and is not keeping pace with accelerating change. The report identifies many adaptation gaps—that is, the difference between actual levels of adaptation and the levels required for acceptable and equitable risk reduction. Reducing these gaps would require adaptation at significantly higher speed and scale.

Second, adaptation has limits regarding the amount of change it can adjust to. At some point, most systems reach what is called their *limits to adaptation*. Some systems have already reached their limits. For instance, many of the world's coral reefs are dying because the reefs can no longer adjust. Some coastal communities have been displaced by sea-level rise. The report finds that many other systems will begin to reach and exceed their limits as global warming levels rise.

Finally, if not planned and implemented properly, adjusting to climate change can lead to what the IPCC calls *maladaptation*—that is, unintended consequences. For instance, building a levee to reduce flood risk can cause more people to move closer to the river and thus be at greater risk as large floods—beyond the design criteria of the levee—become more common. Often, maladaptation includes inequitable outcomes, where actions that reduce some risks create new risks for others.

The report offers guidance on how adaptation might become more effective.

First, if we don't get greenhouse gas emissions under control, the challenge becomes increasing unmanageable. More and more systems will cross their limits to adaptation. The next IPCC report, coming out in April, has a specific focus on mitigation—that is, options for reducing such emissions. Our report highlights the importance of integrating adaptation and mitigation, along with sustainable economic development. Planning and implementing these actions together enhance synergies and reduce trade-offs.

Second, it is more effective to work with nature than against it. For instance, using natural systems as a supplement or alternative to structural flood control measures can benefit both people and nature.

Third, the report identifies some key enabling conditions that can help accelerate adaptation and move from incremental to more-comprehensive solutions. These enablers are finance, governance, and capacity building and knowledge, and technology. I'll mention knowledge and capacity building as one important area for improvement. For this IPCC report, hundreds of scientists scoured the literature looking for evidence of which adaptation actions work and which don't work, and under what conditions. Although the information base is growing, and is much better than it was at the time of the last IPCC report, our understanding of adaptation effectiveness is still in its early stages. We all, including states like Minnesota, can usefully do a better job of assessing and sharing information on what's working and why.

Finally, this is an all-hands-on-deck problem. No one group—not a state government, nor the federal government—can address it all alone. Effective solutions emerge from collaboration among all levels of government, the private sector, civil society, tribal groups, and others.

That said, this report identifies a number of options that state governments can consider pursuing.

## Recommendations for State Governments

States can ensure that building codes, infrastructure investments, zoning, land use, and related guidance are based on the best available, future-looking climate information, not historical records of past climates. Similarly, states can ensure that financial incentives, such as insurance and financial disclosure, reflect the best available climate science. States can develop and implement their own climate actions plan, including adaptation and resilience, and also require local and tribal jurisdictions to have such plans. These plans assess climate-related risks, identify risk-reduction actions, implement those actions, monitor effectiveness, and adjust over time. States can help their businesses, farms, local jurisdictions, and others plan and implement adaptation by funding and supporting capacity building and by providing climate services, including research, information repositories, websites, and decision tools. States can support equity through inclusive governance processes and financial support for disadvantaged and at-risk communities. Finally, state governments can improve the tracking and monitoring of adaptation efforts and budgets.

Let me leave you with one last thought. The IPCC has been conducting these scientific assessments of climate change for close to 35 years. Previously, climate change was often seen as something we needed to prepare for in the future. Climate change is now affecting us in the present, and people can see it with their own eyes. This IPCC report makes clear that some sort of transformation—that is, some type of fundamental change in human and natural systems—is now inevitable. We can choose to take actions that guide that change along pathways we desire, or we can experience change inconsistent with our goals and aspirations. This report helps clarify the challenges and offers some guidance on solutions.