

Pace University

DigitalCommons@Pace

Pace Law Faculty Publications

School of Law

2011

Energy Revolution and Disaster Response in the Face of Climate Change

Elizabeth Burleson
Pace Law School

Follow this and additional works at: <https://digitalcommons.pace.edu/lawfaculty>



Part of the [Energy and Utilities Law Commons](#), and the [Environmental Law Commons](#)

Recommended Citation

Elizabeth Burleson, Energy Revolution and Disaster Response in the Face of Climate Change, 22 Vill. Envtl. L.J. 169 (2011)

This Article is brought to you for free and open access by the School of Law at DigitalCommons@Pace. It has been accepted for inclusion in Pace Law Faculty Publications by an authorized administrator of DigitalCommons@Pace. For more information, please contact dheller2@law.pace.edu.

ENERGY REVOLUTION AND DISASTER RESPONSE IN THE FACE OF CLIMATE CHANGE

ELIZABETH BURLESON*

I. INTRODUCTION

Nuclear meltdown in Japan and civil society strife across the Middle East highlight the degree to which resilience is core to international peace and security. Resilience does not need to mean an effort to return to a past point, but rather the ability to effectively cope with adversity.¹ Effective disaster response remains a central concern for the international community. Climate and non-climate disasters alike reek havoc by threatening the safety, and sometimes survival, of states and individuals around the globe.

Energy efficiency, adaptive water management, and disaster-resilient green building are but a few examples of win-win endeavors that both mitigate and enhance communities abilities to adapt to climate instability. Adaptation can be global, regional, national, local, and individual. Moreover, it can be short or long term as well as proactive or reactive. Many adaptation measures encompass significant changes to water and land use. In transitioning to sound energy, water, and climate policies, it is important to recognize the existence of scientific obstacles, political eddies, and the potential role of the legal system in addressing climate change. Like many other international cooperative initiatives, energy consensus has been a deliberative process unable to be accomplished inside a day. Yet, emergency preparedness requires substantive and procedural coordination to harmonize initiatives at various scales of governance.

This article considers the means by which communities can become increasingly resilient through shared best practices across a range of climate change measures. Part II of this article will address emergency preparedness for effective disaster response. Part III will analyze how decision-makers can use adaptive management in a shared local, regional, national, and international cohesive frame-

* Professor Elizabeth Burleson has a L.L.M. from the London School of Economics and a J.D. from the University of Connecticut School of Law. She has written reports for the United Nations and teaches at the Pace Law School.

1. J.B. Ruhl, *Climate Change Adaptation and the Structural Transformation of Environmental Law*, 40 ENVTL. L. 363, 396 (2010) (stating that “ecosystem resilience resides in biodiversity”).

work. Part IV will recommend resilient green building strategies. This article concludes that in the midst of an unprecedented energy revolution, there are meaningful emergency preparedness measures that the international community can facilitate to build resilience in the face of natural and unnatural disasters.

II. EMERGENCY PREPAREDNESS FOR EFFECTIVE DISASTER RESPONSE

Potential threats to human security remain indeterminate in scope and scale but alarming enough to address in a proactive rather than reactive manner. Combining innovative and proven strategies generally, while making room for learning capacity in particular, is important given the uncertainty and complexity that disasters present.² Doing so increases resiliency as individuals and adaptive institutions at all scales have the capacity to respond to unpredictable changes.

In short feedback loops, actors recognize a new event, react, learn, and reflect on the action and unintended consequences. Ongoing monitoring of climate and other disaster triggers facilitates such autonomous change, as do cultures in which innovation is valued.³ Governance impacts the adaptive capacity of institutions, which

determines the space given to social actors to participate creatively in the problem solving process and thereby establish institutions. A governance framework is needed that allows for creativity, innovative behaviour, and the ability to take entrepreneurial risks. Justice, equity, the rule of law and general social stability are also important preconditions for the trust and mutual respect that are necessary for the three central qualities of adaptive institutions. Adaptive institutions emerge from and promote systems of fair governance. This implies that institutions should promote legitimate policy processes, the protec-

2. Katrien Termeer, Robbert Biesbroek, & Margo Van den Brink, *Institutions for Adaption to Climate Change: Comparing National Adaptation Strategies in Europe*, APSA 2009 Toronto Meeting Paper, 4 (2009), available at <http://ssrn.com/abstract=1451808> (detailing meaning of adaptive institutions). An adaptive institution "encourages actors to critically investigate socially embedded meanings, assumptions, knowledge, claims, roles, rules, procedures and identities that are normally taken for granted." *Id.* at 5.

3. See *id.* at 5 (stressing importance of ongoing monitoring).

tion of basic rights and equity, responsiveness and transparency, and accountability.⁴

Maladaptation can result in inadequate responses.

While successful adaptation approaches will vary with local conditions, many adaptation measures are sensible irrespective of climate change. Post-disaster aid is often directed towards reconstruction, which offers opportunities to help people transition to sustainable and safe homes.⁵ Sharing best practices in a way that allows local communities to implement successful strategies can be an important form of capacity building. Such capacity building can come in the form of building training with disaster resilience in mind. Post-disaster rebuilding should also involve local communities and materials.⁶ Given the reality that poor people in developed countries construct their own homes, the international community can facilitate capacity building by providing model homes that emphasize resilience to disasters likely to impact a given region. This effort can combine local traditional knowledge with structural engineering developments to achieve safe, affordable, and sustainable buildings throughout the world. This kind of work is underway in Haiti and could be greatly expanded around the globe.

Adaptation requires a broad perspective on the part of public and private entities seeking to effectively respond to climate change. For instance, mangrove services include storm protection as well as acting as carbon sinks and nurseries for marine life. Yet, rot-resistant wood and space for agriculture, aquaculture, and building are in high demand. Globally, mangrove destruction is four times that of other forests. With one fifth of mangroves destroyed since 1980, there are very real consequences for the stability of fisheries and storm protection.⁷ Recognizing the value of ecosys-

4. *Id.* at 6 (emphasizing that post-disaster aid is often concentrated in reconstruction efforts).

