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CLIMATE CHANGE CONSENSUS: EMERGING INTERNATIONAL LAW

ELIZABETH BURLESON*

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INTRODUCTION

The international community can achieve an effective and equitable response to climate change by strengthening its commitment to mitigate, adapt, fund, and innovate. The embryonic statement that came out of the Copenhagen Climate Conference indicates the very real struggle to build consensus. The US and China finally found basic common ground on emissions targets, financing, and transparency.¹ Yet, MIT's John Sterman

* Professor Elizabeth Burleson has an LL.M. from the London School of Economics and Political Science and a J.D. from the University of Connecticut School of Law. She has also written reports for UNICEF and UNESCO and is a professor at the University of South Dakota School of Law. Professor Burleson was a member of the UNICEF delegation to the Bali Climate Conference and helped the UNEP Delegation as a member of the National Wildlife Federation Delegation to the Copenhagen Climate Conference.

¹ Talea Miller, *Newshour: Obama Urges Action, Meets With Chinese Premier* (PBS television broadcast Dec. 18, 2009), available at http://www.pbs.org/newshour/updates/environment/July-dec09/copenhagen_12-18.html (noting that "China has been the target

notes that, based upon pledges coming into Copenhagen, global temperature will increase by 3.9° Celsius (C) above preindustrial levels.²

Future international climate negotiations could proceed using a system of two-thirds majority vote rather than consensus. This would increase the likelihood of timely agreement to predictable, stable, and adequate funding of mitigation, adaptation, capacity building, and innovation cooperation.

This article analyzes emerging international law addressing climate change. Part I analyzes the Copenhagen Climate Conference. Part II considers the greenhouse gas ("GHG") emissions targets needed to avert catastrophic climate change. Part III assesses the funding debate. Part IV addresses the ongoing international climate proceedings. This article concludes that agreement in Mexico must result in a comprehensive, ratifiable instrument that addresses our collective climate challenge.

I. COPENHAGEN CLIMATE CONSENSUS BY EXHAUSTION

There appears to be a gap of 4.2 gigatons (Gt) of carbon emissions between the present country pledges and the required 2020 level of forty-four Gt to stay below a 2°C rise in global temperature.³ We are likely to reach an increase of 3°C by 2050.⁴ "A rise of 3°C would mean up to 170 million more people suffering severe coastal floods and 550 million more at risk of hunger," according to the Stern economic review.⁵

On the bright side, the head of the UN Climate Change Secretariat, Yvo de Boer, notes that the forestry and technology provisions of

of much criticism during the summit for not offering stronger carbon emissions targets and for resisting international monitoring of its actions." *Id.*

² Stu Seidel, *Climate Accord in Hand, Obama Turns to Senate*, NPR, Dec. 19, 2009, <http://www.npr.org/templates/story/story.php?storyId=121669686&ft=1&f=1001>.

³ Suzanne Goldenberg et al., *Leaked UN Report Shows Cuts Offered at Copenhagen Would Lead to 3C Rise*, GUARDIAN.CO.UK, Dec. 18, 2009, <http://www.guardian.co.uk/environment/2009/dec/17/un-leaked-report-copenhagen-3c>.

⁴ *Id.* (noting that "Bill McKibben, founder of the campaign 350.org, said: 'In one sense this is no secret—we've been saying it for months.'"). *Id.*; see also Shai Oster, *The Climate Conference—Copenhagen: World's Top Polluter Emerges as Green-Technology Leader*, WALL ST. J., Dec. 15, 2009, <http://online.wsj.com/article/SB126082776435591089.html> (noting that "China and the US together have 44% of the world's coal reserves, and aren't about to give up on the cheap and reliable source of power. According to US government projections, world coal use could increase nearly 50% by 2030."); see also Pete Harrison, *Climate Deal on Ships and Planes Seen Slipping Away*, REUTERS, Dec. 18, 2009, <http://www.reuters.com/article/idUSTRE5BF3X320091216>.

