

University of Miami Law School

University of Miami School of Law Institutional Repository

Articles

Faculty and Deans

1-2015

A Response to the IPCC Fifth Assessment

Jessica Owley

Sarah J. Adams-Schoen

Deepa Badrinarayana,

Cinnamon Carlarne

Robin Kundis Craig

See next page for additional authors

Follow this and additional works at: https://repository.law.miami.edu/fac_articles



Part of the [Land Use Law Commons](#), and the [Natural Resources Law Commons](#)

Authors

Jessica Owley; Sarah J. Adams-Schoen; Deepa Badrinarayana;; Cinnamon Carlarne; Robin Kundis Craig; John C. Dernbach; Keith H. Hirokawa; Alexandra B. Klass; Katrina Fischer Kuh; Stephen R. Miller; Shannon Roesler; Jonathan Rosenbloom; Inara Scott; and David Takacs

A Response to the IPCC Fifth Assessment

by Sarah J. Adams-Schoen,
Deepa Badrinarayana, Cinnamon
Carlarne, Robin Kundis Craig,
John C. Dernbach, Keith H. Hirokawa,
Alexandra B. Klass, Katrina Fischer
Kuh, Stephen R. Miller,
Jessica Owley, Shannon Roesler,
Jonathan Rosenbloom, Inara Scott,
and David Takacs

Summary

The Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report presented significant data and findings about climate change. But the IPCC's working groups' summaries for policymakers avoid making normative statements about the IPCC's findings. The authors, members of the Environmental Law Collaborative, bridge this gap by identifying the normative claims that stem from the working groups' summaries to spark deeper discussion and help shape the IPCC's sixth assessment.

I. Introduction

On September 27, 2013, Working Group I released its report, *Climate Change 2013: The Physical Science Basis*, which concluded, with 95% confidence, that climate change is occurring and humans are causing it.¹ Working Groups II and III followed with their reports in 2014—respectively, *Climate Change 2014: Impacts, Adaptation, and Vulnerability* and *Climate Change 2014: Mitigation of Climate Change*. Collectively, these three reports constitute the IPCC's Fifth Assessment Report (AR5). This Article's authors used the AR5 as the text through which to examine how issues of climate change are presented and, moreover, what is missing from that presentation. The authors found that not everything was fully accounted for, even in the three massive Working Group reports. With particular concentration on the three Working Group Summaries for Policymakers, the authors decided to use the AR5 as a springboard for discussing the relationship between environmental science, environmental and natural resources law and policy, and the social issues that arise where those two meet.

The Summaries for Policymakers primarily focused on empirical claims. Each Working Group assembled facts about climate change and presented a compendium of the information gathered. To have any meaning for law and policy, however, the facts of the Summaries for Policymakers must be refracted through a series of value claims (for example, "biodiversity is good" or "considering the needs of future generations is more important than over-consuming Earth's resources today") to generate normative claims. The Summaries for Policymakers shied away from such normative claims.

Authors' Note: The authors collectively engaged in this project as the Environmental Law Collaborative. We would like to thank several institutions for the support needed to make this project possible, including the University of Idaho College of Law and the Teton Science School in Jackson, Wyoming. While they were unable to join us for the writing of essays, the Collaborative was also enriched by David M. Driesen and Sarah Krakoff, both of whom attended and contributed to the Collaborative's second meeting. We would also like to thank ELI for their continual support of our efforts. The Environmental Law Collaborative's first collection of essays appeared in *ELR* two years ago. [See Michael Burger et al., *Rethinking Sustainability to Meet the Climate Change Challenge*, 43 *ELR* 10342 (Apr. 2013)]. The group expanded these essays into a book-length project. [RETHINKING SUSTAINABILITY TO MEET THE CLIMATE CHANGE CHALLENGE (Jessica Owley & Keith Hirokawa eds., forthcoming 2015)].

1. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS 4, 15 (2013), available at http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf [hereinafter WGI SUMMARY FOR POLICYMAKERS].

Normative claims, however, are the provenance of lawyers and law professors. How should we live our lives? How should laws (in general, or in a specific area) be rewritten to reflect the realities of climate change? What new laws should be written? How should laws be enforced or interpreted, given changing ecological circumstances? How should a changing climate prompt changes in existing systems of environmental resource governance? Who should have a say in implementing the law that governs your resource of interest?

This Article explores how the empirical claims generated by the IPCC should be translated into normative claims. The methodology used was to choose an excerpt from one of the Summaries for Policymakers (each excerpt is an empirical claim) and then write a normative response to that claim. The responses may serve as jumping-off points for deeper discussions and action by the environmental law community and, potentially, even as a way to conceptualize the framework for the IPCC's Sixth Assessment.

II. Finding the Energy to Mitigate

This section was authored by Cinnamon Carlarne, Professor of Law, Michael E. Moritz College of Law, The Ohio State University.

Climate change is a massive environmental problem, but it is much more than that. It is also a security problem, a human rights problem, a trade problem, an economic development problem, a public health problem, and, at its very roots, an energy problem. We delay mitigation efforts in significant part because mitigating climate change requires making fundamental changes to our energy system, and our energy system rests at the center of the dominant economic model. Change is hard. Yet, change is necessary. The necessity of change is highlighted by AR5, which states, in key part: Delaying mitigation efforts beyond those in place today through 2030 is estimated to substantially increase the difficulty of the transition to low longer-term emissions levels and narrow the range of options consistent with maintaining temperature change below 2°C relative to pre-industrial levels (*high confidence*).²

2. IPCC, CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE: SUMMARY FOR POLICYMAKERS 13-14 (2014), available at http://report.mitigation2014.org/spm/ipcc_wg3_ar5_summary-for-policymakers_approved.pdf [hereinafter WGIII SUMMARY FOR POLICYMAKERS]. The section continues:

Cost-effective mitigation scenarios that make it at least as likely as not that temperature change will remain below 2°C relative to pre-industrial levels (2100 concentrations between about 450 and 500 ppm [parts per million] CO₂eq [carbon dioxide equivalent]) are typically characterized by annual GHG emissions in 2030 of roughly between 30 GtCO₂eq and 50 GtCO₂eq. Scenarios with annual GHG emissions above 55 GtCO₂eq in 2030 are characterized by substantially higher rates of emissions reductions from 2030 to 2050; much more rapid scale-up of low-carbon energy over this period; a larger reliance on CDR technologies in the long-term; and higher transitional and long-term economic impacts. Due to these increased mitigation challenges, many models with annual 2030 GHG emissions higher than 55 GtCO₂eq could not produce scenarios reaching atmospheric concentration levels that make it as

Yet, the only way to avoid delaying mitigation indefinitely is to be as frank as possible in identifying climate change as sitting at the nexus between energy and environmental law. Mitigating climate change means making changes in the energy sector. In the United States, for example, in 2011, carbon dioxide (CO₂) accounted for 84% of total U.S. greenhouse gas (GHG) emissions, with 97% of those CO₂ emissions attributable to energy use.³ Accordingly, in the United States, “the most direct way to reduce future climate change is to reduce emissions from the energy sector by using energy more efficiently and switching to lower carbon energy sources.”⁴ Although the percentages vary, the relationship between CO₂ emissions and energy use sits at the center of efforts to mitigate climate change across developed and developing countries.

Fundamentally, then, efforts to mitigate climate change require reducing GHG emissions from the energy sector. Yet, traditionally, questions of energy and environmental law have been addressed in separate forums using largely distinct systems of law and policy. As a result, the intersections between environmental law and energy law and policy have been approached at the margins. At the domestic level, for example, environmental regulations influence extraction, transportation, generation, and disposal actions to significantly different degrees depending on the energy source (for example, more for coal, less for gas, and even less for oil). But most sectors of the energy industry continue to receive significant environmental exemptions. This fragmentation, both within the energy field and between the energy and environmental fields, means that energy decisions continue to be made largely in isolation from larger questions about environmental issues, including climate change.

Similarly, at the international level, international agreements such as the Montreal Protocol influence production methods and incentivize energy efficiency. On occasion, the decisions of key institutions such as the World Trade Organization (WTO) address tensions between trade, energy, and environmental concerns. However, as in the domestic context, the decisions are piecemeal, and there is no substantive and meaningful engagement between key international energy, environmental, and economic institutions about ways in which to coordinate energy decisions with overarching global climate goals.

The disconnect between climate change and energy is really a disconnect between merely identifying the problem of climate change and actually beginning to experiment with pathways toward mitigating climate change. As the U.S. Global Change Research Program (USGCRP) Third National Climate Assessment concludes, making inroads

likely as not that temperature change will remain below 2°C relative to pre-industrial levels.

Id.

3. U.S. GLOBAL CHANGE RESEARCH PROGRAM (USGCRP), THIRD NATIONAL CLIMATE ASSESSMENT 10 (2013), available at <http://nca2014.globalchange.gov/downloads>.

4. *Id.* at 64.

into addressing climate change “require[s] substantial decarbonization of the global economy by the end of this century, implying a fundamental transformation of the global energy system.”⁵ Almost across the board, however, the short-term costs of efforts to decarbonize are seen as dwarfing the perceived long-term benefits, as significant as they might be. Yet, without changes to domestic energy policies worldwide, global efforts to mitigate climate change will fail. As one of the co-chairs for AR5’s Working Group II recently posited, we will instead have to refocus our energies on managing and, ultimately, surviving climate change.⁶

However, to accept massive climate change as inevitable or to allow the costs of responding to climate change to accumulate exponentially would be to the detriment of all. In launching the AR5, IPCC chair Rajendra Pachauri cautioned against this approach, warning that “[t]he high speed mitigation train needs to leave the station very soon, and all of global society will have to get on board.”⁷ Critically, all of the mitigation pathways considered in the AR5 involve upscaling of low-carbon energy. In essence, we must begin mitigating climate change immediately, and doing so means shifting our energy infrastructure quickly and dramatically.

Unfortunately, even the most-advanced economies are still in the early stages of thinking through how to achieve the types of energy shifts that the IPCC and the USGCRP Third National Climate Assessment suggest are necessary to avoid the possibility of increasingly severe climate change impacts.⁸ Thus, while it is increasingly clear that significant changes in the energy sector are necessary to curb climate change, it is less clear that any major state or regional players know how to achieve those changes in ways that are technologically, economically, and politically feasible.

However, reform is needed and needed fast. Mitigation cannot be neglected. Having conversations about mitigation means wrestling with our energy options openly and often. The stakes are high and we are at a critical moment in determining our collective future. Confronting the similarly existential crises of nuclear warfare, Albert Camus famously opined: “We have nothing to lose except everything. So let’s go ahead. This is the wager of our generation. If we are to fail, it is better, in any case, to have stood on

the side of those who choose life than on the side of those who are destroying.”⁹

Climate change is the wager of our generation. We can choose to do nothing and face an uncertain future, or we can choose to do something and begin a deliberate revolution—a revolution based on optimism and the heroic assumption that we are capable of dealing with the big issues, even when those big issues involve energy and fundamentally changing our dominant economic model.¹⁰

III. Achieving Dramatic Reductions in GHG Emissions Through Sustainable Development

This section was authored by John C. Dernbach, Distinguished Professor of Law at Widener University and Co-Director of Widener’s Environmental Law Center.

What do we need to do to have a decent chance of preventing large and growing emissions and atmospheric concentrations of GHGs from dangerously interfering with the climate system? The answer, according to the IPCC, is that the world needs to reduce GHG emissions by at least 40-70% by 2050, and to zero or below by 2100. Other scientific reports would say we must proceed faster. The IPCC also indicates that the many paths to this reduction should all be guided by sustainable development. That is, nations must find ways to reduce GHG emissions that also foster equitable economic and social development and promote security.

The task, then, can be succinctly stated as follows: Starting now, we must rapidly reduce GHG emissions to zero or below, creating as much social, environmental, economic, and security benefit as we can, and on an equitable basis. The IPCC reports do not say so as directly, but that is among the most essential tasks of our time.

A. Mitigation

Here is one of the most important paragraphs in the entire three volumes of the IPCC reports. It appears in Working Group I’s Summary for Policymakers and concerns the physical science basis for climate change. It is also likely to be among the densest, most tightly packed paragraphs you will ever read:

Limiting the warming caused by anthropogenic CO₂ emissions alone with a probability of >33%, >50%, and >66% to less than 2°C since the period 1861-1880, will require cumulative CO₂ emissions from all anthropogenic sources to stay between 0 and about 1570 GtC (5760 GtCO₂), 0 and about 1210 GtC (4440 GtCO₂), and 0 and about 1000 GtC (3670 GtCO₂) since that period, respectively. These upper amounts are reduced to about 900 GtC (3300 GtCO₂), 820 GtC (3010 GtCO₂), and

5. *Id.*

6. See, e.g., Uri Friedman & Svati Kristen Narula, *The UN’s New Focus: Surviving, Not Stopping, Climate Change*, ATLANTIC, Apr. 1, 2014.

7. Matt McGrath, *World Must End “Dirty” Fuel Use—UN*, BBC NEWS, Apr. 13, 2014, <http://www.bbc.com/news/science-environment-27008352>.

8. As the USGCRP’s Third Assessment emphasizes:

The principal types of national actions that could effect such changes include putting a price on emissions, setting regulations and standards for activities that cause emissions, changing subsidy programs, and direct federal expenditures. Market-based approaches include cap-and-trade programs that establish markets for trading emissions permits, analogous to the Clean Air Act provisions for sulfur dioxide reductions. None of these price-based measures has been implemented at the national level in the U.S.

USGCRP, THIRD NATIONAL CLIMATE ASSESSMENT, *supra* note 3, at 64.