5. Olesya Dmitracova, *Build Well to Save Lives in Disasters, Experts Urge*, REUTERS, Mar. 22, 2010, <http://www.reuters.com/article/2010/03/22/us-aid-disasters-building-idUSTRE62L3DO20100322> (describing simple measures that could be employed to prevent buildings from killing occupants in natural disasters). For example, “[s]hutters on windows will prevent wind from blowing through the building and lifting it off the ground. Tying the roof to the walls will stop it from being blown off.” *Id.*

6. *See id.* (suggesting that local resources should be more involved in rebuilding process).

7. *World’s Mangroves Retreating at Alarming Rate: Study*, REUTERS (July 15, 2010), <http://www.reuters.com/article/2010/07/14/us-world-mangroves-idUSTRE66D28X20100714> (reporting that mangrove forest loss is occurring “at a rate of around 0.7 percent a year by activities such as coastal construction and shrimp farming”).

tem services can help jurisdictions at all scales adapt appropriately. Biodiversity and adaptation are intricately interrelated.⁸

The Dutch Climate Changes Spatial Planning Programme explains that people can learn and share best practices through experimentation with the development of national adaptation strategies that inform one another.⁹ This can involve a transition away from the traditional policymaker inclination to reduce complexity by proposing a single problem frame rather than a dynamic framework to address climate change. Civil society participation, along with scientific and technical expert involvement, can facilitate a dynamic adaptation strategy. The Aarhus Convention has codified a human right to a clean environment, granting citizens access to environmental information, participation in decision-making in environmental matters, and judicial redress.¹⁰ Implementation of the Aarhus Convention in the context of climate change can help overcome the “institutionalized distrust in the problem solving capacity of civil society.”¹¹

As an example of a national adaptation strategy, the Netherlands is considering directing 0.5 percent of its national income to add land to 350 km of the Dutch coast because 16 million citizens are at risk of inundation by storm surges. In the wake of the devastating floods of 1953, the Dutch launched the Delta project that led to the closure of estuaries and higher dikes. A “Delta Fund” would tap natural gas revenues as well as depend upon long-term state

8. *U.N. Urges New Resource Accounting, Cites BP Spill*, REUTERS (July 13, 2010), <http://www.reuters.com/article/2010/07/12/us-biodiversity-idUSTRE66B6X620100712> (describing interrelatedness of biodiversity and adaptation). Good governance experiments to explicitly value biodiversity include payment by municipalities for preserving wetlands and forests. *Id.* In the context of drinking water availability, awareness is spreading that ecosystem services purify water supplies. *Id.* This phenomenon avoided the expense of additional treatment to the tune of \$5 billion globally in 2008. *Id.*

9. Termeer, Biesbroek, & Van den Brink, *supra* note 2, at 19 (analyzing institutional capacity to adapt to climate change).

10. *Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters*, June 25, 1998, 38 I.L.M. 517 (1999) (entered into force Oct. 30, 2001), available at <http://www.unece.org/env/pp/documents/cep43e.pdf> (providing text of so-called “Aarhus Convention”). This convention was negotiated among the member states of the United Nations Economic Commission for Europe. On June 25, 1998, the convention was adopted at a pan-European meeting of environment ministers in Aarhus, Denmark. All of the member states of the European Union and the EU itself were signatories.

11. Termeer, Biesbroek, & Van den Brink, *supra* note 2, at 17 (describing one institutional weakness).

bonds.¹² This funding can facilitate effective responses to drought, heavier rainfall, strong storm surges, and other climate variability by financing “building, upgrading improving, managing and maintaining, and operating water management works with a view to water safety and the freshwater supply.”¹³ Given the high stakes to national security, the Dutch are engineering adaptive management measures.¹⁴

Emergency preparedness requires substantive and procedural coordination to harmonize initiatives at various levels of governance. Dynamic federalism can occur in a manner that allows federalist systems to address climate change.¹⁵ Nascent disaster planning has begun to harmonize the roles of the public sector’s various layers, fleshing out the means by which communities will address human security as climate risks become better understood.¹⁶ An adaptive process informed by new scientific understanding of where and in what manner climate disruptions are likely to occur provides for better planning for potential extreme flooding and heat waves. For instance, local jurisdictions can work with their national partners to update maps in order to reflect the climate impacts for given areas. Current maps are not likely to adequately guide flood insurance decisions or requisite emergency response resources. Overall, adaptation measures need to integrate policies to protect food security and such infrastructure as transportation systems and power stations in the face of fires, floods, and other potential disasters.¹⁷

12. *The Delta Programme, the New-Style Delta Plan*, DELTA PROGRAMME COMMISSIONER, <http://www.deltacommissaris.nl/english/topics/#aline4> (last visited May 30, 2011) (providing background and details of Delta Plan).

13. *Id.* (describing possible uses of Delta Fund).

14. See Harro ten Wolde, *Dutch to Boost Flood Protection Measures*, REUTERS (Sept. 4, 2008), <http://www.reuters.com/article/2008/09/03/us-dutch-flood-idUSL349086320080903> (discussing funding of further adaptation measures to address sea level rise along Dutch coastlines).

15. Kirsten H. Engel, *Harnessing the Benefits of Dynamic Federalism in Environmental Law*, 56 EMORY L.J. 159, 176 (2006) (describing phenomenon of dynamic federalism). “[A]ccording to dynamic federalism, federal and state governments function as alternative centers of power and any matter is presumptively within the authority of both the federal and the state governments.” *Id.*

16. Edna Sussman, David C. Major, Rachel Deming, Pamela R. Esterman, Adeb Fadil, Amy Fisher, Fred Fucci, Roberta Gordon, Caroline Harris, J. Kevin Healy, Cullen Howe, Kathy Robb & Jeff Smith, *Climate Change Adaptation: Fostering Progress Through Law and Regulation*, 18 N.Y.U. ENVTL. L.J. 55, 127 (2010) (discussing effects of nascent disaster planning).

