

C O M M E N T

ANTICIPATING AND PREPARING FOR CLIMATE CHANGE

by Joel D. Scheraga

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J.B. Ruhl and Robin Kundis Craig have written a very thought-provoking article. As they acknowledge in their article, the Earth's climate is changing at an increasingly rapid rate, outside the range to which society has adapted in the past. Since the Industrial Revolution, the Earth has warmed an average of 1.1° Celsius (°C). It has been estimated by the Intergovernmental Panel on Climate Change (IPCC) that global average temperatures will rise 1.5°C (2.7°F) above pre-industrial levels sometime around the first half of the 2030s due to the burning of fossil fuels.¹

The Paris Agreement that was adopted in December 2015 by 196 parties to the UN Climate Change Conference (COP21) addressed concerns about the increasing risks posed by climate change. The overarching goal of the treaty is to limit “the increase in the global average temperature to well below 2°C above pre-industrial levels.”² The treaty also called for virtually every nation to pursue efforts to hold global warming to 1.5°C. The treaty entered into force in November 2016.³

Surpassing the 1.5°C level doesn't mean that humanity is doomed. However, beyond 1.5°C, the impacts of climate change, including heat waves, drought, wildfires, more frequent and intense storms and flooding, sea-level rise and damaging storm surges, crop failures and resulting malnutrition, and species extinctions, will become significantly harder for human society to handle.

Realistically, achieving the goal set in the 2015 Paris Agreement of limiting global warming to 1.5°C will be almost unattainable without drastic actions to reduce greenhouse gas emissions. In the absence of any additional efforts to reduce emissions, existing and currently planned fossil fuel infrastructure will produce enough greenhouse gases to warm the planet roughly 2°C this century.

Author's Note: The views expressed in this Comment are the author's alone and do not necessarily reflect the position of EPA.

1. See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Summary for Policymakers*, in GLOBAL WARMING OF 1.5°C 1, 4 (2022), <https://doi.org/10.1017/9781009157940.001>.

2. WHAT IS THE PARIS AGREEMENT?, <https://unfccc.int/process-and-meetings/the-paris-agreement>.

3. See *id.*

Ruhl and Craig acknowledge these trends and highlight the critical importance of concurrent governance efforts to both mitigate emissions of greenhouse gases to limit the rate of warming and anticipatorily adapt for inevitable impacts. This call for action is to be applauded. As noted in the IPCC's 2023 AR6 Synthesis Report,

Climate change is a threat to human well-being and planetary health (very high confidence). There is a rapidly closing window of opportunity to secure a liveable and sustainable future for all (very high confidence). Climate resilient development integrates adaptation and mitigation to advance sustainable development for all, and is enabled by increased international cooperation including improved access to adequate financial resources, particularly for vulnerable regions, sectors and groups, and inclusive governance and coordinated policies (high confidence). The choices and actions implemented in this decade will have impacts now and for thousands of years (high confidence).⁴

Ruhl and Craig go a step further. They argue that barring rapid global political, social, and technological transformations, we will be fortunate to limit temperature rise to 2.0°C and the possibility of reaching 4°C cannot be ignored.

Reaching a 4°C world would certainly have potentially catastrophic consequences. However, as suggested in the IPCC AR6 Synthesis Report, many of the most dire climate scenarios once feared by scientists, such as 4°C or more, now look unlikely. Nations are investing more heavily in clean energy, which has become more cost competitive. At least 18 countries, including the United States, have managed to reduce their emissions for more than a decade.

Whether or not one believes a 4°C world is likely, investments in anticipatory adaptation are critically important now. As noted in the IPCC AR6 Report, “Risks and projected adverse impacts and related losses and damages from climate change escalate with every increment of global

4. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2023 SYNTHESIS REPORT: SUMMARY FOR POLICYMAKERS 24 (2023), <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>.

warming (very high confidence).”⁵ Ruhl and Craig suggest that scientists are concerned that we are dangerously close to passing critical tipping points. I argue that we have *already* passed critical tipping points and are continuing to do so. This point is reinforced in the IPCC AR6 Synthesis Report, which states, “Climate change has caused substantial damages, and increasingly irreversible losses, in terrestrial, freshwater, cryospheric, and coastal and open ocean ecosystems (high confidence).”⁶