⁵ Goldenberg et al., *supra* note 3.

a future climate instrument are “oven ready” and could be completed by 2010.⁶ These measures hinge upon wide agreement on the degree to which developed countries can reduce emissions via avoiding deforestation and what level of funding rich nations will provide. The Copenhagen Accord makes mention of forestry, but the UN document that would operationalize REDD awaits 2010 action.⁷ REDD stands for Reducing Emissions from Deforestation and Forest Degradation.⁸ Deforestation has left India and Brazil the third and fourth highest carbon emitters.⁹ Clearing land for plantations and logging for timber contributes fifteen percent of global carbon emissions.¹⁰ “No treaty means that forest destruction will continue unabated, forest-dependent peoples’ rights will not be protected, and endangered species will continue down the path to extinction,” explains Stephen Leonard.¹¹ Participants in the international proceedings continue to struggle with procedural and substantive concerns regarding the optimal means by which to address climate change. Some regard the outcome as remarkable given the domestic constraints facing nations, including the United States and China.¹² Developing countries and their advocates voiced persuasive positions for the survival of Africa and other vulnerable regions.¹³

⁶ Juliet Eilperin, *Hope and Funding for Saving Forests Around the World*, WASH. POST, Dec. 20, 2009, <http://www.washingtonpost.com/wp-dyn/content/article/2009/12/19/AR2009121902262.html>.

⁷ *Id.*; see also Michael Szabo, *Brazil Blocking Expansion of Carbon Finance: Source*, REUTERS, Dec. 18, 2009, <http://www.reuters.com/article/idUSTRE5BF2JE20091216>.

The Brazilian forestry proposal and the Saudi Arabian carbon capture and storage (CCS) proposal have been contested by each other since day one. . . . This could be a deal-breaker at every level and could hold up a final agreement.

. . . .

The source said Brazil is keen to make avoided deforestation eligible under the CDM, but oil-rich Saudi Arabia opposed the proposal over concerns that forestry offsets would dilute the value of those from carbon capture and storage projects.

. . . .

Saudi Arabia, keen to bury carbon emissions in its disused oil fields, put forward a plan to recognize CCS technology under the CDM, but Brazil countered with an objection of its own.

Id.

⁸ Eilperin, *supra* note 6.

⁹ Seidel, *supra* note 2.

¹⁰ *Id.*

¹¹ *Id.*

¹² See *id.*

¹³ See John Vidal & Suzanne Goldenberg, *Copenhagen Talks Stall as African Bloc Accuses UN of Trying to Kill Kyoto*, GUARDIAN.CO.UK, Dec. 14, 2009, <http://www.guardian.co.uk/environment/2009/dec/14/copenhagen-g77-africa-kyoto-suspended>.

Targets and verification proved to be significant stumbling blocks at Copenhagen. The fifteenth meeting of the parties to the 1992 UN Framework Convention on Climate Change¹⁴ ("UNFCCC") commits all parties to "common but differentiated responsibilities"¹⁵ and the 1997 Kyoto Protocol sets mandatory emission reduction goals.¹⁶ The Kyoto Protocol entered into force in 2005 and currently has 190 parties.¹⁷ Member states to both the original convention and the subsequent protocol meet annually, gathering in forums that bring together perspectives from governments, inter-governmental organizations, nongovernmental organizations ("NGOs"), and individual members of civil society.¹⁸ Mexico has offered to host the Conference of the Parties ("COP") 16 to the UNFCCC and the Conference of the Parties serving as the Meeting of the Parties ("COP/MOP") 6 to the Kyoto Protocol.¹⁹ To date, the COP and COP/MOP negotiations have been a mixed process of consensus building.²⁰

In Copenhagen, the 2050 target was dropped and the term "verify" was reduced to the following compromise: "Non-Annex I Parties will

¹⁴ United Nations Framework Convention on Climate Change, May 9, 1992, U.N. Doc. FCCC/INFORMAL/84, available at <http://unfccc.int/resource/docs/convkp/conveng.pdf> [hereinafter UNFCCC].