17. Stephen Castle, *Report Calls on Europe to Move on Global Warming*, N.Y. TIMES, June 25, 2007, <http://www.nytimes.com/2007/06/25/world/europe/25iht-climate.5.6325700.html> (explaining need for all-encompassing adaptation measures). “Some, so-called ‘soft’ measures include water conservation, changes in

III. CHANGE IS THE ONLY CONSTANT: RESILIENCE AND COLLABORATIVE ADAPTIVE MANAGEMENT

“Adaptation policy must operate at all scales in an interconnected network of decision making.”¹⁸

Responding resiliently at inter-linking scales to an increasing array of disasters requires cooperation. While reducing levels of greenhouse gases that contribute to climate change can achieve climate stabilization, the effects of existing accumulated atmospheric concentrations will last many years. Different kinds of adaptation are needed throughout the world, with developing countries facing the greatest need to adapt while having the least capacity to do so and lowest contribution to climate change. A comprehensive, cooperative adaptation framework can support national adaptation plans that facilitate climate-resilient development.¹⁹ Each country should implement early warning systems, disaster risk reduction strategies, and risk management plans.²⁰

Following a massive earthquake in Japan on March 11, 2011, philosophy and law merged in this author’s Oregonian community. Residents not only scrambled for potassium iodide while trying to make sense of disaster law and policy gone nuclear, but they also struggled with how to respond to a potential crest of water few coastlines currently have the capacity to withstand. Learning how to transcend panic and respond effectively in the long-term continues to stymie individuals and cultures alike.²¹ Expecting the best yet preparing for the worst should be a rational response, with commu-

crop rotation and working on wetlands on flood prevention.” *Id.* According to a European Commission study, “[t]hese measures, when taken early, could reduce the need for ‘hard’ defense and relocation measures, e.g. increasing the height of dikes, relocating ports, industry and entire cities . . . from low-lying coastal areas and flood plains, and building new power plants because of failing hydropower stations which are much more costly.” *Id.*

18. Ruhl, *supra* note 1, at 423, 428 (describing necessity of correct scale of governance).

19. United Nations Framework Convention on Climate Change, June 1-12, 2009, *Ad Hoc Working Group on Long-Term Cooperative Action Under the Convention, Negotiating Text: A Note From the Chair*, ch. II, ¶ 24(h), U.N. Doc. FCCC/AWGLCA/2009/8 (May 19, 2009), available at <http://unfccc.int/resource/docs/2009/awglca6/eng/08.pdf> [hereinafter *Negotiating Text*] (recommending “a three-year pilot phase of adaptation activities implemented cooperatively, to catalyse rapid learning about adaptation good practice by supporting enhanced implementation of demonstration projects, programmes and policies in vulnerable countries and communities”).

20. See *id.* at ch. II, ¶ 39 (suggesting that each country implement early warning systems).

21. *Emergency Preparedness and Response: Maintain a Healthy State of Mind*, CENTERS FOR DISEASE CONTROL & PREVENTION (May, 13, 2011), <http://emergency.cdc.gov>.

nities remaining calm but recognizing likely mortality rates and geographical vulnerabilities.²²

Such a rational response, however, requires technology transfer to communities lacking the capacity to warn civil society of pending disasters, comparable to the reverse 9-1-1 calls that Oregon and California residents received shortly after the Japanese earthquake.²³ Wake up calls seem to be coming fast and furiously. Communities can accomplish a great deal of good by channeling crisis awareness into effective disaster planning for resilient coastlines. Recent storm surges highlight the urgent need for a collective consensus within the international community on enhancing resilience to disasters.²⁴ If not now, then when?

Adaptation commissions facilitate integration and harmonization and, by doing so, enhance adaptive capacity.²⁵ As recent climate negotiations have demonstrated, geo-political pendulums also affect adaptive capacity. Adaptation measures should be based on emerging and traditional “sound scientific and technological knowledge.”²⁶ Approaches to adaptation should also be environmentally sound, informed by the best science, as well as sensible from financial and sustainability standpoints.²⁷ Temporal and spatial scales of adaptation are both important to framing adaptation strategies. On-the-ground results should come from “predictable, sustainable, timely, adequate and stable financial resources” on top of official development assistance by developed countries.²⁸ Coun-

cdc.gov/preparedness/mind/adults/ (discussing ways to be prepared for emergencies).

22. *Id.* (providing ways to keep one's mind at ease during emergencies).

23. April Charlton & Marga K. Cooley, *Tsunami Warning “Wake-Up Call” for Local Residents, Emergency Responders*, SANTA MARIA TIMES, Mar. 11, 2011, http://www.santamariatimes.com/news/local/article_639de4b8-4c7e-11e0-99ba-001cc4c002e0.html (describing tsunami warnings used in California, including reverse 9-1-1 calling).

24. Robert Charette, *Japanese and Other Recent Natural Disasters Unfortunately Highlight Importance of Securing Your Digital Afterlife*, THE RISK FACTOR BLOG (Mar. 16, 2011), <http://spectrum.ieee.org/riskfactor/computing/it/japanese-and-other-recent-natural-disasters-unfortunately-highlight-importance-of-securing-your-digital-afterlife-> (noting some recent natural disasters).

25. *Negotiating Text*, *supra* note 19, at ch. II, ¶ 24(c) (describing how adaptive capacity can be enhanced through financial and technical support).

26. *Id.* at ch. II, ¶ 22(k) (discussing how adaptation framework program should be implemented).

27. *Id.* at ch. II, ¶ 22(a) (iii) (providing guidelines for implementing adaptation framework program).

28. *Id.* at ch. II, ¶ 22(c) (explaining implementation method for adaptation framework program).

tries can implement integrated best practices²⁹ consistent with such international instruments as the United Nations Framework Convention on Climate Change (UNFCCC),³⁰ the United Nations Convention to Combat Desertification,³¹ the Convention on Biological Diversity,³² and the United Nations Declaration on the Rights of Indigenous Peoples.³³ Periodic reviews³⁴ of national adaptation plans should assess and update measures for “climate refugees,”³⁵ increasing resilience through economic diversification, as well as the transfer of such adaptation technologies as levy designs, green building innovations, and a wide range of other means by which to respond to climate change.³⁶

Professor J.B. Ruhl artfully notes that “institutional inflexibility is increasingly being adopted as a means to protect legitimate interests excluded from dominant resource allocation regimes.”³⁷ Coordinated, flexible responses are at the core of effective climate adaptation. Existing property rights and risk will likely see unprecedented change. Traditional water, land-use and environmental law are likely to melt into something that can respond to climate instability. Both this instability and the resulting legal responses will have significant human rights implications that communities

29. *Id.* at ch. III, ¶ 129(f) (describing how cooperative sectoral approaches and sector-specific actions should enhance implementation of Article 4.1(c) of AWG-LCA).