9. ALBERT CAMUS, *RESISTANCE, REBELLION, AND DEATH: ESSAYS* 246 (1960).

10. See Cinnamon Carlarne, *Delinking International Environmental Law and Climate Change*, __MICH. J. ENVTL. & ADMIN. L.__ (forthcoming 2015).

790 GtC (2900 Gt CO₂), respectively, when accounting for non-CO₂ forcings as in RCP2.6. An amount of 515 [445 to 585] GtC (1890 [1630 to 2150] GtCO₂), was already emitted by 2011.¹¹

Got it?

To unpack this, it helps to know that the objective of the United Nations Framework Convention on Climate Change (UNFCCC) is “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”¹² The Conference of the Parties to the Convention has translated that objective as “a likely chance of holding the increase in global average temperature below 2°C or 1.5°C above pre-industrial levels.”¹³ The period of 1861 to 1880 provides a baseline for pre-industrial levels.

The paragraph specifies three different probabilities of holding the increase to 2°C (the higher of the two temperatures). The first probability is greater than (>) one out of three; the second probability is greater than 50:50; and the third is greater than two out of three. To put these probabilities in perspective, it helps to recall that the U.S. Environmental Protection Agency (EPA) has traditionally regulated chemicals under its major statutes when they create a risk of cancer of between one in 10,000 and one in 10 million.¹⁴ Cancer risks from chemicals are different from the risks of climate change, of course, but the contrasting probabilities are striking nonetheless. Even in Russian roulette, a player has only a one-in-six chance of dying.

The entire paragraph is about just one GHG—(CO₂) (more on that later). The acronyms GtC and GtCO₂ refer to gigatons of carbon and gigatons of CO₂, respectively. A gigaton is one billion tons. As the last sentence states, approximately 515 gigatons of carbon, or 1890 gigatons of CO₂, were already emitted by 2011.

The term “cumulative emissions” refers to all human (anthropogenic) emissions past, present, and future. In effect—and this is critical—the paragraph says there is an overall carbon budget (or CO₂ budget) that we cannot exceed if we want to have a specified chance of holding the increase to 2°C. To have better than a one-in-three chance, all human CO₂ emissions have to stay below 5,760 gigatons. For a better than 50:50 chance, the figure is 4,440 gigatons. For a better than two-thirds chance, the number is even lower: 3,670 gigatons.

But that is not the whole story, because CO₂ is not the only GHG. When the effect of other GHGs (for example, methane, nitrous oxide, and certain industrial chemicals) is taken into account, the numbers become even lower: 3,300 gigatons of CO₂ (better than one in three), 3,010 gigatons (better than 50:50), and 2,900 gigatons (better than two out of three).

Subtracting what was already emitted in 2011 (a calculation not made in the paragraph), we are left with the following: The world cannot emit more than 1,410 additional gigatons of CO₂ (one-in-three chance of not exceeding 2°C), 1,120 additional gigatons (50:50 chance), or 1,010 additional gigatons (two-in-three chance).

That is essentially what the dense paragraph above says.

Working Group III's Summary for Policymakers explains both the scale of cuts, and how much time is available, if we are to have a “likely” (two-in-three) chance of not exceeding 2°C. By its assessment, global GHG emissions need to be 40-70% lower by 2050 and “near zero” gigatons of CO₂ equivalent or “below” by 2100.¹⁵

Other calculations of a carbon budget provide less time to get emissions that low. The writers of a frequently cited 2009 paper in *Nature* focus on the time period between 2000 and 2050, not between 2000 and 2100, and calculate carbon budgets to avoid exceeding 2°C based on cumulative emissions in the first half of this century.¹⁶ Given past and projected emissions, they conclude, “we would exhaust the CO₂ emission budget by 2024, 2027 or 2039, depending on the probability accepted for exceeding 2°C (respectively 20%, 25% or 50%).”¹⁷

One does not need to be a scientist or a statistician to judge which of these CO₂ budgets gets the timing correct. A set of normative propositions—all discussed in various places throughout the IPCC reports¹⁸—are equally applicable to either approach. The precautionary approach, intergenerational equity, intragenerational equity, human rights, and basic morality all suggest that we need to reduce GHG emissions as rapidly as possible to an ultimate goal of zero or below. In fact, the parties to the 2012 Conference of the Parties of the UNFCCC agreed on the importance of “accelerating the reduction of global greenhouse gases.”¹⁹

11. WGI SUMMARY FOR POLICYMAKERS, *supra* note 1, at 27 (footnotes omitted).

12. United Nations Framework Convention on Climate Change (UNFCCC), art. 2, May 29, 1992, S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 107. U.N. Doc. A/AC.237/18 (Part II)/Add.1; 31 I.L.M. 849.

13. See, e.g., Conference of the Parties, UNFCCC, Decision 1/CP.17 (Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action), in REPORT OF THE CONFERENCE OF THE PARTIES ON ITS SEVENTEENTH SESSION, held in Durban from 28 November to 11 December 2011, Addendum, Part Two: Action Taken by the Conference of the Parties at Its Seventeenth Session, FCCC/CP/2011/9/Add.1 (2012), available at <http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf>.

14. JOHN D. GRAHAM, THE LEGACY OF ONE IN A MILLION, RISK IN PERSPECTIVE 1-2 (1993) (Harvard Center for Risk Analysis), available at <http://www.hsph.harvard.edu/wp-content/uploads/sites/1273/2013/06/The-Legacy-of-One-in-a-Million-March-1993.pdf>.

15. WGIII SUMMARY FOR POLICYMAKERS 13, *supra* note 2 (footnote and emphasis in first sentence omitted). The term “likely” means a “66-100 %” chance of a particular outcome. *Id.* at 4, n.2.

16. Malte Meinshausen et al., *Greenhouse-Gas Emission Targets for Limiting Global Warming to 2 °C*, 458 NATURE 1158 (2009).

17. *Id.* at 1159.

18. See, e.g., CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE, CONTRIBUTION OF WORKING GROUP III TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, ch. 4 [hereinafter WGIII AR5] (2014), available at http://report.mitigation2014.org/drafts/final-draft-postplenary/ipcc_wg3_ar5_final-draft_postplenary_chapter4.pdf.

19. UNFCCC, CONFERENCE OF THE PARTIES, ADVANCING THE DURBAN PLATFORM, FCCC/CP/2012/L.13 (Dec. 8, 2012), available at <http://www3.unog.ch/dohaclimatechange/sites/default/files/FCCCCP2012L13.pdf>.

B. Accelerating Mitigation Through Sustainable Development

Sustainable development is a decisionmaking framework to foster human well-being by ensuring that development and environment goals are achieved at the same time.²⁰ A specific objective of the UNFCCC is sustainable development,²¹ and the Convention is suffused with sustainable development principles and language, including precaution,²² equity,²³ and, perhaps most importantly, integrated decisionmaking.²⁴ In fact, the UNFCCC requires all countries to integrate climate change mitigation and adaptation into their national development plans and processes.²⁵

Sustainable development offers the only realistic approach to accelerating the reduction of GHG emissions, because it would have governments frame their legal and policy approach not only in terms of reducing emissions, but also in terms of the social, economic, security, and environmental benefits that they can obtain by doing so. In addition, according to the IPCC, articulating the equitable or moral basis for sustainable development approaches to climate change enhances the likelihood that these approaches will be agreed to and implemented.²⁶ By creating a space for new approaches to development based on equity that produce both climate change and non-climate change benefits, sustainable development provides a way for public and private decisionmakers in all countries to get past the seemingly intractable conflict between development and climate change mitigation.

In fact, this policy space is now being filled by a variety of new or modified laws that foster renewable energy; energy efficiency and conservation in buildings, transportation, and industry; and distributed energy, among other things. As states discovered more than a decade ago, the co-benefits of addressing climate change—including new jobs; growing businesses; reduced emissions of sulfur dioxide, mercury, and other air pollutants; and reduced energy costs for businesses and the poor—produced more immediate and tangible results than the GHG emission reductions that accompanied these benefits.²⁷

Those who draft, modify, advocate, and implement laws relating to climate change need to look, and are already looking, for ways of doing so that maximize equity and co-benefits. Particularly but not exclusively in developed countries, the greater the co-benefits, the greater GHG emission reductions that are often politically available. The task, then, is to craft, adopt, and implement approaches to reducing GHG emissions that are not only sensible and

ambitious, but are also so attractive that they will overcome all the many obstacles to change, including not only fossil fuel interests, but also simple inertia.

To be sure, sustainable development may not work to address the global problem of climate change. Governments may refuse to enter or treat seriously this new space, taking unsustainable approaches to mitigation or simply adhering to conventional development paths and fossil fuels. Alternatively, runaway GHG emissions could so destabilize governments and societies as to make any prospect for sustainability out of reach. But sustainable development provides an internationally accepted and widely applied framework for reducing GHGs, and is an attractive approach for accelerating the reduction of GHG emissions.

IV. Climate Change, Sustainable Development, and the Fifth Assessment Report

This section was authored by Robin Kundis Craig, William H. Leary Professor of Law, University of Utah S.J. Quinney College of Law.

Proponents of sustainable development should be worried by AR5. However, they might not realize that from the Summaries for Policymakers. Specifically, in Working Group II's Summary for Policymakers, related to climate change adaptation, the IPCC notes that:

Prospects for climate-resilience pathways for sustainable development are related fundamentally to what the world accomplishes with climate change mitigation (*high confidence*). Since mitigation reduces the rate as well as the magnitude of warming, it also increases the time available for adaptation to a particular level of climate change, potentially by several decades. Delaying mitigation may reduce options for climate-resilient pathways in the future.²⁸

On first read, this is a fairly obvious statement. Getting serious about climate change mitigation now will reduce humanity's need to adapt to climate change in the future and give us more time to adapt overall. However, the last sentence subtly suggests that delayed mitigation efforts may reduce humanity's future options, including options for development.

The potential loss of future options poses risks to societies and socioecological systems that should already be modifying how we think about development goals, even sustainable development goals. All human societies ultimately depend on ecosystems and the goods and services that those ecosystems provide, but climate change directly threatens the current states of most of the world's ecosystems. If you change an ecosystem too much in a bad way, then you retard the economic and social development

20. *Id.* at 11-12.

21. UNFCCC, *supra* note 12, art. 3.4.

22. *Id.* art. 3.3.

23. *Id.* art. 3.1.

24. *Id.* art. 3.4.

25. *Id.* art. 4.1(f).

26. WGIII AR5, *supra* note 18, ch. 4 at 4.

27. See John Dernbach and the Widener University Law School Seminar on Global Warming, *Moving the Climate Debate From Models to Proposed Legislation: Lessons From State Experience*, 30 ELR 10933 (Nov. 2000).

28. IPCC, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY: SUMMARY FOR POLICYMAKERS 28 (2014), available at http://ipcc-wg2.gov/AR5/images/uploads/WG2AR5_SPM_FINAL.pdf [hereinafter WGII SUMMARY FOR POLICYMAKERS].

(and ultimately survival) of the societies that depend on that ecosystem.

The climate change extremes of this new reality, such as the predicted disappearance of island nations as a result of sea-level rise,²⁹ have been well-publicized, but not yet incorporated into global development goals. In part, these kinds of extreme—indeed, existential—threats to island (and also Arctic) cultures may not seem generalizable. They are currently generally portrayed as tragic but somewhat unusual climate change fates for particular kinds of human societies, with the implication that the rest of us will still be able to muddle along in our pursuit of continuous development.

Ecological dependence, however, is more insidious than that. In particular, a suite of ecological changes can thoroughly undermine development goals in a particular society *without* completely wiping it out. The *BBC News* recently published a particularly poignant example of the human tragedies that can result from ecosystem decline, tracing how the loss of terrestrial food species and especially freshwater and offshore fisheries has led to increased slavery—especially child slavery—in Burma, Cambodia, Somalia, and Thailand.³⁰ Fewer fisheries and other food species make it highly labor-intensive to get food, promoting the enslavement of children and others to carry out this task.³¹ At some point, in other words, a society's dependence on a failing or radically changing ecosystem drastically retards, even reverses, economic and social development. Climate change is making it all the more likely that a variety of ecosystems will experience such changes, or crash completely.

If you read past the Summary for Policymakers and dive deep into Chapter 20 of the IPCC's report on Impacts, Adaptation, and Vulnerability, you learn that "[c]limate change poses a moderate threat to current sustainable development and a severe threat to future sustainable development."³² Thus, although the IPCC still hews to sustainable development as a global goal, it acknowledges that climate change could substantially vitiate that goal. As it notes in its classically reserved tone, "[a]dded to other stresses such as poverty, inequality, or diseases, the effects of climate change will make sustainable development objectives such as food and livelihood security, poverty reduction, health, and access to clean water more difficult to achieve for many locations, systems, and affected populations."³³

For societies that lose their homelands, food supply, or water supply, this statement does not go nearly far enough. Sustainable development goals—indeed, *any* development goals—presume that the relevant society will continue to have the basic ecological requisites for development: a place to inhabit, a source or sources of food, water that is or can be made potable. Climate change calls those assumptions into question and limits the future development options for current societies, particularly in conjunction with an ever-rising global human population.

Nor is the potential loss of development options, or developmental retardation, limited to developing nations. Europe's remaining ecosystems cannot support the human population of that continent at its current levels of affluence. In 2005, the World Wildlife Fund estimated that Europe's consumption footprint more than doubles its own biological productive capacity, and hence "Europe's well-being depends on ecological capacity from elsewhere."³⁴ The U.S. ecological footprint is even greater. While consumption patterns in Europe and the United States raise valid climate change issues in their own right, the point here is much more limited: We cannot assess the U.S. and European Union's climate change vulnerability *or* development futures by looking only at those nations' capacity to respond to internal climate change impacts. These two sets of societies are intimately dependent on the health of ecosystems elsewhere, and climate change impacts on *those* ecosystems potentially limit the future options of the United States and the EU as much as they limit the options of much more physically proximate societies.

