

RESPONDING TO GLOBAL WARMING: ADAPTATION AND TRANSFORMATIONAL CHANGE

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The Problem

The inadequacy of global efforts to reduce emissions of gases that accumulate in the atmosphere and result in global warming has led to greater attention to coping with a warmer world. While the capacity to adjust in various ways to higher global average temperatures might imply less urgency to reducing emissions, adaptation is also costly. Thus, questions of equity and responsibility arise. As a global problem, climate change faces the challenges of formulating and implementing legal, ethical, and normative obligations. The system of sovereign states assumes that governments will attend first to their own interests. If economic growth requires burning more than a country's share of fossil fuels, so be it. No world government exists to prevent that, and a government that fails to maximize its own country's economic status risks popular disapproval and lost international standing. Since Machiavelli, the difficulties of acting on ethical principles in international politics has been well understood. Coping with the effects of climate change means addressing difficult challenges of externalities. The beneficiaries of activities that produce greenhouse gas (GHG) emissions do not have to pay all the costs. Small farmers in regions facing permanent drought due to global warming hardly contribute to the problem at all, but they might pay with their homes and livelihoods. Lacking an authority able to force compensation for externalities, the perpetrator can refuse to pay, leaving all the costs on those suffering the ill effects of global climate change. Reducing GHG emissions (mitigation) is falling short, leading to efforts to adjust (adaptation) which are costly, raising questions of equity and responsibility. The ethical issues are immensely difficult to solve in the institutional context of an anarchic state system that enables the imposition of externalities on others. The problem worsens as temperatures rise.

The Current Situation

The main responses to climate change include mitigation, adaptation, and geoengineering. Mitigation encompasses such measures as reduced use of fossil fuels, changed agricultural practices, and maintaining forests. Adaptation refers to adjustments to cope with

present and anticipated effects of climate change. Adaptation spans a wide spectrum, from minor adjustments to systemic transformations. Geoengineering is the attempt to apply technological fixes, to withdraw GHG from the atmosphere or manage solar radiation. These technologies are as yet unproven, not deployed, and could have unforeseen negative consequences.

The central question in international climate negotiations since adoption of the UN Framework Convention on Climate Change (UNFCCC) in 1992 has been mitigation. Until the Paris conference on climate in 2015, the generally accepted objective was to hold the temperature rise below 2°C compared to the pre-industrial era. At Paris, the member states participating in the negotiations agreed that 1.5°C should be the target, presumably avoiding climate change that, even at 2°C, would damage vulnerable areas. In December 2018, the parties to the UNFCCC met in Poland to consider how well the Paris agreement was performing at reducing GHG emissions. The news was not good. A reporter notes, “Looked at collectively, countries would need to increase their commitments fivefold to keep temperature rise below 1.5°C, according to the report. They would need to increase their commitments three-fold to keep them below 2°C. Scientists say crossing either threshold could unleash a slew of irreversible consequences.”¹ Yet, despite progress on some fronts, the necessary “ratcheting up” of commitments to GHG reductions does not appear to be happening. Instead, the United States, embracing climate science denial,² announced its intention to withdraw from the Paris pact and has taken regulatory steps to weaken U.S. commitments to reduce emissions.³ The administration rejected the Poland conference’s declaration that climate change could have

¹ Justin Worland (2018) “The U.S. Isn’t the Only Major Country Not Meeting Its Climate Goals,” *TIME* November 27, <http://time.com/5463519/climate-change-united-nations-report/>, accessed December 10, 2018.

² John Timmer (2015) “Senate staff reshuffle: Climate denial is everywhere,” *Ars technica* (January 13) <http://arstechnica.com/science/2015/01/senate-staff-reshuffle-climate-denial-is-everywhere/>, accessed December 10, 2018.

³ Carol Davenport and Lisa Friedman (2018) “How Trump Is Ensuring That Greenhouse Gas Emissions Will Rise,” *New York Times* (November 26) https://www.nytimes.com/2018/11/26/climate/trump-greenhouse-gas-emissions.html?rref=collection%2Fsectioncollection%2Fclimate&action=click&contentCollection=climate®ion=stream&module=stream_unit&version=latest&contentPlacement=16&pgtype=sectionfront, accessed December 10, 2018.

dangerous effects on human society.⁴ U.S. policy could derail the Paris accord entirely, as other countries decide the absence of the world's second-largest GHG emitter after China renders the agreement futile.⁵ Brazil, for its part, has changed course on climate policy toward higher emissions with the election of right-wing Jair Bolsonaro.⁶ Other countries, while not formally rejecting the climate science or international agreements, have set emissions targets too weak to make much difference. In all, the prospects for mitigation are not bright.