30. See Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, Rep. on its 5th Sess., U.N. Doc. A/AC.237/18 (Part II)/Add.1 (May 15, 1992), available at <http://unfccc.int/resource/docs/a/18p2a01.pdf> [hereinafter UNFCCC] (providing text of convention).

31. United Nations Convention to Combat Desertification, *The Convention, UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION*, available at <http://www.unccd.int/convention/menu.php> (last visited May 22, 2011) (providing links to text of convention).

32. *Convention on Biological Diversity: About the Convention*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/convention/about.shtml> (last visited May 22, 2011) (providing brief overview of Convention on Biological Diversity).

33. *Negotiating Text*, *supra* note 19, at ch. II, ¶ 22(i) (noting that United Nations conventions’ implementation of adaptation framework programme should be consistent). The *Negotiating Text* makes it clear that indigenous persons should be involved in mitigation actions and their rights respected under all applicable laws or, in its absence, in accordance with the United Nations Declaration on the Rights of Indigenous People. *Id.* at ch. III, ¶ 109.

34. *Id.* at ch. II, ¶ 26 (suggesting reviews every three to four years).

35. Elizabeth Burleson, *Climate Change Displacement to Refuge*, 25 J. ENVTL. L. & LITIG. 19, 35 (2010) (discussing establishment of legal status for climate refugees).

36. *Negotiating Text*, *supra* note 19, at ch. II, ¶ 25(c)–(e) (explaining how adaptation plans should be implemented).

37. Ruhl, *supra* note 1, at 367 (cautioning against adaptation). One reason why adaptation should not be used is because “the degree of friction in the proposed institutional responses is often underestimated so institutions may not perform as expected.” *Id.* at 366.

should address at the outset, rather than acknowledge in retrospect.

Rule of law is at the core of effective communities and need not be compromised in the effort to adapt effectively to climate instability. Effective climate measures can occur through coordination among all levels of governance and decision-making. This decision-making should address climate change legislatively, judicially, and administratively, while remaining mindful of the need for both flexibility and capacity building.³⁸ Many adaptation measures can be addressed at the proactive or reactive stage. Arguably, a proactive response leaves greater flexibility with which communities can respond.³⁹ Emergency response and disaster recovery are classic reactive adaptive measures that can be prepared for, while proactive measures include: "crop and livelihood diversification, seasonal climate forecasting, community-based disaster risk reduction, famine early warning systems, insurance, [and] water storage."⁴⁰

While reducing vulnerability can avert directing resources to post-disaster recovery, climate vulnerabilities will remain. The level of risk will depend upon interrelated knowledge, technology, and capacity gaps.⁴¹ Robust habitat protection/restoration and emergency response systems are resilience enhancers.⁴² Resilience need not be the baby thrown out with the bathwater. There is a growing understanding that stationarity is giving way to a climate change-

38. *Id.* at 364 (describing how numerous policy fronts will play a role in addressing climate change). Ten trends include:

(1) shift in emphasis from preservationism to transitionalism in natural resources conservation policy, 2) rapid evolution of property rights and liability rules associated with natural capital adaptation resources, 3) accelerated merger of water law, land-use law, and environmental law, 4) incorporation of a human rights dimension in climate change adaptation policy, 5) catastrophe and crisis avoidance and response as an overarching adaptation policy priority, 6) frequent reconfigurations of transpolicy linkages and trade-offs at all scales and across scales, 7) shift from 'front end' decision methods relying on robust predictive capacity to 'back end' decision methods relying on active adaptive management, 8) greater variety and flexibility in regulatory instruments, 9) increased reliance on multiscalar governance networks, and 10) conciliation.

Id. at 364.

39. *Id.* at 383 (noting how proactive adaptation strategies anticipate climate change).

40. *Id.* at 383 (listing various proactive adaptation strategies).

41. *Id.* at 386 (describing factors influencing level of risk).

42. See generally Elizabeth Burleson, *Multilateral Climate Change Mitigation*, 41 U.S.F. L. Rev. 373 (2007) (providing examples of resilience enhancers).

induced no-analog future in which ecological variability will not stay within known parameters.⁴³

Professor Robin Kundis Craig notes that “water law is almost uniquely available to support some of the adaptive management regimes that climate change adaptation will require [and] public trust doctrines can be particularly well-suited to providing legal support for adaptive management-based climate change adaptation regimes.”⁴⁴ Given the need for a legal system that both provides stable expectations and adapts to climate change, the common law may be in a good position to respond flexibly.⁴⁵ Craig has identified at least sixteen states in the United States that have ecological public trust doctrines, and at least six states that describe such doctrines as adaptive and evolutionary.⁴⁶ Explicitly including climate as a threat to public trust resources allows states to respond to climate instability through public trust doctrines.

Adaptive public trust doctrines enable states to address some water-related climate change. For example, judicial adaptive management may follow the approach taken in the South Dakota case of *Parks v. Cooper*.⁴⁷ In this case, three lakes resulted from an area receiving higher than normal precipitation, perhaps a new normal for the region. Riparian landowners sued to exclude members of the public from using the new bodies of water for fishing and recreation upon a private lake argument.⁴⁸ The South Dakota Supreme Court concluded that “all water in South Dakota belongs to the people in accord with the public trust doctrine and as declared by

43. Ruhl, *supra* note 1, at 394 (discussing climate change mitigation); *see also* P. C. D. Milly et al., *Stationarity Is Dead: Whither Water Management?*, 319 SCIENCE 573, 573-74 (Feb. 1 2008), *available at* <http://www.sciencemag.org/content/319/5863/573.summary> (discussing how climate change undermines traditional water management). Stationarity is “the idea that natural systems fluctuate within an unchanging envelope of variability.” P. C. D. Milly et al., *supra* note 43, at 573.