Whether or not a tipping point exists and whether it has been exceeded depends on the individuals, communities, and ecosystems you are talking about, their geographic location, the particular climatic risks they are facing, and the values they hold about the things that might be lost. I suggest, for example, that the tribal community of Shishmaref in Alaska, whose elders voted in 2016 to move their entire community to another location—despite the precious cultural resources that will be lost—would say they’ve passed a critical threshold.⁷

Impacts are already occurring, and both physical and socioeconomic thresholds are being exceeded. These trends also have significant implications for governance and law. They strengthen the argument made by Ruhl and Craig that concurrent governance efforts to mitigate greenhouse gas emissions and adapt to climate change are essential. They also reinforce the reality that engaging now in anticipatory adaptation is the best chance of avoiding a breakdown in democratic governance. It is true, as noted in the AR6 Report, that “[s]ome future changes are unavoidable and/or irreversible but can be limited by deep, rapid and sustained global greenhouse gas emissions reduction.”⁸ But significant investments in anticipatory adaptation are essential and are urgently needed. As noted in the AR6 Report, “Adaptation options that are feasible and effective today will become constrained and less effective with increasing global warming.”⁹

Immediate investments in anticipatory adaptation are smart government and smart business. The question is how to do it.

Given their focus on 4°C, Ruhl and Craig recommend reorienting adaptation policy for anticipatory redesign away from incremental adaptation that is carried out largely at state and local scales to one that is more regional and national. I suggest to you that this reorientation is already beginning. Many of the items in their “toolbox” for redesigning adaptation are already being implemented in the United States by both the federal government and the private sector.

President Joseph Biden’s “Executive Order on Tackling the Climate Crisis at Home and Abroad,” issued during his

first week in office in 2021, made clear that the policy of the Administration was:

to organize and deploy the full capacity of its agencies to combat the climate crisis to implement a Government-wide approach that reduces climate pollution in every sector of the economy; increases resilience to the impacts of climate change; protects public health; conserves our lands, waters, and biodiversity; delivers environmental justice; and spurs well-paying union jobs and economic growth, especially through innovation, commercialization, and deployment of clean energy technologies and infrastructure.¹⁰

The Executive Order went further and acknowledged the importance of partnerships with all levels of government and the private sector. It reinforced that “[s]uccessfully meeting these challenges will require the Federal Government to pursue such a coordinated approach from planning to implementation, coupled with substantive engagement by stakeholders, including State, local, and Tribal governments.”¹¹

Landmark legislation like the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) have since provided historic financial resources to put these mechanisms at the national and regional level in motion.

Ruhl and Craig highlight the value of letting the market direct investments in adaptation in the right ways. Financial markets are already responding to the increasing risks posed by climate change to municipalities. The National Oceanic and Atmospheric Administration (NOAA) has reported that since 1980, the United States has incurred over \$1.5 trillion in damages from weather and climate disasters, each of which cost at least \$1 billion. The economic impacts have become so severe that the vulnerability of local communities to future impacts is now influencing credit ratings for municipal bonds.¹²

The financial markets care.

Ruhl and Craig also argue that planning and prodding by the federal government to guide private actors to make climate-smart decisions and investments is critically important. They note that there is considerable agreement that the United States’ basic infrastructure already warrants increased investment. That is why the 2022 IIJA provides billions of dollars for federal agencies to provide resources to states, tribes, and local communities to invest in infrastructure, with a concurrent focus on advancing environmental justice. A huge focus is being placed by federal agencies and the recipients of the funds on ensuring these investments lead to outcomes that are resilient to the impacts of climate change.

The U.S. Environmental Protection Agency (EPA), which received approximately \$60 billion from the IIJA,

5. *Id.* at 14.

6. *Id.* at 5.

7. Merrit Kennedy, *Threatened by Rising Seas, Alaska Village Decides to Relocate*, NPR (Aug. 18, 2016, 7:49 PM), <https://www.npr.org/sections/thertwo-way/2016/08/18/490519540/threatened-by-rising-seas-an-alaskan-village-decides-to-relocate>.

8. SYNTHESIS REPORT, *supra* note 4, at 18.

9. *Id.* at 19.