The IPCC, in other words, is just beginning to wrestle with what climate change could truly mean for future human development, sustainable or otherwise. Notably, reduced and changing resources alter not only a particular society's development options, but also its adaptive capacity, potentially creating a vicious cycle of ever-diminishing resilience and ability to cope with climate change, let alone achieve economic or social progress. Clearly, as the IPCC does emphasize, a strong, immediate, and effective climate-change mitigation strategy is our first-best approach to preserving as many options as possible for the future. Reading between the lines, however, we should also be starting to think about what "development goals" can look like in an option-constrained—and in many places under many scenarios, *severely* option-limited—future.

V. Responding to Imminent Risks and Present Harms

This section was authored by Shannon Roesler, Professor of Law, Oklahoma City University School of Law.

Working Group II's Summary for Policymakers regarding climate impacts, adaptation, and vulnerability identifies a

29. See, e.g., *Climate Change: The "Greatest Threat" to the Peoples of the Pacific*, ISLAND BUS., July 31, 2014, <http://www.islandsbusiness.com/news/palau/5906/climate-change-the-greatest-threat-to-the-peoples/>.

30. Matt McGrath, *Global Decline of Wildlife Linked to Child Slavery*, BBC NEWS, July 24, 2014, <http://www.bbc.com/news/science-environment-28463036>.

31. *Id.*

32. Fatima Denton et al., *Chapter 20: Climate-Resilient Pathways: Adaptation, Mitigation, and Sustainable Development 2* (Oct. 2013), in IPCC, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY (2014), CONTRIBUTION OF WORKING GROUP II TO THE FIFTH ASSESSMENT REPORT OF THE INTERNATIONAL PANEL ON CLIMATE CHANGE [hereinafter WGII AR5], ch. 20 (2014), available at http://ipcc-wg2.gov/AR5/images/uploads/WGII-AR5-Chap20_FGDall.pdf.

33. *Id.*

34. WORLD WILDLIFE FUND, EUROPE 2005: THE ECOLOGICAL FOOTPRINT 3 (2005), available at http://www2.wwf.fi/wwf/www/uploads/pdf/ekologinen_jalanjalki_june05.pdf.

number of imminent risks: Some unique and threatened systems, including ecosystems and cultures, are already at risk from climate change (*high confidence*). . . .

Climate-change-related risks from extreme events, such as heat waves, extreme precipitation, and coastal flooding, are already moderate (*high confidence*). . . .

Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development.³⁵

These quotations come from three of the five “reasons for concern” identified by the IPCC in its Third Assessment Report as “starting point[s] for evaluating dangerous anthropogenic interference with the climate system.”³⁶ In a report that understandably focuses much attention on the heightened probability and magnitude of harm associated with further warming in the future, the risks identified in the first two quotations stand out because they *already* exist. Some communities, including coastal villages in the Arctic and small island states, are *already* facing threats to their very existence. In addition, the risks associated with extreme weather events are widespread and *already* here. When these risks are considered alongside the reality that they are “unevenly distributed” and “generally greater for disadvantaged people,” they present policy questions not only about long-term adaptation planning, but also about immediate disaster response and aid.

In cases where communities are under serious threat from coastal erosion and sea-ice melt, the threat is imminent and the costs are steep. For example, in 2003, the U.S. Government Accountability Office (GAO) reported that coastal erosion and flooding had affected 184 of 213 Alaska Native communities.³⁷ In 2009, the GAO reported that 31 Native villages face “imminent threats” and that 12 of the 31 villages had decided to relocate or consider partial or complete relocation.³⁸ Given the rapid rate of warming in the Arctic, the number of villages facing an imminent threat is likely higher today than it was in 2009.

These threats result in real and quantifiable *current* costs. In 2006, the U.S. Army Corps of Engineers (the Corps) estimated the costs of relocating the Alaska Native village of Newtok at \$80-\$130 million.³⁹ Estimates of the costs to relocate other villages are either comparable or much higher. For example, it could cost as much as \$400 million to move the inhabitants of the village of Kivalina.⁴⁰ Even though Alaska Native communities are generally small (ranging from a couple to several hundred people), they are located in remote areas often accessible year-round only by airplane, a reality that makes relocation extremely expen-

sive. The costs will only grow as flooding and coastal erosion pose increasing threats to homes, infrastructure, and the way of life in more of these communities.

Funding to relocate these villages must come from somewhere other than the local communities. Most Alaska Native villages are self-sustaining communities closely tied to the sea and river ecosystems where they hunt and fish for food. Federal funding is essential, but villages often fail to qualify for the disaster-mitigation programs administered by the Federal Emergency Management Agency (FEMA). A village may lack a FEMA-approved disaster-mitigation plan, which is a prerequisite for mitigation funding, and even if such a plan is in place, it does not guarantee funding.⁴¹ FEMA makes funding decisions based on the cost-effectiveness of a project, and the high costs of new infrastructure (in comparison to the small numbers of people relocated) make relocation projects costly.⁴² In addition, the nature of the risk (in this case, gradual coastal erosion) may frustrate attempts to obtain a federal disaster declaration, and serious obstacles prevent many villages from participating in the National Flood Insurance Program.⁴³

In addition to the difficulty in qualifying for federal disaster funding, these villages also face serious challenges in the planning and decisionmaking phases of relocation. Decisions regarding relocation depend on the coordination of efforts by local, state, and federal authorities. The impacts of gradual coastal erosion and flooding are not governed by one federal or state agency.⁴⁴ Federal funding may be administered by multiple agencies, including the Corps, FEMA, and the U.S. Department of Housing and Urban Development. Without clear structures for information-sharing and coordination, decisionmaking is inefficient at best. Indeed, the authors of the IPCC report on climate impacts note that “limited integration or coordination of governance” can hinder adaptation efforts.⁴⁵

Given the considerable difficulties in obtaining governmental assistance, it is not surprising that one Alaska Native village recently turned to the courts for relief. In 2008, the village of Kivalina sued oil, energy, and utility companies in federal district court, alleging that the defendants’ GHG emissions have caused global warming, which is, in turn, causing massive coastal erosion and increasing the risks of extreme weather and flooding.⁴⁶ On appeal, the U.S. Court of Appeals for the Ninth Circuit affirmed the district court’s dismissal, concluding that under U.S. Supreme Court precedent, claims for damages pursuant to the federal common law of public nuisance are displaced by the Clean Air Act (CAA).⁴⁷ The majority concluded its opinion by acknowledging the seriousness of the problem, but characterizing it as one not amenable to judicial action:

35. WGII SUMMARY FOR POLICYMAKERS, *supra* note 28, at 12.

36. *Id.*

37. See U.S. GOV’T ACCOUNTABILITY OFFICE (GAO), GAO-09-551, ALASKA NATIVE VILLAGES: LIMITED PROGRESS HAS BEEN MADE ON RELOCATING VILLAGES THREATENED BY FLOODING AND EROSION 12 (2009).

38. *Id.*

39. See *id.* at 29.

40. See *Native Village of Kivalina v. ExxonMobil Corp.*, 663 F. Supp. 2d 863, 869, 39 ELR 20236 (N.D. Cal. 2009).

41. See GAO, ALASKA NATIVE VILLAGES, *supra* note 37, at 22.

42. See *id.* at 22-23.

43. See *id.* at 23-24.

44. See *id.* at 36.

45. WGII SUMMARY FOR POLICYMAKERS, *supra* note 28, at 26.

46. *Kivalina*, 663 F. Supp. 2d 863.

47. *Native Village of Kivalina v. ExxonMobil Corp.*, 696 F.3d 849, 858, 42 ELR 20195 (9th Cir. 2012). The Clean Air Act is codified at 42 U.S.C. §§7401-7671q, ELR STAT. CAA §§101-618.

“Our conclusion obviously does not aid Kivalina, which itself is being displaced by the rising sea. But the solution to Kivalina’s dire circumstance must rest in the hands of the legislative and executive branches of government, not the federal common law.”⁴⁸

Of course, given the interests involved, a complete political solution to Kivalina’s “dire circumstance” is unlikely. Congress is not likely to appropriate the millions of dollars required to relocate the village. But perhaps more modest goals are within reach. A combination of legislative and executive actions could address coordination problems, making the administration of available funds more efficient and effective. Revision of current disaster-assistance laws and policies may remove some obstacles that villages face when applying for federal assistance.

Furthermore, although any response to the problem is likely to be a political one, civil litigation may nevertheless have a role to play. Plaintiffs will have difficulty establishing the required legal elements, including the causal link between climate-related harms and the conduct (GHG emissions) of specific defendants. But as social movement activists and scholars have long recognized, even unsuccessful lawsuits can serve important functions. They often capture media and public attention and provide a means by which to communicate grievances to the larger political society and to shape the discussion of critical issues.

In fact, Kivalina’s lawsuit may have had such an effect. The village’s story is often recounted in news articles and scholarly commentary, and in many cases, the focus is on governmental accountability, rather than private liability. For example, one news account quotes a Kivalina Council leader’s description of the problem as one of political injustice: “‘The U.S. government imposed this Western lifestyle on us, gave us their burdens and now they expect us to pick everything up and move it ourselves. What kind of government does that?’”⁴⁹ As the Ninth Circuit opinion suggests, this is a question best addressed to the political branches of government, ideally acting in response to shared commitments in the larger political society. The lawsuit may have helped educate the public and even played a role in framing the relevant questions; perhaps future litigation can help ensure that we keep the conversation going and identify solutions sooner rather than later. The threats to these communities are not theoretical or distant; they are *already* here.

VI. Security Regained, Security Lost? The Climate Change Conundrum

This section was authored by Deepa Badrinarayana, Professor, Chapman University, Dale E. Fowler School of Law.

Consider the following definition, quotation, and Working Group II empirical claims:

From the Oxford English Dictionary: “Security: The state of being free from danger or threat. . . . Origin: late middle English: from Old French *securite* or Latin *securitas* from *securus* ‘free from care.’”⁵⁰

From the United Nations: “We need another profound transition in thinking—from nuclear security to human security.”⁵¹

From Working Group III: All aspects of food security are potentially affected by climate change, including food access, utilization, and price stability (*high confidence*).

Climate change over the 21st century is projected to increase displacement of people (*medium evidence, high agreement*).

Climate change can indirectly increase risks of violent conflicts in the form of civil war and inter-group violence by amplifying well-documented drivers of these conflicts such as poverty and economic shocks (*medium confidence*).

The impacts of climate change on the critical infrastructure and territorial integrity of many states are expected to influence national security policies (*medium evidence, medium agreement*).⁵²

In 1945, nations that came together to establish the United Nations (U.N.) had one clear goal: to remove the scourge of war, two of which had debilitated a significant portion of the world. The U.N. had a singular mission: to maintain peace and security.⁵³ The Security Council was established as the decisionmaking body to address security threats.⁵⁴ However, nations also realized the importance of international cooperation, the need to achieve economic growth, and the need to protect social and cultural structures, while at the same time protecting human rights and ensuring justice. They vested in the U.N. the responsibility to foster good international relations among nations.⁵⁵ Implicit in this structure was a confidence that secure nations with sound socioeconomic and political structures would cater to the needs of their citizens.

In 1994, nations heralded the end of another “war,” the Cold War. By then, the world was a much different place. Security of nations in the traditional territorial sense no longer occupied center stage. Rather, the state of people within nations gained focus, and that focus was on human security. The U.N. Development Programme, in its 1994 Human Development Report, introduced an endless list of human security concerns that warranted international attention—from energy to food to displacement of people to water scarcity to human rights abuses to any aspect of

48. *Kivalina*, 696 F.3d at 858.

49. Stephen Sackur, *The Alaskan Village Set to Disappear Under Water in a Decade*, BBC NEWS MAG., July 29, 2013, <http://www.bbc.com/news/magazine-23346370>.

50. OXFORD ENGLISH DICTIONARY, available at <http://www.oxforddictionaries.com/definition/english/security> (last visited Oct. 17, 2014).

51. U.N. DEVELOPMENT PROGRAMME, HUMAN DEVELOPMENT REPORT, 1994 (New York: United States, 1994), available at http://hdr.undp.org/sites/default/files/reports/255/hdr_1994_en_complete_nostats.pdf.

52. WGII: SUMMARY FOR POLICYMAKERS, *supra* note 28, at 8.

53. U.N. CHARTER, available at www.un.org/en/documents/charter/chapter1.shtml.

54. *Id.* art. 7.

55. U.N. CHARTER, *supra* note 53.

human integrity and well-being. Human security, however, did not gain the center stage in international law in the same way as national security, with the exception of international intervention in internal civil wars in some nations. After all, why should international law have a role in purely domestic matters? Instead, subnational and non-government entities that began to mushroom in the 1990s, plus individuals, made an effort to fill the gap left by international law by creating networks to influence laws, create policies, and/or to implement solutions.⁵⁶

Climate change triggers traditional national security and human security concerns. According to AR5, climate change can increase human security concerns, as well as national security concerns, including concerns about security in property. The establishment of climate security organizations composed of retired military generals signals the gravity of the security threats that climate change presents. In the United States, identified national security threats include everything from threats to military installations from sea-level rise to international competition for natural resources in the Arctic region.⁵⁷ Human security threats also abound: loss of food resources; displacement of people; loss of livelihood; civil war; and loss of property, to name a few.