44. Robin Kundis Craig, *Adapting to Climate Change: The Potential Role of State Common-Law Public Trust Doctrines*, 34 VT. L. REV. 781, 781 (2010) (explaining that state public trust doctrines emerge from state common law as well as key federal provisions).

45. *Id.* at 806 (describing how the common law can allow “the law to reflect special circumstances, changing conditions, and/or changing norms, while at the same time encouraging judges to be mindful of existing rights and expectations”); *see also* Frank Partnoy, *Synthetic Common Law*, 53 U. KAN. L. REV. 281, 291 (2005); *see also* Mary Christina Wood, *Advancing the Sovereign Trust of Government to Safeguard the Environment for Present and Future Generations (Part I): Ecological Realism and the Need for a Paradigm Shift*, 39 ENVTL. L. 43, 78 (2009).

46. Craig, *supra* note 44, at 850 (noting that there has been “an evolution of the American public trust doctrine far beyond its classic protection of public rights to navigate, fish in, and engage in commerce on navigable waters”).

47. *Parks v. Cooper*, 676 N.W.2d 823, 524-25 (S.D. 2004).

48. *Id.* at 825 (discussing facts of case).

statute and precedent, and thus, although the lake beds are mostly privately owned, the water in the lakes is public and may be converted to public use.”⁴⁹

Parks v. Cooper may be at the forefront of a growing state trend to address climate change via state public trust doctrines. Should this method gain momentum, a body of common law may develop that effectively addresses climate disruptions too unpredictable at present for the public sector to feel comfortable legislating. International frameworks, national climate thresholds, state common law, local zoning, tax abatement for individuals, and civil society participation can together facilitate resilience efforts at all scales that remain mindful of human and ecological vulnerabilities.

IV. RECOMMENDATIONS FOR RESILIENT GREEN BUILDING AND CLIMATE COOPERATION

Sir Nicholas Stern calls for 2 percent of worldwide GDP to be invested annually in addressing climate change to protect the 20 percent of global GDP that is at risk if nothing is done.⁵⁰ Green building can help integrate social equity and environmental resilience. As Professor Patricia Salkin points out, adequate affordable housing is central to social equity and sustainable development is already a part of many states’ comprehensive planning statutes in the United States.⁵¹

To address the forty percent of United States greenhouse gas emissions that come from buildings,⁵² private-public partnerships

49. *Id.* (relating court’s holding).

50. Gillian Murdoch, Q+A: *How Does Climate Change Hit GDP?*, REUTERS (Apr. 28, 2009), <http://www.reuters.com/article/2009/04/27/us-climate-adb-sb-idUSTRE53Q0K720090427> (observing that “[h]ealth services will also be stretched, and economic productivity lost, as more people die from thermal stress, malaria, dengue and other diseases”); see also Tsegaye Tadesse, *Africa Wants \$67 Billion a Year to Fight Climate Change*, REUTERS (Aug. 25, 2009), <http://www.reuters.com/article/2009/08/24/us-climate-africa-idUSTRE57N26M20090824> (reporting that “Africa is the region most at risk from warming and is home to 15 of the 20 most vulnerable countries”); see also Jeremy Lovell, Britain, *Bangladesh Urge Climate Change Action*, REUTERS (Sept. 10, 2008), <http://www.reuters.com/article/2008/09/10/idUSLA246067> (describing how Oxfam called for an 80 percent reduction in global carbon emissions by 2050 and a US \$50 billion annual contribution to finance adaptation in developing countries).

51. Patricia E. Salkin, *Sustainability and Land Use Planning: Greening State and Local Land Use Plans and Regulations to Address Climate Change Challenges and Preserve Resources for Future Generations*, 34 WM. & MARY ENVTL. L. & POL’Y REV. 121, 132 (2009) (discussing importance of affordable housing and sustainable development). “A number of states require local governments to plan for natural hazards such as earthquakes, fires, flooding, and land subsidence.” *Id.* at 155.

52. *Id.* (quantifying buildings’ contribution to U.S. greenhouse gas emissions).

have developed building sustainability standards. For example, jurisdictions are beginning to implement the private Leadership in Energy and Environmental Design (LEED) rating system.⁵³ The success of LEED could be enhanced by measures that take into account seismic resilience, regional water variability, and new efficiency/energy innovations to a greater degree.⁵⁴ While various states have preempted local action, others allow local governments to surpass state climate measures impacting water, energy, and other sectors. Professor John Nolon notes that Boston's LEED compliance approach gives developers an option regarding which LEED standards with which to achieve parity rather than actual certification. Elsewhere, zoning approaches could use LEED or other green building standards as review protocols.⁵⁵

There is an array of state, county, and local measures underway across the United States recognizing and supporting the role that green and cool roofs play in retaining stormwater, enhancing air/water quality, and mitigating greenhouse gas emissions.⁵⁶ Other green building incentives include grants, special density or height allowances, and fast-track permit approval.⁵⁷ Yet, Professor Carl Circo notes that the "waste that buildings generate on a life-cycle basis alone is enough to put the long-term challenge into sharp relief. New construction yields enormous quantities of debris; and renovations and demolitions of existing structures to make way for new development create even greater waste burdens for a sustaina-

53. *Id.* at 156 (explaining how all nine LEED rating systems address "sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality"); see also *LEED Rating Systems*, U.S. GREEN BUILDING COUNCIL, <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222> (last visited May 22, 2011).

54. Salkin, *supra* note 51, at 157 (offering ways to improve upon LEED certification.)

55. John R. Nolon, *The Land Use Stabilization Wedge Strategy: Shifting Ground To Mitigate Climate Change*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 1, 39 (2009) (discussing how zoning regulations use green building standards as review protocols).