¹⁵ *Id.* at art. 4, ¶ 1; UNFCCC, STATUS OF RATIFICATION 10 (2009), available at http://unfccc.int/files/essential_background/convention/status_of_ratification/application/pdf/unfccc_ratification_20091016.pdf.

¹⁶ UNFCCC, *Kyoto Protocol*, art. 3, U.N. Doc. FCCC/CP/1997/L.7/add.1 (Dec. 10, 1997), available at <http://unfccc.int/resource/docs/convkp/kpeng.pdf> [hereinafter *Kyoto Protocol*]. The treaty notes that the greenhouse gases are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF₆). *Id.* at annex A.

¹⁷ Press Release, Develop Programme, United Nations Climate Change Conference Kicks off in Copenhagen (Dec. 7, 2009), <http://content.undp.org/go/newsroom/2009/December/historic-united-nations-climate-change-conference-kicks-off-in-copenhagen.en?sessionid=axbWzt8vXD9>.

¹⁸ See *Climate Change Diplomacy: Fiddling with Words as the World Melts*, THE ECONOMIST, Dec. 20, 2008, at 108.

¹⁹ UNFCCC, Rio Conventions Calendar, http://unfccc.int/meetings/rio_calendar/items/2659.php (last visited Jan. 18, 2010).

²⁰ See *Climate Change Diplomacy*, *supra* note 18, at 108-09.

To be fair to the 10,000-odd people (diplomats, UN bureaucrats, NGO types) who assembled in Posnan, a semicolon was removed. At a similar meeting in Bali a year earlier, governments had vowed to consider ways of cutting emissions from "deforestation and forest degradation in developing countries; and the role of conservation [and forest management]." After much haggling, delegates in Poland decided to upgrade conservation by replacing the offending punctuation mark with a comma.

Id. at 108.

communicate information on the implementation of their actions through National Communications, with provisions for international consultations and analysis under clearly defined guidelines that will ensure that national sovereignty is respected.”²¹ This is not as robust as the measurable, reportable, and verifiable architecture discussed to date. Given colonial abuses until recent decades, the international community must establish an equitable as well as efficient means by which to mitigate and adapt to climate change.²² There are real concerns that can be overcome by continued efforts to internalize economic externalities without disproportionately impacting already marginalized members of society.

The international community still lacks (1) specific emission reductions on the part of individual countries, (2) details on new money that rich countries will provide poor countries, and (3) agreement on monitoring, reporting, and verifying (“MRV”).²³ China calls upon the United States to live up to its obligations under the UNFCCC to reduce US emissions and to provide money for developing countries to curb their own GHG output.²⁴ China has also made clear that international verification of Chinese emissions target progress would be viewed as an infringement upon Chinese sovereignty.²⁵ The United States prefers to use 2005 as the “baseline” year for reducing emissions, rather than 1990, as set forth in the UNFCCC.²⁶

²¹ UNFCCC, Dec. 7-18, 2009, *Copenhagen Accord*, ¶ 5, U.N. Doc. FCCC/CP/2009/L.7 (Dec. 18, 2009); see also David Kestenbaum, *All Things Considered: Copenhagen Climate Deal Hinged on 1 Sentence* (NPR radio broadcast Dec. 19, 2009), available at <http://www.npr.org/templates/story/story.php?storyId=121667895> (“[W]e have a big advantage. It’s always in English. And for all these other countries, it’s tough. You know, I wouldn’t want to negotiate. I speak French. I wouldn’t want to negotiate a contract in French.”). *Id.* (quoting Ned Helm, President, Center for Clean Air Policy); see also Allegra Stratton, *Gordon Brown Hints at Plan B if Copenhagen Talks Remain Unresolved*, GUARDIAN.CO.UK, Dec. 18, 2009, <http://www.guardian.co.uk/environment/2009/dec/18/gordon-brown-plan-b-copenhagen> (“An official said a plan B was possible: ‘There are not thousands of variables in this, there are a handful. It is only the 2050 target and the issue of how to verify [emission cuts countries pledge].’”). *Id.*

²² *Newshour: U.S. Looks to Revive Climate Talks with \$100B Yearly Pledge* (PBS television broadcast Dec. 17, 2009), available at http://www.pbs.org/newshour/bb/environment/july-dec09/copenhagen_12-17.html.