Indeed, it may be too late to achieve the 1.5°C goal without massive deployment of technology to remove GHG from the atmosphere. Even staying below 2°C likely requires rapid transformation of the global energy system, along with reversing deforestation and less reliance on livestock for food. Yet, the stronger commitments to reduce emissions are not likely to be forthcoming, while GHG emissions are instead increasing.⁷ Even with the Paris agreement, current commitments would likely lead to 3.5°C increase at the end of this century. If Paris is abandoned altogether, temperature rise of 4.0°C or more is possible.⁸ The world has been hotter before, but

⁴ David Nakamura and Darryl Fears (2018) "Trump administration resists global climate efforts at home and overseas," *Washington Post* (December 9) https://www.washingtonpost.com/politics/trump-administration-resists-global-climate-efforts-at-home-overseas/2018/12/09/b94a9ef0-fa41-11e8-863c-9e2f864d47e7_story.html?utm_term=.d5141cc8171c, accessed December 10, 2018.

⁵ Somini Sengupta (2018) "U.S.-China Friction Threatens to Undercut the Fight Against Climate Change," *New York Times* (December 7) <https://www.nytimes.com/2018/12/07/climate/us-china-climate-change.html>, accessed December 10, 2018.

⁶ Marina Lopes (2018) "Activists feared Brazil's Bolsonaro would accelerate Amazon deforestation. Now they think it's already happening," *Washington Post*, (December 7) https://www.washingtonpost.com/world/2018/12/07/activists-feared-brazils-bolsonaro-would-accelerate-amazon-deforestation-now-they-think-its-already-happening/?utm_term=.0ba874b1b71e, accessed December 10, 2018.

⁷ Chelsea Harvey (2018) "CO2 Emissions Reached an All-Time High in 2018," *Scientific American* (December 6) <https://www.scientificamerican.com/article/co2-emissions-reached-an-all-time-high-in-2018/>, accessed December 10, 2018.

⁸ Betts A, Collins M, Hemming DL, Jones CD, Lowe JA and Sanderson, MG (2011) When could global warming reach 4°C? *Phil Trans R Soc A*: 369: 67–84. Available at <http://rsta.royalsocietypublishing.org/content/369/1934/67>.

never has the global average temperature changed this quickly, and never has human civilization existed in a world that much warmer.

The Fourth National Climate Assessment, a product of numerous U.S. agencies, found that the United States is already experiencing the consequences of rising global temperatures, and the negative effects are likely to be much greater in the future. A key message of the report is: “Climate change creates new risks and exacerbates existing vulnerabilities in communities across the United States, presenting growing challenges to human health and safety, quality of life, and the rate of economic growth.”⁹ Likewise, the Intergovernmental Panel on Climate Change (IPCC) states that high GHG emissions will lead to considerable disruption and damage, falling heavily on the people and communities least able to respond effectively: “Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems.”¹⁰

Of course, the degree of impact rises with global average temperature increases. As Jamieson notes, at higher temperatures, “familiar comforts, places, and ways of life will disappear on a timescale of years or decades.”¹¹ Further, tipping points might exist, albeit at unknown exact temperatures. If so, then the climate could abruptly shift into a new state, with no going back.¹² Planetary feedback loops could begin to raise temperatures independently of additional GHG emissions, at which point nothing humans do will make a significant difference; the planet will continue warming even were human-source GHG emissions reduced to net zero. Whether linear or abrupt

⁹ USGCRP (2018) *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II: Report-in-Brief* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, p. 12.

¹⁰ IPCC, Climate Change 2014 Synthesis Report: Summary for Policy Makers, p. 8.

¹¹ Dale Jamieson (2014) *Reason in a Dark Time: why the struggle against climate change failed and what it means for our future* (New York: Oxford University Press) p. 1.

¹² Dave Levitan (2013) “Quick-Change Planet: Do Global Climate Tipping Points Exist?” *Scientific American* (March 25) <https://www.scientificamerican.com/article/do-global-tipping-points-exist/>, accessed December 10, 2018.

change occurs, impacts on the climate, the global ecosystem, and human interests will rise with temperatures.