Yet, the security risks of climate change have failed to catalyze international legal response. Major GHG emitters are instead using arguments of human security to avoid international legal obligations. The United States has been arguing that it will suffer competition loss that could result in loss of livelihood if it enters into a treaty that does not bind China to similar obligations. Australia, Canada, Japan, and Russia have joined in this viewpoint for the second commitment period of the Kyoto Protocol. China and India have been arguing that the short-term needs of their citizens, from energy to food to other basic needs, require them to develop without emissions reduction obligations. For these nations, the short-term security needs of their peoples come before their long-term interests.

There are those nations, however, that face both short-term and long-term security risks. Small island nations whose territorial integrity is challenged by rising sea levels face physical threat to their borders. However, despite acknowledgment of security threats by the United States and other nations, there is no international action on this issue. Neither the UNFCCC nor the Kyoto Protocol uses the word “security.” Instead, nations are focusing on building national resilience to climate change impacts.⁵⁸

The implicit message appears to be that the U.N. mandate to maintain peace and security is limited to threats from traditional “war-like” aggression. Of course, even if the U.N. Security Council were to undertake this matter, what would a permanent membership composed of United States and China decide that might be different from their stance on climate change treaty obligations?

For some other nations, such as sub-Saharan African nations, climate change presents nearly insurmountable risks to human security—food insecurity, water scarcity, livelihood insecurity, and property insecurity. However, these insecurities already exist in these countries. The difference between some of these countries and emerging economies like China and India is that the sub-Saharan African nations are not in a place of economic development that apparently promises to address short-term human security needs. They are also not in a position to mitigate climate change.

Finally, there are a group of countries, oil-producing nations such as the Middle East nations, that face their own security issues. Climate change may disrupt their long-term security, but mitigation efforts could upend their short-term security, because of their limited economic portfolio, primarily in fossil fuels.

The world viewed from the lens of climate security is a mismatch of national interests and security concerns. It begs the question of whether economic growth or reversal of the current economic system can ensure security, especially in a world divided by physical boundaries but united by one atmosphere. Just as climate change itself poses different kinds of security risks in different nations, so, too, does actually dealing with climate change. As a result, it is time to rethink the international law framework—period—in order to deal with these very real security complexities.

VII. Approaching Climate Change Through Systems Thinking

This section was authored by Keith H. Hirokawa, Professor of Law, Albany Law School.

Working Group II's Summary for Policymakers identifies natural and built infrastructure challenges as crucial to an adaptation strategy, as follows:

Climate change will have profound impacts on a broad spectrum of infrastructure systems (water and energy supply, sanitation and drainage, transport and telecommunication), services (including health care and emergency services), the built environment, and ecosystem services. These interact with other social, economic, and environmental stressors exacerbating and compounding risks to individual and household well-being (*medium confidence based on high agreement, medium evidence*).⁵⁹

In this statement, the Working Group identifies the wide range of social, economic, and environmental assets

56. ANNE-MARIE SLAUGHTER, A NEW WORLD ORDER 15-16 (2004); Kal Raustiala, *The Architecture of International Cooperation: Transgovernmental Networks and the Future of International Law*, 43 VA. J. INT'L L. 1 (2002); MARGARET E. KECK & KATHRYN SIKKINK, TRANSNATIONAL ADVOCACY NETWORKS IN INTERNATIONAL POLITICS, ACTIVISTS BEYOND BORDERS (1998).

57. CENTER FOR CLIMATE & SECURITY, *Secretary Hagel on Climate Change Affecting the Security Environment*, Oct. 12, 2014, <http://climateandsecurity.org/2014/10/12/secretary-hagel-on-climate-change-affecting-the-security-environment/>.

58. U.S. DEPARTMENT OF DEFENSE, 2014 CLIMATE CHANGE ADAPTATION ROADMAP (2014), available at <http://www.acq.osd.mil/ie/download/CCA-Rprin t.pdf>.

59. WGII AR5, *supra* note 32, ch. 8 at 3.

and responsibilities that will be challenged by climate changes. For our purposes, it is significant that the IPCC chose to associate the costs of sustaining infrastructure and services with the built environment and ecosystem services. My observation is simple: If infrastructure and the built environment are to be sustainable in the face of climate changes—if it will have the capacity to meet the social, economic, and environmental necessities of our time and over time—then an understanding of ecological services must be incorporated into infrastructure and built environment planning. Sound decisions about infrastructure and public services cannot be made without considering the relationship between essential services provision and ecosystem structure and function.

Consider, for example, water infrastructure. Water infrastructure provides clean and sufficient water for drinking, as well as other water-intensive uses such as irrigated agriculture and industry; transports water to where it is needed; treats waste and stormwater; handles storm surges and provides safety from such surges; and also provides recreational and community opportunities. The water system provides these services through the construction of an artificial system of physical capture and conveyance, storage, and treatment. The system's strength is assessed by volume provision and miles of pipe.

That water infrastructure is addressed in climate change planning is no small thing: Without an effective infrastructure, individuals may be unable to obtain basic needs, and the consequences will be catastrophic. Of course, public access to adequate water is often difficult to ensure. As such, the IPCC statement acknowledges the immense cost of infrastructure maintenance and replacement into the next century, as well as the "profound" importance that civil society effectively plan for scarcity and challenges to the provision of basic human needs. It is of significant consequence that this observation arises in the context of urban resilience. As Alexandra Klass notes in the section immediately below, a shift toward urbanization that began over one century ago continues and even accelerates into the next century.

Society is becoming more urbanized, and human population is becoming more concentrated and, accordingly, efficient and effective provision of public essential services has become paramount. These changes require that governance prioritize planning to overcome the significant challenges faced in meeting infrastructure needs in human population centers. The challenges are real with regard to physical and financial projections. According to one estimate, the average cost of water infrastructure replacement in the developed world will range from \$550-\$2,300 to \$6,300 per household for smaller systems, and up to \$10,000 per household if treatment plants and pumps need replacement. In the meantime, the useful life of water infrastructure has declined: The average life expectancy for gray infrastructure has decreased from 120 years (for systems features installed in the late 1800s) down to 75 years for post-World War II infrastructure. The staggered

life expectancies of water infrastructure components makes financing infrastructure more complicated, including equitably allocating scarce resources to the replacement where and when systems come to the end of their useful life.

The foregoing example suggests the capture of substantial benefits from combining our assessment of necessary infrastructure with an inventory of ecosystem services. Ecosystem services is an approach to ecology and economics that focuses on ecosystem processes and ecosystem functionality.⁶⁰ This approach values the manner in which ecosystems produce goods of value, the manner in which ecosystems provide services that are essential to human well-being, and the economic value that can be attributed to functioning ecosystems as the value of the services they provide. The change in thinking toward ecosystem services is a monumental move toward climate change preparedness. Consider two realizations that come with ecosystem services thinking: (1) we have typically displaced and interrupted ecosystems to build infrastructure systems and the built environment; and (2) built infrastructure does not last forever. Ecosystem services thinking offers an additional opportunity in infrastructure planning that envisions flexibility, adaptive reasoning, and risk analysis. Ecosystem services thinking requires us to identify the ways that we rely on functioning ecosystems for clean air and water, temperature control, nutrient cycling, spiritual grounding, and a host of other services that are so essential to life that they often cannot be artificially replaced.

The thrust of ecosystem services thinking is that we need to break from commodity-based valuation. By focusing attention on the market values of goods that can be taken from ecosystems, without also accounting for the methods of sustaining the production of those goods or the loss of production in the future, we have expedited the decline of functionality throughout the natural systems. Both consumption and the corresponding inattention to ecosystem functions that occurs in the commodification of nature have limited the ability of ecosystems to regenerate and sustain themselves, requiring the production of substitutes. From this perspective, a resilient water infrastructure system will recognize the role that natural systems play in producing clean and sufficient water (rivers, lakes, streams, groundwater aquifers, floodplains, floodways, wetlands, and the watersheds), and will integrate those processes in formulating the means to capture, treat, store, and deliver water to places it is needed.

Switching to an ecosystem services accounting, or at least incorporating ecosystem services into the infrastructure accounting, will produce better planning decisions. Examples of the benefits of ecosystem services planning are illustrated in the watershed investments in New York City and Seattle, where the acquisition of real property interests throughout the watershed has captured the value of eco-

60. See, e.g., NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS (Gretchen C. Daily ed., 1997); Robert Costanza et al., *The Value of the World's Ecosystem Services and Natural Capital*, 387 NATURE 253 (1997); Robert Costanza & Herman E. Daly, *Natural Capital and Sustainable Development*, 6 CONSERVATION BIOLOGY 37 (1992).

system services in providing quality and quantity of public water supplies; or Santa Fe, which is currently identifying forest management practices that will facilitate the capture of watershed service from the ecosystem and help avoid the gargantuan costs of losing such services from forest fires and other events.

These cities are investing in ecosystem functionality to ensure that watersheds are performing as they can and should, at a fraction of the cost of built infrastructure, and as a minimal maintenance cost over time. The cities have incorporated the wisdom of ecosystem services: The built or gray infrastructure that comprise their water systems are designed to provide services that are already provided by natural systems, including water and sewer, storm and flood protection, temperature control and climate stabilization, waste cycling and assimilation, and other natural services. As an additional benefit, natural systems provide these services very effectively and efficiently, while also securing other foundational goods and services, including oxygen, water, land, recreational opportunities, aesthetic value and spiritual attachment, and energy.

Although ecosystem services planning is a new approach, it is essential that water managers incorporate ecosystem services concepts into the decisionmaking process. The result of such an integration would be to capture the benefits of functioning ecosystems, while protecting the valuable assets of natural capital. Ecosystem services thinking connects ecosystem function with basic human needs—not merely as a means to protect the environment, but as a means to assure human well-being.

VIII. Climate Change and Cities

This section was authored by Alexandra B. Klass, Professor of Law, University of Minnesota Law School.

For the first time in 2014, in AR5's volume on mitigation of climate change, the IPCC included a separate chapter, Chapter 12, entitled Human Settlements, Infrastructure, and Spatial Planning. According to the IPCC, "[s]ince the publication of the Fourth Assessment Report, there has been a growing recognition of the significant contribution of urban areas to GHG [greenhouse gas] emissions, their potential role in mitigating them, and a multi-fold increase in the corresponding scientific literature."⁶¹ In both Chapter 12 of the Mitigation of Climate Change volume and the Summary for Policymakers for that volume, the IPCC concludes:

Thousands of Cities are undertaking climate action plans, but their aggregate impact on urban emissions is uncertain (*robust evidence, high agreement*).⁶²

There has been little systematic assessment on their implementation, the extent to which emission reduction

targets are being achieved, or emissions reduced. Current climate action plans focus largely on energy efficiency. Fewer climate action plans consider land use planning strategies and cross-sectoral measures to reduce sprawl and promote transit-oriented development.⁶³ The urbanization of the world and the impact of that urbanization on GHG emissions are significant. Today, more than one-half the global population is urban, as compared to only 13% in 1900.⁶⁴ By 2050, the global urban population is expected to increase by 2.5-3.0 billion, corresponding to nearly 70% of the world's population.⁶⁵ Today, urban areas account for approximately 75% of global energy use and the same amount of CO₂ emissions from global energy.⁶⁶ Moreover, the majority of future urban population growth will take place in small- or medium-size urban areas in developing countries.⁶⁷

There is both potential and risk with this type of growth. Because such development will be mostly new, there is the potential to create buildings, other infrastructure, transportation, and land use plans that maximize efficiency and reduce GHG emissions from the outset, as opposed to having to retrofit existing buildings, infrastructure, and transportation networks. On the other hand, because most of this urban growth will be in developing countries, there is the risk that lack of political will, coupled with limited institutional and financial capacity, will result in low-efficiency buildings and infrastructure and urban sprawl.

As noted in the AR5, thousands of cities are undertaking climate action plans, raising the issue of what kind of GHG emissions cities can actually control. According to the U.S. Energy Information Agency (EIA), the factors that contribute to statewide per-capita GHG emissions (and thus impact urban GHG emissions) include climate (significant cold or hot weather results in more energy-related emissions in urban areas), the structure of the state economy (energy-producing economies are more carbon-intensive), population density, energy sources, building standards, and explicit state policies to reduce emissions.

With regard to these factors, cities have little control over their baseline climate, although planners of new cities can attempt to concentrate development in more moderate regions. Cities have some but not significant control over whether they build their economies on energy production or on non-energy-producing activities such as finance, higher education, or high-tech industries. Energy-producing economies are tied to the physical location of energy resources, which means cities near energy resources will generally base their economies on development of those resources, leading to greater GHG emissions. But cities can choose to focus on other economic drivers, such as high-tech or higher education, if they create the amenities to draw the target companies and workers to those cities. Pittsburgh, Pennsylvania, is an example of a city that has

61. IPCC, AR5, MITIGATION OF CLIMATE CHANGE, ch. 12: Human Settlements, Infrastructure, and Spatial Planning 7 (2014) [hereinafter IPCC, MITIGATION OF CLIMATE CHANGE]; WGIII: SUMMARY FOR POLICYMAKERS, *supra* note 2, at 26.

62. WGIII: SUMMARY FOR POLICYMAKERS, *supra* note 2, at 27.

63. IPCC, MITIGATION OF CLIMATE CHANGE, ch. 12, at 6.

64. *Id.* at 7.

65. *Id.* at 4.

66. *Id.*

67. *Id.* at 7.

made a significant effort in recent decades to transition from an energy-intensive economy (coal mining and steel manufacturing) to one based on higher education, medicine, and high-tech industries.

Cities also have some, and increasingly significant, control over the energy sources they use for heating and electricity. Although state public utility commissions and state legislatures make many of the primary decisions regarding energy use in the state, cities are increasingly choosing to limit their use of coal and other fossil fuels and to shift their energy uses to natural gas and renewable energy. Chicago, Illinois, is an example of a city that has made a policy choice to reduce coal in its electricity mix and rely much more heavily on renewable energy by promoting an “electric aggregation” program, whereby it enters into long-term power purchase agreements with electricity suppliers on behalf of its citizens. By negotiating a new price for all of its residents under one contract, Chicago can use its bargaining power to lower electricity rates and/or demand certain types of generation like wind, solar, and natural gas and eliminate or reduce reliance on coal.