56. Salkin, *supra* note 51, at 168 (describing benefits of green roofs); see also *DDC Cool & Green Roofing Manual*, NYC DEPARTMENT OF DESIGN & CONSTRUCTION, http://www.nyc.gov/html/ddc/downloads/pdf/cool_green_roof_man.pdf (evaluating effectiveness of environmental roof strategies and explaining "that introducing lighter, more reflective surfaces and/or more greenery can mitigate heat build-up on the scale of individual buildings").

57. Compare *id.*, with Carl J. Circo, *Should Owners and Developers of Low-Performance Buildings Pay Impact or Mitigation Fees to Finance Green Building Incentive Programs and Other Sustainable Development Initiatives?*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 55, 60 (2009). "Expedited review programs . . . require adequately trained professionals to assure compliance with the program's requirements . . . [and] are only valuable to the extent that the reduced processing time has sufficient value to encourage developers to incur the additional costs of sustainable design." Circo, *supra* note 57, at 65-66.

ble society.”⁵⁸ Green building initiatives need to be genuinely environmentally sound, not just a marginally less damaging means of constructing infrastructure that presents cradle-to-grave sustainability challenges.

Zoning and building codes can have an enormous climate impact, and at the very least should not prevent environmentally sound improvements to be undertaken at all scales.⁵⁹ For instance, Hawaii requires solar hot water heaters in residential construction,⁶⁰ recognizing that heating hot water can represent up to 25 percent of a household’s energy consumption.⁶¹ While a broad discussion of solar power as a renewable energy source has reemerged, green roofs also offer substantial opportunities to both mitigate and adapt to climate disruptions. In addition to reducing greenhouse gas emissions, green roofs can absorb water on site that otherwise would contribute to increased stormwater flooding.⁶²

Professor Daniel Farber reminds us that “green building can be a way of mitigating climate change through reduced energy use but it can also help adapt to climate change through more efficient water use.”⁶³ Both Germany and Switzerland mandate the use of green roofs, whereas Seattle requires the use of green landscaping

58. See Circo, *supra* note 57, at 67 (noting that offering height and intensity incentives to use green building practices may have social costs insufficiently offset by degree to which buildings are more environmentally friendly than traditional buildings); see also Matthew D. Zinn, *Adapting to Climate Change: Environmental Law in a Warmer World*, 34 *ECOLOGY L.Q.* 61, 99 (2007) (explaining that “[t]he root of the social license is the firm’s need to accommodate community concerns about its treatment of the environment, preserve its reputation with consumers, and streamline its relationships with government regulators”).

59. Sussman et al., *supra* note 16, at 103 (suggesting that building codes should not hinder green technology improvements).

60. HAW. REV. STAT. § 196-6.5(a) (2010) (requiring new single family dwellings to have solar water heater system).

61. See generally *Energy Savers: Water Heating*, U.S. DEP’T OF ENERGY, http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=12760 (last visited May 23, 2011) (suggesting that heating bills can be reduced through utilization of certain water heaters).

62. Sussman et al., *supra* note 16, at 57, 66 (explaining how “[n]ew zoning regulations can improve storm water management and reduce flooding on privately owned property”). “To reduce flooding and decrease the incidence of combined sewer overflow events and related pollution, best practices for on-site storm water management could be incorporated throughout the Zoning Resolution as well as in the Building Code.” *Id.* at 66.

63. Daniel A. Farber, *Climate Adaptation and Federalism: Mapping the Issues* 7 (UC Berkeley Public Law Research Paper No. 1468621), available at <http://ssrn.com/abstract=1468621> (discussing relationship between green building and climate change). “The trend toward green building may push some regulatory decision making from the local level to the state level, and it is easy to imagine that the federal government might step in to promote the move to green building.” *Id.*

elements and Chicago requires light-colored reflective roofs.⁶⁴ Similarly, New York has incentivized green roofs by offering tax abatements to property owners.⁶⁵ Resilient green building best practices can respond to both flooding and drought conditions and building codes/standards can facilitate effective emergency preparedness.

Climate mitigation, adaptation, financing, and environmentally sound technology transfer remain core to international climate negotiations. Moreover, these elements provide a range of best practices with which transnational efforts can adapt despite uncertainties with projected climate disruptions. As Gandhi reminded us, we must be the change we wish to see. Building capacity through education and facilitating adaptation through loans and subsidies can help communities address climate change.⁶⁶

Alejandro Camacho, Lawrence Susskind, and Todd Schenk explain that

[a]daptive management advocates stress that resource management should be more dynamic, changing over time to adjust to new information and shifting ecological and social conditions. Proponents of collaborative planning maintain that the best management processes involve stakeholders working jointly to make decisions, rather than government agencies ordaining resource management decisions independently. Involving all stakeholders from the beginning is likely to lead to more broadly supported and thus more successful agreements. When combined, these two innovations are sometimes referred to as collaborative adaptive management. . . .⁶⁷

64. *Id.* at 102; *see also, e.g.*, SEATTLE, WASH., MUN. CODE §23.47A-016 (2006) (requiring landscaping to achieve particular Green Factor scores), *and* CHICAGO, ILL., MUN. CODE § 18-13-101.5.4.1 (2009) (requiring low-sloped roofs meet initial reflectance values).

65. *See generally* N.Y. REAL PROP. TAX LAW §§ 499aaa-ggg (McKinney 2009) (providing tax abatement programs to promote green roofs, which can lower grid load and raise on-site stormwater retention).

66. Alejandro E. Camacho, *Adapting Governance to Climate Change: Managing Uncertainty Through a Learning Infrastructure*, 59 EMORY L. J. 1, 75 (2009) (suggesting “regulatory credit programs that reduce regulatory requirements or streamline permit review processes for permit holders who generate reliable, valuable data on the efficacy of particular conservation efforts”). “Legislators could even enlist stakeholders to buttress monitoring or evaluation of agency or third-party compliance with program goals. In short, stakeholders can and should be incentivized to participate in and help evaluate adopted strategies and agency performance.” *Id.*

67. Lawrence Susskind, Alejandro E. Camacho, & Todd Schenk, *Collaborative Planning and Adaptive Management in Glen Canyon: A Cautionary Tale*, 35 COLUM. J. ENVTL. L. 1, 2-3 (2010) (citations omitted) (explaining adaptive management).