Not a few climate scientists and other concerned observers assert that 4°C increase in global average temperature would spell the end of civilization. The “business-as-usual” scenario suggests that 4°C temperature increase will occur by 2100, so civilization-breaking climate change is a plausible outcome. Nor would temperature rise stop there. If the planet warmed to its previous high temperature, global average temperature would be about 14°C above pre-industrial, at which point much of the world would be unfit for human habitation.¹³ James Lovelock claims that “We are in a fool’s climate . . . and before this century is over, billions of us will die and the few breeding pairs of people that survive will be in the arctic region where the climate remains tolerable.”¹⁴ While Lovelock may go too far, few informed observers believe that a 4°C warmer world will be anything but a “tough new planet”¹⁵ that is inhospitable to industrial, technological, consumerist society as we know it, or indeed any civilization that has thrived during the Holocene.

The inadequacy of mitigation and the short time available to make the sweeping changes needed to hold temperature down to a tolerable level explain the increasing attention to adaptation. The prospect of climate catastrophe and the fading hopes for mitigation lead to a search for ways to live in a warmer world. However, entrenched interests and ways of life could prevent an effective response. The survival of civilization could require contemplating transformations of institutions, culture, norms, and practices that constitute a way of life. The most fundamental questions of the future of society are at stake.

The IPCC’s Assessment Reports offer a guide to what adaptation means under varying circumstances. The IPCC surveys pertinent literature, summarizing the general findings of research on a given aspect of climate change, and drawing conclusions as to what the literature suggests for future climate patterns, effects on the global

¹³ Sherwood SC and Huber M (2010) “An adaptability limit to climate change due to heat stress,” *PNAS* 107(21): 9552-9555.

¹⁴ James Lovelock (2006) *The Revenge of Gaia* (New York: Basic Books).

¹⁵ Bill McKibben (2010) *Eaarth: making a life on a tough new planet* (New York: Times Books).

ecosystem, and possible policy options. The final reports undergo an extensive review process. The authors tend to avoid drama, so an IPCC report can be taken as a cautious statement of the problem, perhaps overly cautious.¹⁶ Even so, these observations and conclusions reflecting the broad consensus of the scientific community suggest that adaptation can call for sweeping change to institutions and ways of life.

Importantly, “adaptation involves change, in response to environmental conditions, which maintains, preserves, or enhances viability of the system of interest.”¹⁷ Only humans are capable of identifying a system of interest, and usually they will identify systems of interest to themselves because a given system affects human wellbeing. Adaptation to climate change is not just any change of infrastructure, behavior, values, or institutions in response to rising temperatures. Rather, adaptation to climate change is about serving human purposes by preserving, maintaining or enhancing a system of interest to human beings. In the IPCC’s work, the guiding principle is sustainable development. Thus, the system of interest would be the set of institutions, practices, beliefs, and behaviors that tend toward that goal, and adaptation would be adjustments made to preserve the requisites of sustainable development.

The most recent IPCC Assessment Report, AR5, identifies several forms of response to climate change, each corresponding roughly to the amount of temperature rise. They are incremental adaptation, transformational adaptation, and transformational change. Incremental adaptation entails taking actions that aim “to maintain the essence and integrity of the existing technological, institutional, governance, and value systems.”¹⁸ Incremental adaptation is about “adjustments” such as growing different crops, planting earlier or later in the season, and improving irrigation systems. It can include strengthening infrastructure, re-zoning, and altering building codes.

¹⁶ David Spratt and Ian Dunlop (2018) *What Lies Beneath: The Underestimation of Existential Climate Risk* (Melbourne: National Centre for Climate Restoration), pp. 10-13.

¹⁷ John Smithers and Barry Smit, (1997) “Human Adaptation to Climatic Variability and Change,” *Global Environmental Change* 7(2): pp. 129-146, reprinted in *The Earthscan Reader on Adaptation to Climate Change*, E. Lisa F. Schipper, and Ian Burton, eds., (London and New York: Earthscan, 2009).

¹⁸ AR 5, Chapter 14, p. 839.

Holding temperature rise below the 2°C level would likely be required for incremental adaptation to suffice, although this will vary by region and locale. The question is when impacts become so severe that incremental adaptation will no longer protect the “system of interest.”

Transformational adaptation increases the amount of adjustment. It calls for changes of “fundamental attributes of systems in response to actual or expected climate and its effects, often at a scale and ambition greater than incremental activities.”¹⁹ Rather than switch to another crop, a farming region might go from field crops to livestock. People might migrate as employment opportunities decline in heavily impacted areas. Ideas about the relationship between humans and nature can change.