²³ See Jeffrey Ball, Stephen Power, & Guy Chazan, *Climate Summit: Divisions Persist on Core Questions as Leaders Arrive—Sharp Disagreements on Reductions, Aid*, WALL ST. J., Dec. 16, 2009, at A16.

²⁴ *Id.*

²⁵ *Id.*

²⁶ *Id.* (“Measured against 2005, said Mr. Stern, the EU’s target for 2020 amounts to an emissions cut of only 13%. And that, he said, isn’t as aggressive as the 17% cut from 2005 that the U.S. has promised.”). *Id.*

A reduction of seventeen percent below 2005 levels only equates to four percent below 1990 levels of GHG emissions in the United States.²⁷

The Nobel Peace Prize-winning Intergovernmental Panel on Climate Change ("IPCC") has called upon industrialized countries to reduce GHG emissions by twenty-five to forty percent from 1990 levels by 2020, and cut global emissions by half before 2050.²⁸ UN Secretary-General Ban Ki-moon has acknowledged that the current mitigation commitments offered by countries fail "to meet the scientific bottom line."²⁹

Mr. Ban has called upon the international community to conclude a legally binding treaty in 2010.³⁰ The legal status of the Copenhagen Accord is comparable to a letter of intent; according to Yvo de Boer, "[t]hat means we have a lot of work to do on the long road to Mexico."³¹ The Copenhagen Accord hashed out by the US, China, India, Brazil, and South Africa makes no mention of a legally binding agreement or a deadline for concluding an international treaty.³² The Accord has merely been "recognized" rather than approved by countries at Copenhagen given the lack of unanimous support.³³ Beyond the legal status of the Accord, key issues are the temperature target, funding, and verification.³⁴ The non-binding Accord recognizes the scientific view that global temperature

²⁷ Michael Szabo, Alister Doyle, & Gerard Wynn, *Factbox: Climate Offers, Demands by Top CO2 Emitters*, REUTERS, Dec. 7, 2009, <http://www.planetark.com/enviro-news/item/55823>.

²⁸ The Nobel Foundation, *The Nobel Peace Prize 2007*, http://nobelprize.org/nobel_prizes/peace/laureates/2007/ (last visited Jan. 25, 2010); the series of IPCC reports are available at <http://www.ipcc.ch/>. The Bali Action Plan preamble states: "Recognizing that deep cuts in global emissions will be required to achieve the ultimate objective of the Convention and emphasizing the urgency to address climate change as indicated in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change." Conference of the Parties to the Framework Convention on Climate Change, Bali, Indon., Dec. 3–15, 2007, *Bali Action Plan*, pmbl., U.N. Doc. FCCC/CP/2007/6/Add.1 (Mar. 14, 2008), available at <http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf> [hereinafter *Bali Action Plan*]. The Bali Action Plan's sole footnote states: "Contribution of Working Group 3 of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Technical Summary, pages 39 and 90, and Chapter 13, page 776." *Id.* at n.1.

²⁹ Nathaniel Gronewold, *U.N. Chief Declares Climate Accord 'Significant Achievement'*, N.Y. TIMES, Dec. 21, 2009, <http://www.nytimes.com/gwire/2009/12/21/21greenwire-un-chief-declares-climate-accord-significant-a-24845.html>.

³⁰ *Copenhagen Deal: Key Points*, BBC NEWS, Dec. 19, 2009, <http://news.bbc.co.uk/2/hi/science/nature/8422307.stm>.

³¹ Alister Doyle & Gerard Wynn, *U.N. Climate Talks End with Bare Minimum Agreement*, REUTERS, Dec. 21, 2009, <http://www.reuters.com/article/idUSGEE5BB07F20091220>.