Comparative environmental law's concrete models for adaptive management and public participation can facilitate transitioning toward approaches that encompass water, energy, climate, sustainable development, and good governance.

Environmental decision-making often utilizes economic tools such as tradable permits to address transboundary externalities including climate change, but struggles with the equity issues involved in initially allocating such permits. Economics involves the study of limited resources while law provides a framework for allocating such resources. Together, law and economics can contribute to the resolution of disputes. Yet, such resolution must address equities to be sustainable. Recent social unrest in North Africa provides one of the most recent reminders that equity is strongly linked to sustainability. Human rights and environmental law come together when addressing water availability, energy use, and climate resilience. The energy-water-climate nexus has historically been, and will continue to be, central to individual, regional, and international security. As cities swell, rapid and chaotic urbanization illustrates the international community's struggle to humanely meet the needs of humanity. The global population is likely to increase by half over the next forty years.⁶⁸ Resilience to withstand climate disruption is required and can best be facilitated through international cooperation to enhance sustainable development.

In *The Hollow Men*, T. S. Eliot emphasizes dryness, instability, meaninglessness, and stagnation—the emptiness of human existence. As if describing a scarecrow, Eliot depicts the hollow man as shape without form, stuffed yet hollow. Although paralysis prevents the hollow men from piecing together the fragments of their world, Eliot provides the possibility for hope. Whether the world will end in the whimper of a fading star is up to the hollow men. They must prove that the fact that they can hope is enough to make what they hope for possible.⁶⁹ Substantive climate cooperation requires a shared vision for mitigation, adaptation, technology transfer, and funding. This in turn requires hope that can transcend into meaningful and equitable collaboration.

68. *A Special Report on Forests: Something Stirs, But to Save the Forests, the World Needs to Find Somewhere Else to Grow Its Food*, THE ECONOMIST, Sept. 23, 2010, <http://www.economist.com/node/17062727> (discussing relationship between forests and climate change).

69. T. S. ELIOT, *The Hollow Men*, in COLLECTED POEMS, 54-59 (Harcourt, Brace & Company 1936) (noting that contradiction between hollow and stuffed reveals paradox that although gorged with society's materialism, we are all really hollow).

What does hope look like? We stand at a crossroads seeking a globally shared vision on whether to mitigate, adapt, finance, and transfer environmentally sound technologies via a second round of the Kyoto Protocol or through some new initiative. At stake is the adaptation funding available through the Clean Development Mechanism (CDM) that is subject to a 2 percent levy to fund adaptation in the developing world.⁷⁰ Depending on the price of carbon, this fund could make available hundreds of billions of dollars. The UNFCCC Adaptation Fund awaits international commitment to operationalize and distribute funds. In the meantime, floods and droughts increasingly erode the capacity of communities to meet basic needs. Who makes climate decisions and how to build collective action trust are two questions that remain central to an international climate instrument emerging from the ongoing United Nations Framework Convention on Climate Change negotiations.

International water law could help establish a framework with which to build consensus on water, climate, and energy use in a coordinated manner. In particular, the multifactor-balancing test from the Convention on the Law of the Non-Navigational Uses of International Watercourses could be applied to integrated water, climate change, and energy cooperation. Article 5 of this Convention sets forth "equitable and reasonable utilization."⁷¹ A few months after the United Nations General Assembly adopted the Convention, the International Court of Justice (ICJ) quoted the en-

70. Elizabeth Burleson, *Climate Change Consensus: Emerging International Law*, 34 WM & MARY ENVTL. L. & POL'Y REV. 543, 558 (2010) (discussing UN Clean Development Mechanism); see also *What is the Clean Development Mechanism?*, UNFCCC, <http://cdm.unfccc.int/about/index.html> (last visited June 2, 2011) [hereinafter *What is the Clean Development Mechanism?*] (explaining Clean Development Mechanism). "The CDM allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO₂. These CERs can be traded and sold, and used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol." *What is the Clean Development Mechanism?*, *supra* note 70. In addition, the CDM "stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets." *Id.*

71. Convention on the Law of Non-Navigational Uses of International Watercourses, G.A. Res. 51/229, U.N. GAOR, 51st Sess., U.N. Doc. A/RES/51/229 (1997), *reprinted in* 36 I.L.M. 700 (1997) (offering multifactor-balancing test). For more information on equitable and reasonable water use, see Elizabeth Burleson, *Equitable and Reasonable Use of Water in the Euphrates-Tigris River Basin*, 35 ELR 10041 (2005).

tire equitable participation paragraph of Article 5(2) in its judgment in *Gabcikovo-Nagymaros*.⁷²

The ICJ thereby set forth a standard that balances the needs of upstream and downstream countries. In particular, the ICJ called upon countries to use numerous factors in resolving transboundary disputes. It would be helpful to build consensus around interrelated energy, water, climate concerns using the following international water law factors: (A) natural condition; (B) social and economic needs; (C) population; (D) transboundary effects; (E) existing and potential use; (F) development, protection, and conservation; and (G) availability of alternatives.⁷³ For instance, highland water storage can lead to less evaporation than desert lowland storage. Similarly, taking into account the ramifications of high population growth rates and the large number of farmers dependent on scarce water resources can help reduce the kind of civil unrest underway in the Middle East and North Africa. Addressing cross-cutting challenges collectively can help build consensus among civil society, international institutions, tribes, and states.

International institutional leadership can facilitate forums and ongoing relationships to address water availability and quality, energy equity, and climate change mitigation and adaptation. Inclusive stakeholder participation brings new perspectives to problem solving as well as trust and support for implementation. Game theory suggests that indefinite future interactions lead to cooperation. Accordingly, forums that increase the frequency of interactions build trust and form stable expectations.

What does hope look like? International institutions, governments, non-governmental organizations, and civil society can transcend politics to maintain international peace and security. Climate volatility, rapid population growth, technological innovation, and conflict can be considered in an integrated manner. Collaboration on environmentally sound technology transfer, energy

72. *Gabcikovo-Nagymaros Project* (Hung. v. Slov.), 1997 I.C.J. 92 (Sept. 25), 37 I.L.M. 162, 201, ¶ 147 (1998) (demonstrating judicial application of Convention on Law of Non-Navigational Uses of International Watercourses).