10. Exec. Order No. 14008, 86 Fed. Reg. 7619, 7622 (Jan. 27, 2021).

11. *Id.*

12. See Aaron Levitt, *Climate Change & Muni Bond Insurance*, MUNICIPAL BONDS (Apr. 27, 2022), <https://www.municipalbond.com/bond-insurance/climate-change-and-muni-bond-insurance/>.

is including criteria that incentivize climate adaptation in the various financial mechanisms being used to distribute the IIJA funds. It is improving access to the funds for middle-to-smaller sized underserved communities and tribes. EPA is also providing tools, training, and technical support to recipients of the funds to help them make climate-smart investments.

Ruhl and Craig emphasize the need for investment in research to better inform adaptation decisions and to provide the tools necessary. In fact, the U.S. Global Change Research Program (USGCRP) has been investing in research and assessments to inform decisionmaking.¹³ Since 2000, the USGCRP has been producing National Climate Assessments required under the Global Change Research Act of 1990 to provide timely and useful information to support decisionmaking.¹⁴ The USGCRP is now in the process of producing the Fifth National Climate Assessment.¹⁵ In addition, many federal agencies like EPA, NOAA, the U.S. Department of Energy (DOE), and the U.S. Department of Transportation (DOT), are making significant investments to produce the tools and technical support and information needed by decisionmakers in the public and private sectors across the nation.

Ruhl and Craig discuss the need to create a “National Foresight System for Adaptation Planning.” In March 2023, the White House Office of Science and Technology Policy (OSTP) released a report entitled “A Federal Framework and Action Plan for Climate Services.”¹⁶ The

report outlines the development of a data-driven Climate Services System by the federal government that will provide the types of services a national foresight system needs to provide.

Finally, Ruhl and Craig talk about the need to develop programs that create paying jobs and provide training in adaptation skills. That is already underway across the federal government. In 2009, the USGCRP published a guide entitled “Climate Literacy: The Essential Principles of Climate Science.”¹⁷ The guide provides a framework and essential principles for formal and informal education about climate change. The USGCRP is now updating the Guide to include current climate and social science, and a focus on justice and capacity to implement solutions.¹⁸ Also, agencies like EPA are already developing and providing training for people and communities across the nation to increase their awareness of why climate change matters for the things they care about and to train them on the implementation of adaptation strategies.¹⁹

In conclusion, I share Ruhl’s and Craig’s concerns about the risks posed by climate change and for the importance of having concurrent governance efforts to both mitigate greenhouse gas emissions and adapt to climate change. However, whether or not we feel a need to prepare the nation for a path to a 4°C world, we can—and are already—taking significant steps to develop a robust national foresight system for climate adaptation. And we need to continue doing so.

13. See *About USGCRP*, U.S. GLOBAL CHANGE RESEARCH PROGRAM, <https://www.globalchange.gov/about>.

14. See *Legal Mandate*, U.S. GLOBAL CHANGE RESEARCH PROGRAM, <https://www.globalchange.gov/about/legal-mandate>.

15. See *Fifth National Climate Assessment*, U.S. GLOBAL CHANGE RESEARCH PROGRAM, <https://www.globalchange.gov/nca5>.

16. Fast Track Action Committee on Climate Services of the National Science and Technology Council, *A FEDERAL FRAMEWORK AND ACTION PLAN FOR CLIMATE SERVICES* (2023), https://www.whitehouse.gov/wp-content/uploads/2023/03/FTAC_Report_03222023_508.pdf.

17. U.S. GLOBAL CHANGE RESEARCH PROGRAM, *CLIMATE LITERACY: THE ESSENTIAL PRINCIPLES OF CLIMATE SCIENCE* (2009), <https://www.globalchange.gov/browse/reports/climate-literacy-essential-principles-climate-science-high-resolution-booklet>.

18. Notice of Request for Information, 88 Fed. Reg. 15981 (Mar. 15, 2023), <https://www.federalregister.gov/documents/2023/03/15/2023-05322/notice-of-request-for-information-us-global-change-research-program-usgcrp>.

19. *Climate Change Adaptation Training*, U.S. Env’t Prot. Agency, <https://www.epa.gov/arc-x/climate-change-adaptation-training>.