³² See *Copenhagen Accord*, *supra* note 21.

³³ *Id.*

³⁴ *Id.* at ¶¶ 2, 5.

should not exceed 2°C without indicating a deadline by which GHG emissions should peak.³⁵

UK Prime Minister Gordon Brown came up with a suggestion that developed countries fund a \$100 billion climate fund for developing countries.³⁶ Developed countries will provide \$30 billion USD to developing countries across the next three years, reaching \$100 billion a year by 2020.³⁷ The Accord states that:

[t]his funding will come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance. New multilateral funding for adaptation will be delivered through effective and efficient fund arrangements, with a governance structure providing for equal representation of developed and developing countries. A significant portion of such funding should flow through the Copenhagen Green Climate Fund.³⁸

In an annex to the Copenhagen Accord, rich countries can list mitigation targets and funding commitments while poor countries can register mitigation and adaptation projects that can be monitored.³⁹

³⁵ *Id.* at ¶ 2.

³⁶ Suzanne Goldenberg et al., *Copenhagen: The Key Players and How They Rated*, GUARDIAN.CO.UK, Dec. 20, 2009, <http://www.guardian.co.uk/environment/2009/dec/20/copenhagen-obama-brown-climate>; see also Allegra Stratton, *Gordon Brown Basks in Limelight of Copenhagen Climate Change Summit*, GUARDIAN.CO.UK, Dec. 18, 2009, <http://www.guardian.co.uk/environment/2009/dec/18/gordon-brown-copenhagen-summit> (“[Brown] became the first world leader to say he would attend a meeting supposed to be only for environment ministers, precipitating a near-stampede by heads of states and government with 130 attending. [Brown] was also the first to arrive and settled into a breakneck pace of diplomacy. . .”). *Id.*

³⁷ *Copenhagen Accord*, *supra* note 21, at ¶ 8; see also *Obama’s Speech to the Copenhagen Climate Summit*, GUARDIAN.CO.UK, Dec. 18, 2009, <http://www.guardian.co.uk/environment/2009/dec/18/obama-speech-copenhagen-climate-summit>.

America will be a part of fast-start funding that will ramp up to \$10 billion in 2012. And, yesterday Secretary Clinton made it clear that we will engage in a global effort to mobilize \$100 billion in financing by 2020, if—and only if—it is part of the broader accord that I have just described.

Id.

³⁸ *Copenhagen Accord*, *supra* note 21, at ¶ 8.

³⁹ Press Release, United Nations, Climate Change Deal Marks an ‘Essential Beginning,’ Ban Says, (Dec. 19, 2009), available at <http://www.un.org/apps/news/story.asp?NewsID=33305>.

Environmentally sound technology innovation and cooperation can facilitate developing country adaptation and mitigation.⁴⁰ The Copenhagen Accord states that the Green Climate Fund will facilitate developed countries in providing “adequate, predictable and sustainable financial resources, technology and capacity-building to support the implementation of adaptation action in developing countries.”⁴¹ The Accord addresses emissions technology by calling for developed country pledges to undergo “rigorous, robust and transparent” review by the UNFCCC while developing countries submit national reports on emissions pledges in a process “that will ensure that national sovereignty is respected.”⁴² A registry will include pledges of climate mitigation measures seeking international support.⁴³ Two key issues remain unclear: (1) where Copenhagen Green Climate Fund money will come from and (2) how the money will be used.⁴⁴

Controversial negotiator for the G77, Lumumba Stanislaus Di-Aping, states that a 2°C target would result in “certain death” for Africa.⁴⁵ Ten billion dollars a year would not even “buy the poor nations the coffins.”⁴⁶ GHGs already in the atmosphere will increase global temperatures by 1.5°C, according to current projections.⁴⁷ Halting all emissions immediately may not be feasible,⁴⁸ but it is important to determine how much of the money will be from public funds, carbon markets, etc. It is crucial that the funds be additional to existing aid funding.⁴⁹ The Accord does not set forth a framework on carbon markets, calling instead for “various

⁴⁰ Robert Siegel, *All Things Considered: Climate Envoy: China, India Remain Stumbling Blocks* (NPR radio broadcast Dec. 17, 2009), <http://www.npr.org/templates/story/story.php?storyId=121576370>. US lead negotiator Stern points out that “the U.S. is the most innovative country in the world. We need to get our innovators working, develop a whole green tech set of industries. . .” *Id.*

⁴¹ *Copenhagen Accord*, *supra* note 21, at ¶ 3.