Cities have even more control over building efficiencies, density, and mass transit, all of which have significant impacts on urban GHG emissions. While it is difficult to make major changes to existing building efficiency, transportation infrastructure, and density because such investments are prone to “lock-in” of energy and emissions pathways, many European and Asian cities and even some U.S. cities that have a long history of high density and excellent mass transit are good examples for future urban development.

But many city efforts in this area have focused on the energy efficiency of buildings. This is not surprising as buildings are a major contributor to GHG emissions and a source of such emissions over which cities have significant control. In the United States, buildings account for 39% of total energy use and 68% of electricity use. As a result, increasing the efficiency of electricity use in buildings has the potential to reduce overall energy use, leading to decreased energy costs, reduced need to build more power plants, greater energy security, and significant environmental protection benefits. The consulting firm McKinsey & Company estimates that \$520 billion invested in non-transportation energy efficiency in the United States by 2020 could generate energy savings worth over \$1.2 trillion, reduce end-use energy demand by 23% of current projections, and as a co-benefit provide over 1.1 billion tons of GHG reductions.⁶⁸ On a global scale, of course, these benefits multiply exponentially.

U.S. cities are beginning to enact innovative policies to “benchmark” commercial buildings by collecting, disclosing, and analyzing building energy consumption data. With such data, cities can encourage market transactions that allow more efficient buildings to benefit, shape energy-efficient behavior of building owners, and learn from that

data to shape future city policies and guide building construction policies in the new cities that will inevitably result from the urbanization of the world’s population.

The cities of Austin, Texas; Minneapolis, Minnesota; New York City; Seattle, Washington; and Washington, D.C., all impose some form of benchmarking requirements on commercial buildings and mandate some information disclosure to local governments or prospective buyers to increase demand for energy-efficient buildings. Nevertheless, even though this is one area where cities have significant regulatory authority, barriers to collecting such data as a result of public utility privacy policies and sometimes state public utility commission privacy policies make the data collection difficult. For instance, some public utilities do not provide such data in a uniform format that can be easily analyzed by customers or third parties. State privacy laws also can pose a barrier to accessible energy consumption data because they direct the utilities to disclose such data only in highly aggregated form that makes it difficult for third-party energy-efficiency providers or policy-makers to determine trends, recommend energy-efficiency improvements, or otherwise analyze the data for research or consulting purposes. Some states, such as California, are in the process of developing rules to balance any privacy interests in energy consumption data with the need to make such data available to shape energy-efficiency policies and allow cities to make GHG reductions in their building stock. But most states have no policies in place at all and thus are limiting the ability of cities to engage in GHG mitigation in the areas in which they would otherwise have the most authority to act.

In sum, cities will play an increasingly significant role in contributing to worldwide GHG emissions, but also have the potential to make major contributions to GHG mitigation efforts with the right policies in place. In order to realize that potential, however, cities must be given the tools to collect, analyze, and use energy consumption data to improve building efficiency. If cities are able to make strides in this area, their research and policies can serve as models for the cities of the future.

IX. Urban Community Collaborative

This section was authored by Jonathan Rosenbloom, Associate Professor of Law, Drake University Law School.

Working Group II, discussing impacts, adaptation, and vulnerability, makes the following empirical claim:

Coordinated support from higher levels of governments, the private sector and civil society and horizontal learning through networks of cities and practitioners benefits urban adaptation (*medium confidence based on medium agreement, medium evidence*).⁶⁹

Unfortunately, Working Group II (and the other Working Groups) provided little detail as to what it envisioned as “horizontal learning” or a “network of cities” and how

68. MCKINSEY & CO., UNLOCKING ENERGY EFFICIENCY IN THE U.S. ECONOMY iii (July 2009).

69. WGII AR5, *supra* note 32, ch. 8.

they may benefit urban adaptation. Working Group II also omitted this statement from its Summary for Policymakers.

Because I interpret the statement as referring, in part, to self-coordinated collective action among urban communities throughout the world, and because I believe an urban community collaborative has the potential to be a powerful and realistic alternative in mitigating and adapting to climate change, this section considers what an urban community collaborative could look like and the potential it holds. My hope is that the IPCC continues to increase its recognition of urban centers and the cumulative impact they may have when collaborating to reduce GHG emissions. As part of this, the IPCC should include the statement above or a similar one pertaining to self-coordinated collective action among urban communities in its future reports and, at a minimum, discuss the possibilities and challenges of an urban community collaborative.⁷⁰

The AR5 reiterates many facts that indicate the importance and relevance of urban areas in the debate on climate change, including continued population growth and continued increase in the amount of emissions originating from urban areas. The Report notes the need for cities to mitigate and adapt to climate changing conditions,⁷¹ while also noting significant obstacles to achieving adaptation or mitigation, including a lack of local resources.⁷²

From an urban governance perspective, bridging the gap between action on climate change and the making of day-to-day policies at the local level is as complex as it is critical to reducing GHG emissions. Bridging this gap includes overcoming deficiencies in financial and human capital, lack of information concerning the challenges and possible solutions, and other operational and legal obstacles. For example, there are likely few local governments that have the time or resources necessary to analyze the IPCC's Report and ponder adequate responses to it. Even if a local government had the time and resources, it would be inefficient for thousands of local governments to research and draft policies when many of those local governments are confronting similar challenges that can be addressed with similar solutions.

One way to help move from the Report to implementation at the local level is through an urban community collaborative in which local governments horizontally coordinate and agree to enact coordinated, legally bind-

ing policies to reduce GHG emissions. These policies could go far beyond the climate action reports mentioned by the IPCC. They could include a diverse and detailed array of local functions ranging from local procurement policies to school lunch programs to zoning and building codes. Reviewing the many aspects of local governance that affect GHG emissions and reconsidering how to amend policies to lower emissions across functions is a gargantuan task. However, if that task is spread among the thousands of local governments, it may not only be more manageable to a single local government, but it also may be more efficient and help expedite the reduction of GHG emissions.

There are several groups collaborating around local governments that work to facilitate a reduction in GHG emissions, including the U.S. Conference of Mayors Climate Protection Agreement,⁷³ C40 Cities Climate Leadership Group,⁷⁴ United Cities & Local Governments,⁷⁵ and ICLEI-Local Governments for Sustainability.⁷⁶ None of these, however, place binding obligations on local governments or have enforcement mechanisms. They are predominantly focused on voluntarily sharing best practices and information on climate change. While obviously helpful in moving cities forward, it is not surprising that the IPCC found that "[t]housands of Cities are undertaking climate action plans, but their aggregate impact on urban emissions is uncertain (*robust evidence, high agreement*)."⁷⁷

While a successful urban community collaborative could take many forms, at a minimum, it would likely require local governments to have: (1) *legal authority* at the international, national, and subnational levels to enter into an urban community collaborative; (2) *recognition of an affirmative obligation* to mitigate climate change that cannot be abrogated by higher levels of authority (international, national, and subnational); and (3) the *political will* to set binding obligations and to enforce standards to reduce free-riding and minimize leakage.

There are no doubt legal, political, and logistical challenges to each of these three (not the least of which involves national sovereignty and legal supremacy). And I understand the significance of the matching principle and the virtues of having an international body address a global issue such as climate change. But if the international community is unable to act and there is a willingness among local governments to act, then why not allow them to do so? Even if the international community is able to act, having both cities and nations work to lower GHG emissions

70. The IPCC's *Synthesis Report of the Fifth Assessment Report* devotes an entire section to subnational action on climate change (4.4.2), although it only gives a passing mention to subnational collaborations in Section 4.4.2.2:

Sub-national climate policies are increasingly prevalent, both in countries with national policies and in those without. These policies include state and provincial climate plans combining market, regulatory and information instruments, and sub-national cap-and-trade systems. In addition, transnational cooperation has arisen among sub-national actors, notably among institutional investors, NGOs seeking to govern carbon offset markets, and networks of cities seeking to collaborate in generating low-carbon urban development. [13.5.2, 15.2.4, 15.8]

71. *Id.* at 3 ("Action in urban centres is essential to successful global climate change adaptation"); WGIII AR5, *supra* note 18, ch. 4 (noting the importance of "bottom-up approaches, engaging participation of diverse countries and actors, creating procedurally equitable forms of decentralization").

72. WGII AR5, *supra* note 32, ch. 8 at 4-6.

73. U.S. CONFERENCE OF MAYORS, *Climate Protection Agreement*, <http://www.usmayors.org/climateprotection/agreement.htm> (last visited Oct. 20, 2014).

74. C40 CITIES CLIMATE LEADERSHIP GROUP, *C40*, <http://www.c40.org/> (last visited Oct. 20, 2014).

75. UNITED CITIES & LOCAL GOVERNMENTS, *Global Network of Cities, Local and Regional Governments*, <http://www.uclg.org/en/organisation/about> (last visited Oct. 20, 2014).

76. ICLEI GLOBAL-LOCAL GOVERNMENTS FOR SUSTAINABILITY, *Sustainable City*, <http://www.iclei.org/our-activities/our-agendas/sustainable-city.html> (last visited Oct. 20, 2014).

77. WGIII: SUMMARY FOR POLICYMAKERS, *supra* note 2, at 7.

and climate change impacts would be a positive and more-comprehensive approach.

On the one hand, urban areas, as large global emitters that may be fractured and divided, represent a massive tragedy of the commons collective action problem. On the other hand, they represent an enormous opportunity to self-coordinate⁷⁸ and sustainably manage their GHG emissions. A collaborative of only the 20 largest cities by population, for example, would represent more people than any other country, except China, India, and the United States.

As the IPCC notes, there are numerous local governments individually taking steps to mitigate climate change. It is not enough for the international, national, and subnational governments to verbally (and, at times, financially) support local efforts. They need to provide local governments with the legal authority to collaborate and to multijurisdictionally regulate climate change. Without some type of sharing of resources and coordinated efforts, it seems too large of a task to ask thousands of urban areas to translate the AR5 report into local action. While not all cities are willing or prepared to address climate change, those that are willing or prepared represent an untapped opportunity to reduce GHG emissions. The international community should make it a priority for these cities to horizontally coordinate to sustainably manage the climate change challenges they are facing.

X. Big Box Resiliency: U.S. Suburbs and Climate Change

This section was authored by Sarah Adams-Schoen, Assistant Professor of Law at Touro College Jacob D. Fuchsberg Law Center and Director of the Institute on Land Use & Sustainable Development Law.

Working Group II's Summary for Policymakers includes the following empirical claims:

Impacts from recent climate-related extremes, such as heat waves, droughts, floods, cyclones, and wildfires, reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability (very high confidence). Impacts of such climate-related extremes include alteration of ecosystems, disruption of food production and water supply, damage to infrastructure and settlements, morbidity and mortality, and consequences for mental health and human well-being. For countries at all levels of development, these impacts are consistent with a significant lack of preparedness for current climate variability in some sectors.⁷⁹

In North America, governments are engaging in incremental adaptation assessment and planning, particularly at the municipal level. Some proactive adaptation is occur-

ring to protect longer-term investments in energy and public infrastructure.⁸⁰

These statements hint at a failure across all levels of government in the United States—specifically, a significant gap between vulnerabilities and preparedness. Although the Summary for Policymakers recognizes the greater efforts of U.S. municipal governments, as compared to federal and state governments, U.S. municipalities still lag behind their counterparts throughout the world.

Living on Long Island, New York—home to the first planned suburb—I am reminded that suburbs pose their own challenges with respect to climate change. Although the distinct characteristics of suburbs may be appropriately outside the purview of the IPCC,⁸¹ recognizing these characteristics, and the legal context within which they occur, is essential for effective preparedness in the United States. In this country, the majority of the population resides in suburbs, suburbs have a higher per-capita carbon footprint than urban areas, and suburbs are less likely to take action on climate change.⁸²

Suburban communities need encouragement and support to assess their climate vulnerabilities, plan and implement adaptation and mitigation strategies, and, in some cases, expand their current efforts beyond building and vehicle initiatives to land use and planning measures.⁸³ As one commentator has noted, “[S]o far, climate action has extended slowly to suburbia. Central cities in smart growth states have taken on climate change, but vast swaths of metropolitan suburbia continue to reproduce a political geography of local free-riding.”⁸⁴

The AR5 highlights the importance of “city and municipal governments acting now to incorporate climate change adaptation into their development plans and policies and infrastructure investments,”⁸⁵ characterizing “[a]ction in urban centres [as] essential to successful global climate change adaptation.”⁸⁶ Additionally, the AR5 finds that “[u]rban adaptation action that delivers mitigation co-benefits is a powerful, resource-efficient means to address climate change and to realize sustainable development goals (*medium confidence based on high agreement, medium evidence*).”⁸⁷ The role of urban areas, including their suburbs, “includes not only building [a] foundation of resilience . . . but also mobilizing new resources, adjusting

78. See ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION (1990).

79. WGII SUMMARY FOR POLICYMAKERS, *supra* note 28, at 6 (footnote omitted).

80. *Id.* at 8.

81. As used in the AR5, the term “urban” appears to encompass suburbs. See WGII AR5, *supra* note 32, ch. 8 at 6, available at <http://www.ipcc.ch/report/ar5/wg2/>.

82. John R. Nolon, *The Land Use Stabilization Wedge Strategy: Shifting Ground to Mitigate Climate Change*, 34 WM. & MARY ENVTL. L. & POL’Y REV. 1, 3-4 (2009).