Transformational change seeks to challenge “the systems and structures, economic and social relations, and beliefs and behaviors that contribute to climate change and social vulnerability.”²⁰ Specifically, if “current development pathways” produce climate risk and vulnerability, then “transformation of wider political, economic, and social systems may be necessary.”²¹ The IPCC is not insensible to the implications of this view: “Transformational change can threaten vested interests, or prioritize the interests of some over the well-being of others, and it is never a neutral process.”²² Although the uneven effects of climate change mean that transformational change “will need to be a key component in nearly all alternative climate-resilient pathways,” if temperatures were to rise +4°C or more, “sustainability will become significantly more difficult to achieve,” and the boundaries of climate resilience will have been exceeded.²³

The normative framework for climate change policy offers resources for formulating responses to climate change at all three levels: incremental and transformational adaptation, and transformational change. What is that framework and how does it bear on adaptation? Is it adequate to meet the challenge of extreme climate disruption looming on the policy horizon?

¹⁹ Ibid.

²⁰ AR5, Chapter 20, pp. 1121-1122.

²¹ Ibid.

²² Ibid, p. 1122.

²³ Ibid, p. 1123.

Principles in International Law and Policy

What normative principles pertinent to adaptation have entered the international dialogue on climate change? First, the UN Framework Convention on Climate Change (1992) specifically notes the obligation to future generations, mentioned in Article 3 on “Principles.”²⁴ The basis for protecting the climate system for the benefit of present and future generations of humankind is equity.

The implications of this principle for adaptation and transformation are profound. Although some adaptation is reactive to experienced impacts of climate change, anticipatory planning and implementation of adaptation measures is also a major part. Adaptation planning that looks forward decades or longer will involve the interests and well-being of future generations. Failing to take appropriate measures now could harm future generations. Already, the definition of sustainable development is that it serves the needs of the current generation while protecting the interests of generations to come.²⁵ Fulfilling this obligation regarding climate change requires anticipating the probable effects of climate change on people and places and taking action to reduce the impact, especially on the most vulnerable, for which anticipatory adaptation is essential.

Second, the UNFCCC acknowledges “common but differentiated responsibilities and respective capabilities.” This principle recognizes both that everyone bears some responsibility for addressing the climate challenge, and that some countries lack the means to address climate change while also alleviating poverty and lack of development. Countries that have benefited from past emissions and thus achieved high levels of development bear a greater obligation to reduce their GHG emissions and to help other countries finance and implement measures to protect the climate system.

The main reason adaptation has risen on the global agenda is that the world has failed to mitigate GHG emissions. Developed countries are largely responsible for the accumulation of GHG in the atmosphere. Although China and India have joined the first rank of GHG emitters, their per capita emissions remain relatively low, and their historic contribution is small compared to the earlier industrializers.

²⁴ United Nations Framework Convention on Climate Change (1992), <https://unfccc.int/resource/docs/convkp/conveng.pdf>.

²⁵ United Nations, “What We Do: Promote Sustainable Development,” <http://www.un.org/en/sections/what-we-do/promote-sustainable-development/>.

Meanwhile, due to climate patterns and geography, the greatest impacts of climate change will fall on poor, developing countries with limited capacity to adapt to the tough new planet. Thus, they can make a legitimate claim on resources to reduce the damage to their countries resulting from the historic accumulation of GHG gases. The international community recognizes this differentiation of responsibilities. The framework for an Adaptation Fund was established in 2001, finalized in the Bali Action Plan in 2007. The Board approved its first projects in 2010.²⁶ Although the Adaptation Fund has committed hundreds of millions of dollars to adaptation projects in developing countries, the need is much greater.

Third, climate policy adopts the environmental principle known as “polluter pays.”²⁷ This principle asserts that the parties creating the environmental problem should finance remedial measures for those experiencing the harms. Polluter pays, again, draws attention to the fact that developed countries have made large contributions to the accumulation of GHG emission while, some of the countries most heavily impacted have made negligible contributions to accumulated GHG emissions. Thus, it follows that those creating the problem should pay for technologies and structures in countries that contributed little but face severe impacts. Certainly, working out the distribution of responsibilities and related financial obligations is no simple matter. It requires deciding how to allocate scarce resources between mitigation and adaptation, assigning responsibility according to past, present and future situations, determining whether individuals or states should bear the costs, and more.²⁸ Still, polluter pays strongly indicates where primary responsibility lies.