⁴² *Id.* at ¶¶ 4-5.

⁴³ *Id.* at ¶ 5.

⁴⁴ Jonathan Watts, *What Was Agreed at Copenhagen—and What was Left Out*, *GUARDIAN.CO.UK*, Dec. 19, 2009, <http://www.guardian.co.uk/environment/2009/dec/18/how-copenhagen-text-was-changed>.

⁴⁵ Geoffrey Lean, *Copenhagen: The Lessons We are Being Forced to Learn*, *TELEGRAPH.CO.UK*, Dec. 12, 2009, <http://www.telegraph.co.uk/earth/copenhagen-climate-change-confe/6791053/Copenhagen-the-lessons-we-are-being-forced-to-learn.html>.

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ *See id.*

⁴⁹ Suzanne Goldenberg, John Vidal, & Jonathan Watts, *Copenhagen Draft Text Reveals Deal is Still Out of Reach*, *GUARDIAN.CO.UK*, Dec. 18, 2009, <http://www.guardian.co.uk/environment/2009/dec/18/copenhagen-draft-text>.

approaches.”⁵⁰ President Obama notes that, “[t]his progress did not come easily, and we know that progress on this particular aspect of climate change negotiations is not enough.”⁵¹

Richard Black notes that the Copenhagen Accord is unlikely to cap global temperature rises at 2°C.⁵² In response to all the comments by world leaders that the Accord is a good first step, Richard Black reminds us: “problem is, Bali in 2007 was the ‘first step’; come to that, Rio in 1992 was the ‘first step’.”⁵³ Hugo Chavez notes that, “[i]n the streets, they are saying the following: if the climate was a bank, you would have already saved it.”⁵⁴ Evo Morales suggests that proposals be put to the people in a series of national referenda.⁵⁵ The New York Times notes that:

[t]he three-page accord that Mr. Obama negotiated with the leaders of China, India, Brazil and South Africa and then presented to the conference did not meet even the modest expectations that leaders set for this meeting, notably by failing to set a 2010 goal for reaching a binding international treaty to seal the provisions of the accord.⁵⁶

The Copenhagen Climate Conference will likely be remembered for a depressing scaling back of ambitions, resulting in a vague call for global

⁵⁰ See *Copenhagen Climate Deal Meets Qualified UN Welcome*, BBC NEWS, Dec. 19, 2009, <http://news.bbc.co.uk/2/hi/8422133.stm>.

⁵¹ *Id.*; see also Suzanne Goldenberg, John Vidal, & Allegra Stratton, *Copenhagen Heading for Meltdown as Stalemate Continues over Emission Cuts*, GUARDIAN.CO.UK, Dec. 18, 2009, <http://www.guardian.co.uk/environment/2009/dec/18/copenhagen-draft-treaty-meltdown>. Lydia Baker, Save the Children’s policy advisor, said: “By signing a sub-standard deal, world leaders have effectively signed a death warrant for many of the world’s poorest children. Up to 250,000 children from poor communities could die before the next major meeting in Mexico at the end of next year.” *Id.*

⁵² *Copenhagen Climate Deal Meets Qualified UN Welcome*, *supra* note 50.

⁵³ *Id.*

⁵⁴ *Newshour: In Copenhagen, Tensions Rise Inside and Outside Summit* (PBS television broadcast Dec. 16, 2009), available at http://www.pbs.org/newshour/bb/europe/july-dec09/copenhagen_12-16.html.