83. Hari M. Osofsky, *Suburban Climate Change Efforts: Possibilities for Small and Nimble Cities Participating in State, Regional, National, and International Networks*, 22 CORNELL J.L. & PUB. POL’Y 395, 440 (2012).

84. Yonn Dierwechter, *Metropolitan Geographies of U.S. Climate Action: Cities, Suburbs, and the Local Divide in Global Responsibilities*, 12 J. ENVTL. POL’Y & PLAN. 59, 79 (2010); Osofsky, *supra* note 83.

85. WGII AR5, *supra* note 32, ch. 8 at 6.

86. *Id.* at 3.

87. *Id.*

building and land-use regulations and continuously developing the local capacity to respond.”⁸⁸

Despite this critical role, climate adaptation planning appears to be a lower priority in the United States than just about anywhere else.⁸⁹ According to a survey administered in 2011, the United States has the lowest percentage of cities pursuing adaptation planning out of all regions surveyed (59%), while Latin American and Canadian cities have the highest (95% and 92%, respectively).⁹⁰ The United States also has the lowest percentage of cities that have completed an assessment of their vulnerabilities and risks (13%).⁹¹

Local governments throughout the United States need more federal and state support.⁹² State law delegates much of the authority relevant to climate change adaptation and mitigation to municipal governments, and yet state and federal policy fails to support local governments in this role through adequate funding and technical support.⁹³

To provide adequate guidance and support to local communities, state and federal governments need to take into consideration the context of those communities. Indeed, the Summary for Policymakers found that “[a]daptation is place- and context-specific, with no single approach for reducing risks appropriate across all settings (*high confidence*).”⁹⁴ Moreover, effective adaptation planning and implementation, as well as mitigation, may benefit from recognizing not only that suburbs are distinct from urban cores, but also that different types of suburbs exist, each of which present distinct challenges and opportunities for building community resilience.⁹⁵

We have an opportunity now to create communities that are resilient to climate-related risks, and that provide mitigation co-benefits. Sixty-six percent of the buildings in existence by the year 2050 will be built between now and then.⁹⁶ By 2040, the United States is projected to add 93 million new homes to accommodate its rapidly growing population. Based on current trends, most of these homes will be single-family homes that are significantly less energy-efficient than their multifamily counterparts; and, based on current planning practices, the occupants of

these single-family homes will continue to commute by car to work, play, and shop.⁹⁷

It is therefore crucial that local, state, and federal governments act now to assess the role of suburbs in climate change adaptation and mitigation, and support these entities in their development of adaptation plans, policies, and infrastructure investments. Otherwise, we are likely to see, at best, the continued “incremental adaptation assessment and planning”⁹⁸ with little implementation observed in the Summary for Policymakers, and, at worst, maladaptive changes in suburban infrastructure and land uses.

XI. The Bottom-Up Climate Consensus

This section was authored by Stephen R. Miller, Associate Professor, University of Idaho College of Law.

Working Group III’s Summary for Policymakers includes the following empirical claim:

The largest mitigation opportunities with respect to human settlements are in rapidly urbanizing areas where urban form and infrastructure are not locked in, but where there are often limited governance, technical, financial, and institutional capacities.⁹⁹

The IPCC is comprehensive in its scope and conclusive in its evidence for climate change. Why, then, has the AR5 failed to be persuasive and, in fact, has seemed to spark a counteroffensive against the idea of climate change generally? The backlash is a many-headed hydra, but at the local level, its growth is manifest in anti-Agenda 21 screeds increasingly heard against local climate action plans in town halls across the United States. It is easy to write off the climate change backlash as either political posturing or ignorance. That would be a mistake; engagement is necessary. What the IPCC process needs now is not more science to prove climate change exists; rather, it needs an approach to planning for climate change that builds consensus and engages diverse stakeholders at the local level where development decisions are made.

While state and federal laws have, within the last few decades, increasingly limited local control, cities still make the lion’s share of choices over the shape of development in the United States. This decentralization of land use decisionmaking is especially important in understanding consensus and climate change: If there is no consensus to address climate change in these decentralized land use decisions, then it will be very difficult for the country as a whole to achieve a viable climate policy.

A brief review of the rise of cities makes their importance clear.¹⁰⁰ Around 2010, more than one-half of the

88. *Id.* at 6.

89. JoAnn Carmin et al., ICLEI USA-Local Governments for Sustainability, *Progress and Challenges in Urban Climate Adaptation Planning: Results of a Global Survey* (2012), available at <http://www.icleiusa.org/action-center/learn-from-others/progress-and-challenges-in-urban-climate-adaptation-planning-results-of-a-global-survey>.

90. *Id.* at 14.

91. *Id.* at 10.

92. *Id.* at 24.

93. See John R. Nolon, *Climate Change and Sustainable Development: The Quest for Green Communities—Part II*, 61 PLANNING & ENVTL. L. No. 11, p. 3 (2009); but see New York Community Risk and Resiliency Act, Ch. 355, N.Y. Laws of 2014 (directing state agencies to prepare model municipal laws taking into consideration sea-level rise and other climate-related events and “develop additional guidance on the use of resiliency measures that utilize natural resources and natural processes to reduce risk”).

94. WGII SUMMARY FOR POLICYMAKERS, *supra* note 28, at 25.

95. See Osofsky, *supra* note 83; Russell Lopez, *Urban Sprawl in the United States: 1970-2010*, 7 CITIES & THE ENV’T (CATE), art. 7 (2014), available at <http://digitalcommons.lmu.edu/cate/vol7/iss1/7>.

96. Nolon, *supra* note 82, at 6.

97. See *id.*; Lopez, *supra* note 95.

98. WGII SUMMARY FOR POLICYMAKERS, *supra* note 28, at 8.

99. WGIII SUMMARY FOR POLICYMAKERS, *supra* note 2, at §4.2.5.

100. See also Stephen R. Miller, *The Sustainable, Inevitably Exploding City*, in Michael Burger et al., *Rethinking Sustainability to Meet the Climate Change Challenge*, 43 ELR 10342, 10346 (Apr. 2013); *Boundaries of Nature and the American City*, in ENVIRONMENTAL LAW AND CONTRASTING IDEAS OF NATURE: A CONSTRUCTIVIST APPROACH (Keith Hirokawa ed., 2014); *Sustainable Cities of Tomorrow: A Land Use Response to Climate Change*, in

world's population was living in cities; by 2050, 70% of the world's population will live in cities. The world is expected to add over 2 billion new people to the planet by 2050, which is the equivalent of building a new city of 1.4 million every week through the mid-century mark. Existing cities in industrialized nations, such as the United States, have "locked in" high energy use through high-energy infrastructure. The best chance of reducing GHG emission growth is for future cities in both industrialized and developing countries to build a low-carbon infrastructure.

This infrastructure imperative is both an unprecedented opportunity and an unprecedented challenge. It is an opportunity because, if we get city planning right in the 21st century, we can have great places to live while at the same time mitigating and adapting to climate change. It is a challenge because the places where people are increasingly moving, in industrialized nations, are cities that are specifically seeking to grow economically by permitting inexpensive but high-GHG lifestyles. (In developing nations, not discussed here, different urbanization patterns arise, but also necessitate greater local consensus.)

Consider the complexity of consensus-building among cities in the United States. According to the last census, the two fastest growing regions of the country were the mountain West and the South. These are also states and cities that are deliberately luring in residents through policies promoting cheap living through easy, and largely unregulated, housing development. Such states and cities are equally luring businesses through concerted deregulation and economic incentives from the Northeast, western coastal states, and the industrial Midwest. The approach has proven remarkably successful in terms of short-term economic growth. The poster child for this approach is Texas, which has one of the fastest growing economies, but also spends \$0.514 of every state dollar on economic development incentives to businesses, according to a *New York Times* study.¹⁰¹ In other words, the prospect of states like Texas, and most of the South and the mountain West, depends upon providing an alternative to the regulatory strictures of places taking climate change seriously. The current economic strategy of such locations is deliberately to welcome climate change regulation refugees.

Meaningful climate change consensus, then, requires a consensus among decentralized decisionmakers, such as states and cities, that climate change does matter and, accordingly, skirting regulation cannot be used as an economic development tool. That will be a tough challenge. Finding consensus on climate policy is not easy even in progressive bastions. Take, for instance, the San Francisco region's Plan Bay Area, arguably the country's most important effort to link land use and transportation planning to reduce climate change. The plan is the subject of four lawsuits by environmentalists, environmental justice advo-

cates, "post-sustainability" anti-Agenda 21 groups, and a local real estate lobby. Thus, even with consensus on climate change's existence, there is difficulty in building consensus on the implementation of climate change planning and adaptation.

To address climate change, places like the American South and mountain West must want to build cities that are resource-efficient. Even in progressive locales like San Francisco, implications of climate change policy must be more forthcoming. Consensus-building must focus on detailing the day-to-day efforts necessary to mitigate and adapt to climate change. Facilitating local consensus on climate change has not been undertaken by the IPCC in any meaningful way. The IPCC reports acknowledge this deficiency to some extent. Buried deep in the Working Group II report is a call for "engaging stakeholders" in the process of climate change decisionmaking.¹⁰² However, as an indicator of the failure to engage, the section notes a recent study finding that only 40% of vulnerability mapping exercises included stakeholder participation, which "rais[ed] questions about the legitimacy and salience of contemporary approaches" to climate change planning.¹⁰³

If we are to build or rebuild cities to benefit the climate, we must start the planning process with stakeholders' daily lives and daily choices. The global impacts of small sacrifices must be clear; people need a vision of what it means to live a life that saves the planet in their own community. It is on the basis of those facts that consensus can be built, not just at the federal level, but also in town halls where development decisions are made. The IPCC has historically been a document of collective scientific *reportage*. What is needed now is a bottom-up component to the process, one in which individuals acting locally understand the climate implications of local actions.

When Georges-Eugène Haussmann was cutting imperial boulevards through Paris' medieval core, Charles Baudelaire wrote with solace, "The form of a city changes faster, alas, than the human heart." As our cities, and our climate, now change even faster than our hearts, we must find paths to consensus—locally, nationally, and internationally—that work politically from the bottom up and give all of us a reason to forsake immediate gains in favor of a better life for generations to come.

XII. Protecting Habitat on the Move

This section was authored by Jessica Owley, Associate Professor, SUNY Buffalo Law School.

Working Group II's Summary for Policymakers makes the following empirical claims:

Many terrestrial, freshwater, and marine species have shifted their geographic ranges, seasonal activities, migration patterns, abundances, and species interactions in response to ongoing climate change (*high confidence*).

RETHINKING SUSTAINABLE DEVELOPMENT TO MEET THE CLIMATE CHANGE CHALLENGE (Jessica Owley & Keith Hirokawa eds., forthcoming 2015).

101. Louise Story et al., *Explore Government Subsidies*, N.Y. TIMES (2012), http://www.nytimes.com/interactive/2012/12/01/us/government-incentives.html?_r=0#TX.

102. WGII AR5, *supra* note 32, at §8.4.2.1.

103. *Id.*

While only a few recent species extinctions have been attributed as yet to climate change (*high confidence*), natural global climate change at rates slower than current anthropogenic climate change caused significant ecosystem shifts and species extinctions during the past millions of years (*high confidence*).¹⁰⁴

These most recent findings of the IPCC confirm something that conservation biologists and other scientists have already been observing and writing about for years: Climate change means landscape change. As the world warms and sea level rises, ecosystems will both shift and reconfigure. The AR5 designates this at its highest confidence level, stating that change has already occurred (and will continue to occur) and it will do so in virtually every type of landscape: terrestrial; freshwater; and marine life. As climate change results in changed landscapes, our strategies for how we interact and behave on the land has no choice but to shift as well. In particular, this section focuses on what this means for land conservation and goals of protecting specific endangered species or ecosystems.

Current land conservation policies focus on static programs that assume land conserved today should be conserved in the future, and that the same conservation goals will be met across time scales. Little attention has been paid to how changes to the landscape will affect the priorities of conserved land or how land management processes or land conservation strategies will need to change in response to changes on the land. For example, a 2011 survey of 73 land conservation organizations (both nonprofit organizations and government agencies) across the United States that use conservation easements as a land protection mechanism found that while most organizations agreed that climate change was likely to impact not only their region, but also their conservation efforts, few had taken or even planned to take active measures to respond to the likely changes.¹⁰⁵ Indeed, the private land conservation movement has been dominated by the use of perpetual property tools that set the status quo as the conservation goal in perpetuity with few mechanisms to revisit that goal or to consider whether the current makeup of the land will be either possible or desirable as climate change shifts landscapes.¹⁰⁶

The AR5 report discusses the benefit of different types of land uses (suggesting that certain types of development might be more harmful or that forestry could be a good thing if done right), but does not go so far as to discuss the legal mechanisms being used to protect and promote specific land uses.¹⁰⁷ In the United States, conservation easements have become the favored tool for private land protection. That trend is slowly spreading to other

regions of the world, including other common-law countries like Australia and Canada, where property law tools are already similar to those in the United States, as well as places with other legal traditions like Latin America and Africa. Indeed, conservation easements are often the cornerstone of key climate change policies, such as the U.N. collaborative initiative REDD (Reducing Emissions From Deforestation and Forest Degradation), or sustainable agriculture, where property agreements such as conservation easements and other servitudes burden the land, requiring adherence to certain environmental standards.¹⁰⁸ In fact, conservation easements may be seen as a way to ensure that carbon sequestration gains are realized (for example, preventing forests from being cut down by subsequent landowners or prohibiting farmers from abandoning agricultural practices).¹⁰⁹

Conservation easements, however, may be particularly ill-suited to a changing world without undergoing some changes themselves. Generally, a conservation easement defines today's use of the land and requires perpetuation of that use. Instead, conservation easements should adopt adaptive management principles and create mechanisms that allow for things that might sound radical, such as changing management provisions or even possibly moving protected areas to follow species migrations.¹¹⁰ In some cases, a simple change may be to convert perpetual conservation easements to term agreements that look more like conservation leases. This could allow conservation organizations to continually assess the conservation value of protecting the property and consider shifting levels of encumbrance on landowner activities.