73. Chusei Yamada, Int'l Law Comm'n, *Third Report on Shared Natural Resources: Transboundary Groundwaters*, Annex, at 19, U.N. Doc. A/CN.4/551 (Feb. 11, 2005) (providing full text of draft convention); see also *Gabcikovo-Nagymaros Project* (Hung. v. Slov.), 1997 I.C.J. 7 (Sept. 25), 37 I.L.M. 162, 201, ¶ 140 (1998); see also The Convention on the Law of Non-Navigational Uses of International Watercourses, G.A. Res. 51/229, at 5, U.N. GAOR, 51st Sess., U.N. Doc. A/RES/51/229 (May 21, 1997), reprinted in 36 I.L.M. 700 (1997); see also Elizabeth Burleson, *Middle Eastern and North African Hydropolitics: From Eddies of Indecision to Emerging International Law*, 18 GEO. INT'L ENVTL. L. R. 385 (2006).

efficiency, and diversity can achieve genuine sustainable development that results in economic growth and social wellbeing that do not impede future economic growth and social wellbeing. These developments may not be achieved by tomorrow, next month, or even next year. Yet, they are within political reach. Cost, pace, and risk are key elements in crafting international instruments that both create stable expectations and effectively address climate, water, and energy security. Identifying key elements of good governance will enhance the legal community's ability to enact equitable and reasonable laws. To this end, the United Nations can facilitate increased scientific understanding of law as well as the legal understanding of science.

Implementing environmental safeguards must involve equitable allocation, which can be addressed through provisions providing for public participation. A transparent, international forum facilitates inclusive decision-making. Inclusive decision-making is important because the means are also often the ends. How one makes a decision affects the substantive provision enacted. Varying legal frameworks can increase or decrease sustainable development. For example, bringing stakeholders together to identify best practices can enhance sustainable development.

Since the international community committed to adaptation assistance for least developed countries and small island nations in Agenda 21, a comprehensive global plan of action, efforts have waxed and waned substantively and procedurally.⁷⁴ Dynamic federalism, fast-start finance, Neo-Kantian/Rawlsian distributive rationales, advances in efficiency and renewable energy innovation, and many other factors have spiraled into splintered policy debates.⁷⁵ Few would argue against the useful role that drip irrigation could play in effectively reducing salt-water intrusion of fresh water aquifers. More controversial is the means by which building codes can provide for such sensible adaptation measures with minimal impact on existing property rights.

74. United Nations Conference on Environment and Development, Rio de Janeiro, Braz., June 3-14, 1992, *Agenda 21*, art. 15.2, U.N. Doc. A/CONF.151/26 (Vol. II) (June 13, 1992), available at <http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=52&ArticleID=50&l=en> (Agenda 21 is a comprehensive global plan of action).

75. See JOHN RAWLS, *A Theory of Justice*, 221-22 (Harvard 2005) (building on Kant's notion of distributive justice).

V. CONCLUSION

Elements of our global security nexus involve interrelated energy-food security, water security, human security, national security, and international peace and security. Both dynamic federalism and international cooperation support adaptation. While building codes have been generally state or local to date in the United States, dynamic federalism has been successful in the United States Clean Air Act context and could provide a model for public participation and “national green building metrics.”⁷⁶

How to integrate new public sector responsibilities into existing federal governmental structures has received extensive critique. Less well developed has been the manner in which developed nations can follow through on commitments to provide adaptation assistance to least developed and small island nations. Equally important is support for indigenous adaptation cooperation and global attention paid to how the international community can respond to projected migration trends. These are basic starting points that need greater attention. Insurance sector and military leadership have sought to highlight the scope of the climate dilemma facing the international community. Security in all of its forms would be enhanced by recognizing the shared responsibility to mitigate, adapt, fund, and transfer environmentally sound technology globally.

The international community can make use of social media to leverage both short-term and long-term disaster response, remaining mindful that members of civil society struggling with profound poverty are not only more likely to have climate-dependent livelihoods but also more likely to lack access to energy and communication options. Displacement creates deep and lasting cultural wounds. A universal harm avoidance instinct draws us together as a global community with a shared vision to avert such trauma and facilitate the ramping up of best practices for climate adaptation. These can include resilient water storage technology transfer for communities that will be increasingly challenged by water scarcity. Building on successful adaptation measures can also involve international efforts to optimize and share battery storage for distributed power.

76. Shari Shapiro, *Who Should Regulate? Federalism and Conflict in Regulation of Green Buildings*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 257, 278 (2009) (discussing potential of building codes to address “energy efficiency, water conservation, materials and resource usage, site selection and indoor air quality considerations”).

The United Nations, along with its governmental and nongovernmental partners, can also help coordinate transboundary sharing of post-disaster response plans and warning system infrastructure. Efforts already underway would benefit from increased international support. Awareness-raising efforts on the part of environmentally minded organizations can build capacity, as can targeted sharing of complex engineering and legal expertise. Together, such approaches can help minimize further vulnerability, be it in the form of mangrove loss and the resulting heightened risk of storm surges or diversifying energy generation.

Irrespective of whether the discussion relates to how to prevent nuclear catastrophe in Japan, geopolitical strife in the Middle East, or global climate disruption, we have the capacity and incentive to use both differences and commonalities to become an innovative, resilient international community. The order in which adaptation measures are implemented is not as crucial as making steady progress towards lowering greenhouse gasses, adapting to climate disruption, sharing environmentally sound technologies, and leveraging public and private funds with which to sustain coordinated climate change measures. Multilateral forums and agreements sustain focus on the myriad of climate responses that can build resilience. Hope, trust, and collaboration at all scales can transcend climate response paralysis. Transnational coordination can help (1) assess and share with local communities the likely risks to given areas; (2) reduce the impacts of disasters via mangrove restoration and other adaptive management measures; and (3) facilitate post-disaster sustainable development. Resilience is the common ground upon which the international community can continue to build international consensus.