Fourth, the precautionary principle shifts the burden of proof in favor of environmental protection. Specifically, the UNFCCC states, “lack of full scientific certainty should not be used as a reason for postponing” efforts to minimize or prevent actions that would contribute to global warming. A strong formulation of the principle calls for rejecting any action that might cause serious harm, emphasizing safety,

²⁶ Adaptation Fund, “Timeline” <https://www.adaptation-fund.org/about/adaptation-fund-timeline/page/2/>.

²⁷ Lauren Hartzell-Nichols (2011) “Responsibility for meeting the costs of adaptation,” Wiley Interdisciplinary Reviews: Climate Change 2(5): 687-700.

²⁸ Ibid, pp. 692-696.

determining whether any safer alternatives are available, and ensuring that all decisions are taken democratically.²⁹

What does the precautionary principle mean for adaptation? First, adaptation policy should begin now. Global average temperature rise of 1.5°C might be “locked in” already, and additional GHG emissions mean that increases beyond that are likely. The lag between rising emissions concentrations and observed temperatures means that adapting to current conditions will be insufficient. Second, planning should assume that the more extreme temperature rises and climate disruption will occur. Optimistic mitigation pathways still leave about a one in three chance of increases beyond 2°C. Meanwhile, there may be no carbon budget remaining at all to stay below that level.³⁰ If that is so, then adaptation planning should begin immediately for a significantly warmer world.

Fifth, the notion of “loss and damage” has entered the climate policy discourse as impacts are becoming evident and the inadequacy of mitigation is likely. “Loss and damage,” write Geest and Warner, “refers to impacts of climate-related stressors that have not been or cannot be avoided through mitigation and adaptation efforts.”³¹ The responsibility of developed countries to compensate for unavoidable loss and damage due to climate change is implied. The Warsaw International Mechanism for Loss and Damage incorporates the objective of “enhancing action and support, including finance, technology and capacity building,”³² which would indicate the need for funding from wealthier nations.

Sustainable development guides application of these principles. “The Parties have a right to, and should promote, sustainable development,” states Article 3 of the UNFCCC. Most of the countries of the world have signed onto the Sustainable Development Goals and to the UNFCCC. The broad commitment of the international community is to effective climate policy that is compatible with

²⁹ Paul Burkett (2016) “On Eco-Revolutionary Prudence: Capitalism, Communism, and the Precautionary Principle,” *Socialism and Democracy* 30(2): 73-96.

³⁰ Spratt and Dunlop (2018) p. 24.

³¹ Kees van der Geest and Koko Warner (2015) “What the IPCC 5th Assessment Report has to say about loss and damage,” UNU-EHS Working Paper, No. 21 (Bonn: United Nations University Institute of Environment and Human Security), p. 3.

³² *Ibid*, p. 7.

sustainable development, recognizing the needs of developing countries and future generations.

Principles of Adaptation and Transformational Change

Fulfillment of the five principles just outlined would go a long way toward implementing incremental adaptation where possible and transformational adaptation where necessary. Adaptation that is respectful of future generations, fair to rich and poor, puts the burden primarily on the parties responsible for the problem, prudently takes account of severe impacts on the most vulnerable, and recognizes that significant negative impact is unavoidable would provide an effective response to severe climate change. The question is whether such a comprehensive response is possible given existing social structures and practices. This is where transformational change enters the picture.

Transformational change is not, itself, an “on the ground” response to climate change. It is not about building infrastructure, protecting ecosystem services, moving people, changing planting times, or any of the other large and small measures societies and communities might take to protect themselves from damages resulting from climate change. Transformational change is about changing the broader context within which decisions, exchanges, and behaviors occur. On what basis do we decide whether to build a new power plant, or close down a factory, or rezone a coastline? The thinking behind transformational change suggests that current “wider political, economic, and social systems” are inappropriate to choosing a development pathway that would implement adequate, fair, forward-looking incremental and transformational adaptation. In what ways, then, should those systems change so that adequate, effective adaptation can occur? Answering that question engages the deepest issues of social theory. Doing so is beyond the scope of this paper. In short, it means asking whether the system of sovereign states, global capitalism, faith in technological progress, and hopes for ever-rising standards of living must be abandoned in favor of more cooperative, simpler, ecologically healthy ways of life if disaster is to be averted.