In addition, land conservationists need to recognize not only that conservation easements are not the only tool presently in their tool box, but also that they need to work on adding tools to that kit. The current embrace and growth of conservation easements demonstrates the possibility for developing new public and private tools to meet community land-protection needs. Already, groups are experimenting with (and scholars are beginning to write about) using options differently, making payments for protection of ecosystem services, and exploring uses of endowments or annuities for land protection.¹¹¹

Moreover, private contract- and payment-based tools will likely prove inadequate on their own. Regulatory prohibitions on harmful activities are needed to meet goals of both mitigation and adaptation.¹¹² For example, state legislatures and courts could begin by acknowledging the idea

104. WGII SUMMARY FOR POLICYMAKERS, *supra* note 28, at 4.

105. See Adena R. Rissman et al., *Adapting Conservation Easements to Climate Change*, CONSERVATION LETTERS (2014), available at <http://onlinelibrary.wiley.com/doi/10.1111/conl.12099/abstract;jsessionid=0B9D2389ABE776F762C692BD52885EB8.f04t03?deniedAccessCustomisedMessage=&useIsAuthenticated=false>.

106. See ADENA R. RISSMAN ET AL., PRIVATE LAND CONSERVATION & CLIMATE CHANGE: RETHINKING STRATEGIES & TOOLS (forthcoming 2015).

107. See generally WGII SUMMARY FOR POLICYMAKERS, *supra* note 28.

108. See Alain Karsenty et al., "Carbon Rights," REDD+, and Payments for Environmental Services, 35 ENVTL. SCI. & POL'Y 20 (2014).

109. See Steven Ruddell et al., *The Role for Sustainably Managed Forests in Climate Change Mitigation*, 105 J. FORESTRY 314 (2007); James L. Olmsted, *Carbon Dinting: Latent Ancillary Rights to Carbon Offsets in Conservation Easements*, 29 J. LAND RESOURCES & ENVTL. L. 121 (2009).

110. See Jesse J. Richardson Jr., *Conservation Easements and Adaptive Management*, 3 SEA GRANT L. & POL'Y J. 31 (2010); Adena R. Rissman et al., *Conservation Easements: Biodiversity Protect and Private Use*, 21 CONSERVATION BIOLOGY 709 (2007).

111. See, e.g., RISSMAN ET AL., *supra* note 106.

112. See W. Neil Adger et al., *Successful Adaptation to Climate Change Across Scales*, 15 GLOBAL ENVTL. CHANGE 77 (2005); Richard J. Lazarus, *Super*

of rolling easements along coastlines where protected areas shift as sea levels rise, even if this will mean loss of private land.¹¹³ While the public trust doctrine protects these areas in theory, many governments are too nervous about potential constitutional Takings Clause claims to disrupt private property owners' expectations (whether those expectations are reasonable or not). Our culture is so busy worshipping at the altar of private property rights that we are likely to degrade, or even destroy, the very idol sitting before us.

XIII. Law Confronts the Intertwined Threats of Climate Change and Species Extinction

This section was authored by David Takacs, Associate Professor of Law, University of California, Hastings College of the Law.

We share the Earth with millions of gorgeous species, the current, ephemeral expressions of over 3 billion years of biological evolution. All species are cogs in functioning ecosystems that support all life. All humans require a diversity of species to feed, heal, and inspire us. With "high confidence," Working Group III's Summary for Policymakers asserts that "[a] large fraction of both terrestrial and freshwater species faces increased extinction risk under projected climate change during and beyond the 21st century, especially as climate change interacts with other stressors, such as habitat modification, over-exploitation, pollution, and invasive species."¹¹⁴ The Summary further notes that "[m]any species will be unable to track suitable climates under mid- and high-range rates of climate change."¹¹⁵ That is to say, continued evolution in the face of a most unnatural selection is unlikely for most species, and thus "[t]hose that cannot adapt sufficiently fast will go extinct in part or all of their ranges."¹¹⁶

Temperatures will rise, droughts will exacerbate, storms will intensify, pests will spread, pollinators will go extinct or lose synchronicity with the plants they pollinate, and all the while, human populations will be expanding and on the move, exploiting more of the ecosystems upon which all human life depends. Through the alchemy of photosynthesis, terrestrial ecosystems absorb about one-quarter of human CO₂ emissions; deforestation disrupts this vital ecosystem service and currently accounts for about 15-20% of GHG emissions. So, as climate change and human needs degrade natural ecosystems—as plants are felled, burned, or eaten; as tundra melts; as peat bogs desiccate—climate change worsens, further imperiling species and ecosystems.

Paying attention to the twinned threats of climate change and species extinction requires ingenuity, cash, and nimble legal mechanisms. Two novel solutions—

REDD+ and biodiversity offsetting—comprise *potentially* win-win solutions.

In REDD+, a local community, individual landowner, private developer, or government entity reforests degraded land or preserves a forest that would otherwise be felled. The actor may then sell the stored carbon for a contracted period of time to entities that want to offset their GHG emissions or simply want to preserve forests. REDD+ may happen on a project-by-project basis. Increasingly, however, it is operating on a broader scale: A nation, province, or state uses REDD+ funds to reduce deforestation or promote reforestation in a wide geographic area, resulting in greater stored carbon than would have occurred without the funding.

REDD+ blurs the bounds between global mitigation and local adaptation. REDD+ mitigates climate change when trees retain carbon that deforestation would otherwise release, or if new growth absorbs extra CO₂. Healthy forests help communities adapt to climate change by sustaining ecosystem services—preventing erosion, increasing rainfall, buffering floods, cleansing drinking water, and harboring crop pollinators—and by preserving biodiversity crucial for human survival. REDD+ investments can promote socioeconomic climate change adaptation through new sources of income and by providing for more secure, formal land title. REDD+ may also further institutional adaptation as community leaders, landowners, and government officials develop and manage REDD+ projects and hone skills and institutions to negotiate effectively with project developers and government functionaries.

Biodiversity offsets, in turn, translate the logic of carbon offsetting into something more sweeping. In more than two dozen jurisdictions, developers are being allowed to destroy biodiversity in one place in exchange for protecting biodiversity elsewhere. They are trading life for life. As in REDD+, if biodiversity offsetting works as its backers promise, then it's a win-win situation: Jurisdictions encourage economic development where it is needed and can prioritize preservation where *it* is most effective and beneficial to the species, ecosystems, and human communities of concern.

To fulfill their promise, biodiversity offsets must both mitigate the original damage and enhance the chance for a species to survive. But is life fungible? Let's put aside for the moment the question of whether it is ethically legitimate to harm one biological community (and perhaps harm the human communities that depend upon those communities) in exchange for biological mitigation elsewhere. In the name of preservation of an imperiled species or ecosystem type, conservation *biology* may support offsetting. Given climate change, isolated small preserves may allow species nowhere to go, and static management that does not respond to ecological change may result in local extinctions as well as global ones. Prioritizing fewer, larger reserves (as opposed to scattered, smaller ones) can help preserve greater genetic diversity (and thus a more resilient species response to climate change). Offsetting might

Wicked Problems and Climate Change: Restraining the Present to Liberate the Future, 94 CORNELL L. REV. 1153 (2009).

113. See So-Min Cheong, *Policy Solutions in the U.S.*, 106 CLIMATE CHANGE 57, 61-62 (2011) (describing rolling easements).

114. WGIII SUMMARY FOR POLICYMAKERS, *supra* note 28, at 14-15.

115. *Id.* at 15.

116. *Id.*

also prioritize corridors and connectivity to allow species to migrate to more suitable habitats.

The IPCC notes that governing a transition toward an effective climate response and sustainable development pathway is “a challenge involving rethinking our relation to nature, accounting for multiple generations and interests (including those based on endowments in natural resources), overlapping environmental issues, among actors with widely unequal capacities, resources, and political power, and divergent conceptions of justice.”¹¹⁷ REDD+ and biodiversity offsetting do not change existing societal patterns unless they are done in ways that are transformative: transferring large quantities of wealth from North to South; inventing nimble and flexible uses of land not subject to the strictures of private property or rigid governmental control; fomenting true environmental democracy as communities are empowered to formulate, manage, and reap economic and ecological benefits from REDD+ projects or biodiversity banks, and/or implemented with the most capacious possible interpretation of international human rights law.¹¹⁸

Whether they function effectively in the short term, or lead to genuine transformation in the long run, REDD+, biodiversity offsetting, or any other legal regime to preserve Earth’s myriad species and the humans that depend upon them, must be implemented sustainably and in a deeply equitable way. For REDD+ or biodiversity offsetting to be sustainable, it must be: (1) effective—working for all stakeholders with minimal complication; (2) synergistic—maximizing benefits for climate, biodiversity, and local people; and (3) equitable—narrowing gaps between rich and poor. “Deep equity,” in turn, refers to the laws, policies, and values that promote sustainable pathways acting in synergy to maximize the health and potential of all individuals, communities, and ecosystems. The equity is “deep” because values become rooted within each individual, requiring that we fundamentally envision our community structures and responsibilities and root these values and responsibilities in our legal systems. Our laws and policies would, in turn, support values and actions promoting even deeper equity.

Neither REDD+ nor biodiversity offsetting offers a permanent solution to the species extinction crisis. They are stopgap, emergency legal mechanisms that buy (literally) time for us to transition to a non-hydrocarbon-based economy and for the planet to heal and rebound from heat and chaos. Poorly designed REDD+ projects and biodiversity offsets may facilitate ecologically damaging human development, and may simply accelerate biodiversity loss in the face of climate change, undermining humans’ own options for adaptation and survival. If done well, however, they offer enhanced resilience for local human and non-human communities in the present, bandages to staunch wounds while we find the moxie to address the underlying causes of species extinction.

XIV. Addressing Climate Change Without Talking About Climate Change

This section was authored by Inara Scott, Assistant Professor, College of Business, Oregon State University.

Talking about climate change gets depressing fast. The AR5 does not help. Though the practical reality of the current situation is buried deep in scenarios, options, and complex modeling, the bottom line is that the current rate of emissions will bring global temperature increases in the range of 3.7-4.8°C by 2100,¹¹⁹ a scenario most agree would be “devastating” to human society.¹²⁰ A “4°C world” will experience severe drought, species and habitat extinction, and risk worldwide tipping points with unpredictable future outcomes.¹²¹

Given this dramatic trajectory, why do only 34% of Americans worry “a great deal” about climate change?¹²² One problem may be our cognitive hardwiring. As a species, humans are not good at making long-term decisions and are particularly apt to choose short-term gains over long-term benefits. Also, studies suggest that activism is likely to be driven in part by feelings of efficacy—that is, the more hopeless and dire the situation appears, the less likely people will be to get involved in political advocacy.¹²³ Thus, our attempts to inspire activism by educating people about the enormity of the climate change problem may backfire by making people less likely to become involved in climate activism.

But what is the alternative? What do I suggest for those of us who are deeply concerned about the impacts of climate change, and want to inspire action toward both adaptation and mitigation? Absolutely *not* to ignore, turn back, or stop important research and outreach related to the causes and long-term impacts of climate change. However, as lawyers who are deeply attuned to the power of language and the art of persuasion, I believe we must recognize the harm we may be doing by leading our arguments with the devastating and irreversible effects of climate change, and consider when and where to emphasize positive and realistic strategies for mitigation and adaptation.

The topic of national security provides an excellent backdrop for exploring this concept. Working Group II describes significant risks to human security from climate change, including displacement and migration caused by rising sea levels, loss of arable land, and drought.¹²⁴ Conflicts over scarce resources, including food and water, can

117. WGIII AR5, *supra* note 18, ch. 4 at 4.

118. For a list of articles on this topic, please visit Social Science Research Network, David Takacs’ Scholarly Papers, <http://ssrn.com/author=1393231>.

119. WGIII SUMMARY FOR POLICYMAKERS, *supra* note 2.

120. HANS JOACHIM SCHELLNHUBER ET AL., WORLD BANK, EXECUTIVE SUMMARY, TURN DOWN THE HEAT: WHY A 4 DEGREE CELSIUS WARMER WORLD MUST BE AVOIDED v (2014), <http://documents.worldbank.org/curated/en/2012/11/17485703/turn-down-heat-4-degree-celsius-warmer-world-must-avoided-executive-summary>.

121. *See id.* at 1-2; WGII SUMMARY FOR POLICYMAKERS, *supra* note 28, at 13.

122. Frank Newport, *Americans Show Low Levels of Concern on Global Warming*, GALLUP, Apr. 14, 2014 <http://www.gallup.com/poll/168236/americans-show-low-levels-concern-global-warming.aspx>.

123. Connie Roser-Renouf et al., *The Genesis of Climate Change Activism: From Key Beliefs to Political Action*, 125 CLIMATIC CHANGE 163 (2014).

124. *See* WGII SUMMARY FOR POLICYMAKERS, *supra* note 28, at 20.

exacerbate conflicts between nations and increase instability of governments. Climate change must be considered as a “threat multiplier,” which exacerbates existing conflicts and risks—including the radicalization of tensions between and among ethnic and religious groups and the spread of terrorism.¹²⁵ It takes little imagination to conclude that a hot, arid, water-constrained planet, marked by warring ethnic and religious factions and unstable governments, threatens U.S. interests, both abroad and at home.

Yet, in the area of national security, there is much that can be done toward the twin goals of adaptation and mitigation that is practical and achievable. The U.S. military, the single largest energy consumer in the world,¹²⁶ has a deeply rooted interest in minimizing its dependence on fossil fuels. Meeting the fossil fuel needs of military operations requires constant resupply and fuel delivery, demanding huge amounts of financial and troop resources and putting those working on supply chains at significant risk.¹²⁷ Technological innovation in the areas of energy efficiency, renewable resources, and alternative fuels could reduce military casualties, improve mobility, and minimize vulnerabilities to attack. It could also have profound impacts on global carbon emissions and, as a result, reduce the extent of global warming.¹²⁸ Through congressional and presidential mandates, the U.S. Department of Defense is uniquely positioned among government agencies to invest in renewable energy and energy-efficiency technologies.¹²⁹ However, if the rhetoric for such efforts is based primarily on threats related to climate change, they are vulnerable to (at best) public apathy or (at worst) political stonewalling.¹³⁰

Other political strategies related to improving national security also have the potential for significant climate change mitigation. For example, efforts to prevent deforestation in Indonesia through programs like REDD could help stabilize the fragile Indonesian government—a key U.S. security goal because of the country’s large Muslim population, which could become a threat if it were to

become radicalized.¹³¹ At home, a number of major military installations, including Naval Station Norfolk, are in areas threatened by rising sea levels and storms, which threaten both the military bases and the surrounding communities.¹³² Adaptation to these conditions may require modification of roads, bridges, water systems, and both public and private infrastructure.¹³³ While the long-term impact of climate change is clearly relevant in both cases, “4°C world” scenarios are not necessary to prove the importance and benefit of taking such measures.

The problem of climate change requires a multifaceted approach. The area of national security provides fertile ground for mitigation and adaptation efforts that improve U.S. security and address current vulnerabilities, while also offering significant co-benefits in the fight against global warming. The key to achieving those benefits may lie in an emphasis on practical, achievable, and positive steps to change.

XV. Agnostic Adaptation

This section was authored by Katrina Fischer Kuh, Professor of Law, Associate Dean for Intellectual Life and Hofstra Research Fellow, Maurice A. Deane School of Law.

Working Group II’s Summary for Policymakers makes the following empirical claims:

Adaptation planning and implementation at all levels of governance are contingent on societal values, objectives, and risk perceptions (*high confidence*). Recognition of diverse interests, circumstances, social-cultural contexts, and expectations can benefit decision-making processes. Indigenous, local, and traditional knowledge systems and practices, including indigenous peoples’ holistic view of community and environment, are a major resource for adapting to climate change, but these have not been used consistently in existing adaptation efforts. Integrating such forms of knowledge with existing practices increases the effectiveness of adaptation.

Decision support is most effective when it is sensitive to context and the diversity of decision types, decision processes, and constituencies (*robust evidence, high agreement*). Organizations bridging science and decision making, including climate services, play an important role in the communication, transfer, and development of climate-related knowledge, including translation, engagement, and knowledge exchange (*medium evidence, high agreement*).¹³⁴

Agnostic adaptation means adaptation without the why—the divorce of adaptation from knowledge or acceptance of climate change being humans’ fault. Adaptation is

125. U.S. DEPARTMENT OF DEFENSE, QUADRENNIAL DEFENSE REVIEW 8 (2014), available at http://www.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf; CNA MILITARY ADVISORY BOARD, NATIONAL SECURITY AND THE ACCELERATING RISKS OF CLIMATE CHANGE 2 (2014), available at http://www.cna.org/sites/default/files/MAB_2014.pdf [hereinafter CNA Report].

126. Siddhartha M. Velandy, *The Green Arms Race: Reorienting the Discussions on Climate Change, Energy Policy, and National Security*, 3 HARV. NAT’L SEC. J. 309, 323-28 (2012).

127. See *id.* at 324.

128. Limiting global warming will require significant reductions in fossil fuel consumption. Working Group III notes that scenarios limiting global temperature increases to 2°C include “more rapid improvements in energy efficiency, a tripling to nearly a quadrupling of the share of zero- and low-carbon energy supply from renewables, [and] nuclear energy and fossil energy with carbon dioxide capture and storage (CCS) or bioenergy with CCS.” WGIII SUMMARY FOR POLICYMAKERS, *supra* note 2, at 13.

129. For a thorough discussion of the complex relationship between the military and the environment, and the potential for the military to drive innovation in the energy industry, see Sarah E. Light, *The Military-Environmental Complex*, 55 B.C. L. REV. 879, 907-14 (2014).

130. Climate Science Watch, *House Votes to Direct the Pentagon to Disregard Climate Change Assessments*, June 24, 2014, at <http://www.climate-science-watch.org/2014/06/24/house-votes-to-direct-the-pentagon-to-disregard-climate-change-assessments/>.

131. See JOSHUA W. BUSBY, COUNCIL ON FOREIGN RELATIONS, CLIMATE CHANGE AND NATIONAL SECURITY: AN AGENDA FOR ACTION, CFR No. 32, at 20-21 (2007), available at <http://www.cfr.org/climate-change/climate-change-national-security/p14862>.

132. See CNA Report, *supra* note 125, at 25.

133. See *id.*

134. WGIII SUMMARY FOR POLICYMAKERS, *supra* note 28, at 26.

agnostic when one prepares for or responds to an actual or projected climate change-induced impact (for example, by planting a drought-resistant crop) without acknowledging that the adaptation is probabilistically or in fact necessarily because of anthropogenic climate change (that drought conditions are caused or exacerbated by humans' emissions of CO₂ and other GHGs).

At the individual level, agnostic adaptation is natural and ubiquitous. When it is uncomfortably hot, people turn on air conditioners, flee to the beach, and visit local park sprinklers. Similarly, they gradually and logically update the stock of boots, umbrellas, and coats in their closets to match the weather they have become accustomed to experiencing, most often with nary a thought of climate change. Considering how adaptation policy should approach agnostic adaptation is, however, more difficult. Should our domestic adaptation policy connect adaptation to anthropogenic climate change? Should it tolerate, or even facilitate, agnostic adaptation?

Numerous government policies or programs are purposefully oriented toward preparing for or adjusting to climate change impacts. For example, executive orders direct federal agencies to promote adaptation in various ways, including by preparing agency adaptation plans.¹³⁵ The U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) Climate Change Adaptation Strategy includes the following:

Action 2: FSA will partner with the REE mission area, as well as NGOs, to publicize and/or make available decision support tools at field offices, facilitating their outreach. An example of such a tool to encourage use of seasonal climate information in farm management decisions is Agroclimate, a project of the Southeast Climate Consortium (Agroclimate 2011).¹³⁶

The AgroClimate website provides detailed information to help farmers better manage climate risks, including those associated with climate change, and features climate risk analyses, drought indices, and a cooling/heating degree days calculator.¹³⁷ Although there are a few references to climate change on the website, it is a fair characterization that the site does not emphasize the connection between

anthropogenic causes and the climate change adaptation measures that it advances.¹³⁸ This, then, appears to provide an example of how adaptation policy may tolerate, if not facilitate, agnostic adaptation in some contexts.

The example chosen here, involving the communication of adaptation strategies to farmers in the Southeast, provides a good illustration of possible rationales for incorporating agnostic adaptation into adaptation policy. Many in the United States reject anthropogenic climate change¹³⁹; perhaps agnostic adaptation outreach will make such individuals more receptive to taking adaptive measures. Perhaps, farmers in the Southeast are more likely to use and trust an agricultural adaptation website that downplays anthropogenic climate change, thereby rendering the agnostic adaptation policy more effective.¹⁴⁰ And because the benefits of effective adaptation accrue locally and to individuals, there is ample incentive for individuals and communities to adapt regardless of their beliefs about why there is a need to adapt. Additionally, predictions about the impacts of climate change are uncertain, particularly at the local level. Another possible benefit of agnostic adaptation policy is that it may relieve the burden of ascertaining and communicating connections between anthropogenic climate change and specific on-the-ground impacts, thereby conserving resources for direct adaptation measures.

However, agnostic adaptation policy also raises concerns. Excising anthropogenic climate change information from adaptation outreach, or simply downplaying the connection between the need to adapt and anthropogenic climate change, may undermine mitigation efforts by obscuring a potentially powerful rationale for mitigation policy: the fact that climate change will threaten the individuals who

135. Exec. Order No. 13514, 74 Fed. Reg. 52117 (Oct. 8, 2009). Agencies are also instructed to direct federal funding to support climate resilience and to design and implement "land- and water-related policies, programs, and regulations . . . to make the Nation's watersheds, natural resources, and ecosystems, and the communities and economies that depend on them, more resilient in the face of a changing climate." Exec. Order No. 13653, 78 Fed. Reg. 66819 (Nov. 6, 2013).

136. USDA FARM SERVICE AGENCY CLIMATE CHANGE ADAPTATION STRATEGY 39-40 (2012).

137. AgroClimate, *Tools for Managing Climate Risk in Agriculture*, <http://agroclimate.org/fact-sheets-climate.php> (last visited July 25, 2014). AgroClimate is a product of the Southeast Climate Consortium, a coalition of six universities funded in part by governmental agencies and programs with the mission "to use advances in climate sciences, including improved capabilities to forecast seasonal climate and long-term climate change, to provide scientifically sound information and decision support tools for agricultural ecosystems, forests and other terrestrial ecosystems, and coastal ecosystems of the Southeastern USA." Southeast Climate Consortium, *Mission*, <http://www.seclimate.org/mission.php> (last visited July 25, 2014).

138. A paper that can be downloaded from the site discusses rainfall intensity. A section titled Climate Change Projections states: "Warmer air can hold more water vapor, and if temperatures continue to rise, the projections of future climate suggest there will be continued increases in high-intensity rain events." Southeast Climate Extension, *Rainfall Intensity Changes in the Southeastern U.S.* In a paper titled Climate Trends in the Southeast: Temperature, a section on Causes of Changes in Temperature states: "Most scientists believe that these increases in temperature are due to increases in greenhouse gases, which trap heat near the surface of the earth rather than releasing it back into space." The site also offers a carbon footprint calculator tool indexed to different crops.

139. Gallup Politics, *One in Four in U.S. Are Solidly Skeptical of Global Warming* (Apr. 22, 2014) (presenting the results of detailed polling of American regarding attitudes toward and beliefs about climate change), <http://www.gallup.com/poll/168620/one-four-solidly-skeptical-global-warming.aspx> (last visited July 27, 2014).

140. In a similar fashion, in the mitigation context, a kind of veiled mitigation strategy divorces actions to reduce GHG emissions from climate mitigation by suggesting that individuals be encouraged to reduce energy use or take other measures that will reduce emissions for reasons other than avoiding climate change, such as energy independence or thrift. See Roger A. Pielke Jr., *The Case for a Sustainable Climate Policy: Why Costs and Benefits Must Be Temporally Balanced*, 155 U. PA. L. REV. 1843, 1850 (2007).

Ultimately, motivating local action to mitigate global climate change calls for an indirect strategy, focused on the ways in which emissions-producing activities are embedded in broader community concerns. The primary benefit of an indirect approach is that it avoids many of the political debates about climate change science that have plagued international efforts to address this issue.

are the subject of adaptation outreach.¹⁴¹ Ultimately, mitigation is a necessary part of successful adaptation because our capacity to adapt could be overwhelmed. The question thus becomes whether agnostic adaptation policy is better at promoting adaptation in the long run. This analysis would require weighing any short-term benefit from more effectively spurring adaptive behaviors in skeptical communities against any longer term influence on the pace and scale of mitigation.

As a practical matter, agnostic adaptation outreach may make it more difficult to structure adaptation policy to promote mitigation co-benefits (decrease emissions) and avoid adverse mitigation side effects (increase emissions).¹⁴² It is hard to promote or discourage an adaptive measure in part because it reduces or produces emissions without first acknowledging that emissions contribute to climate change. Agnostic adaptation policy is also somewhat unpalatable from the perspective of international climate justice. Some of the most com-

elling normative claims for the United States to contribute to international adaptation or mitigation efforts rest upon recognition of anthropocentric climate change and the historic and present U.S. contribution of GHG emissions. Agnostic adaptation may enhance our already superior domestic adaptation capacity in a manner that handicaps the development of public and political support for international adaptation assistance.

Ultimately, evaluating agnostic adaptation policy requires resolution of a series of empirical questions that are better-suited to resolution by the social and communication sciences. For example, will adaptation outreach be more effective if it does not attribute the need for adaptation to climate change and/or attribute climate change to human causes, and what effect does coupling adaptation outreach with information about anthropogenic climate change have on attitudes toward mitigation?¹⁴³ We should, however, take care to understand the answers to these questions when contemplating agnostic adaptation policy.

141. CARA PIKE, ADAPTATION COMMUNICATIONS: AN OVERVIEW OF THE RESEARCH AND PRACTICE (2013), <http://epa.gov/statelocalclimate/documents/pdf/2-adaptation-communications-overview-3-21.pdf> (observing that education about climate impacts can increase interest in mitigation and that “[u]nderstanding of adaptation can lead to heightened interest in mitigation but more on the ground examples are needed.”).

142. For a discussion of the need for and benefits of holistic climate change governance considering both mitigation and adaptation, see Katherine Trisolini, *Holistic Climate Change Governance: Towards Mitigation and Adaptation Synthesis*, 85 U. COLO. L. REV. 615 (2014).

143. The site Climate Access compiles research into climate change communication, including with respect to adaptation outreach. Climate Access, Resource Hub, <http://www.climateaccess.org/resource-hub>. An interesting study is Amanda Carrico et al., *Does Learning About Climate Change Adaptation Change Support for Mitigation?*, 41 J. ENVTL. PSYCH. 19 (2014).