⁵⁵ Posting of Copenhagen Climate Change Summit Final Day Live Blog to <http://www.guardian.co.uk/environment/blog/2009/dec/18/copenhagen-climate-change-summit-liveblog> (Dec. 18, 2009 13:04 GMT).

⁵⁶ John M. Broder, *Many Goals Remain Unmet in 5 Nations’ Climate Deal*, N.Y. TIMES, Dec. 18, 2009, at A1; see also *Newshour: Shields and Brooks on Climate Deal, Senate Health Bill* (PBS television broadcast Dec. 18, 2009), available at http://www.pbs.org/newshour/bb/politics/july-dec09/sb_12-18.html; *Newshour: Leaders Reach Climate Accord, but Skepticism Remains* (PBS television broadcast Dec. 18, 2009), available at http://www.pbs.org/newshour/bb/environment/july-dec09/copenhagen1_12-18.html.

temperature rises not to exceed 2°C and a pledge of \$30 billion over the next three years (\$100 billion a year by 2020) for developing country adaptation and mitigation.⁵⁷ In the months leading up to the conference, doubt was raised that a binding agreement could be reached before December 2010.⁵⁸ A proposal attached to the Accord calls for a legally binding treaty to be agreed upon by the end of 2010.⁵⁹ For now, all the international community has to show for a substantial degree of hard work is a short political statement setting forth broad goals on targets and funding.⁶⁰

Africa consistently insisted upon deep emission reductions from developed countries and continued commitment to the Kyoto Protocol—the only legally binding instrument that requires specific emissions reductions by developed countries.⁶¹ Africa even jeopardized its growing economic ties with China if the latter tried to move away from the Kyoto Protocol.⁶² Developing countries responded to the Danish text in efforts to have geopolitically strategic countries herd the rest of the international community into a deal by noting the departure from the United Nations consensus-based process and the Kyoto Protocol.⁶³ Generally, by the time heads of state gather at international conferences, they sign off on completed texts.⁶⁴ By the time they arrived in Copenhagen, much of the Negotiating Text was still in brackets, indicating that it was still subject to dispute.⁶⁵ Environment ministers and heads of state were drawn into the 24-7 negotiations,⁶⁶ particularly tough for small developing country delegations no longer able to rely on NGO assistance to review the Negotiating Text once civil society was excluded from the forum. Developing countries succeeded in preventing

⁵⁷ Kevin Whitelaw, *Morning Edition: U.S., China Reach Tentative Climate Compromise* (NPR radio broadcast Dec. 19, 2009), available at <http://www.npr.org/templates/story/story.php?storyId=121600755>.

⁵⁸ Sarah Clarke, *Copenhagen Agreement in Doubt*, ABCNEWS.NET.AU, Oct. 5, 2009, <http://www.abc.net.au/news/stories/2009/10/05/2704591.htm>.

⁵⁹ Emma Graham-Harrison, *Main Points of the Copenhagen Accord*, REUTERS, Dec. 21, 2009, <http://www.reuters.com/article/idUSTRE5BL2M920091222>.

⁶⁰ See *Copenhagen Accord*, *supra* note 21.

⁶¹ Onyebuchi Ezigbo, *Africa: At Copenhagen, Africa Insists on Kyoto*, ALLAFRICA.COM, Dec. 15, 2009, <http://allafrica.com/stories/200912150693.html>.

⁶² Goldenberg et al., *Key Players*, *supra* note 36.

⁶³ Suzanne Goldenberg & Allegra Stratton, *From Dinner to Desperation: The 24-Hour Race for a Deal in Copenhagen*, GUARDIAN.CO.UK, Dec. 18, 2009, <http://www.guardian.co.uk/environment/2009/dec/18/copenhagen-race-for-a-deal>.

⁶⁴ See Jeffrey Ball, Stephen Power & Guy Chazan, *Talks in Deadlock Ahead of Leaders' Arrival—President Obama Makes Phone Calls to Lobby Other Countries as Pressure Rises to Reach a Face-Saving Agreement*, WALL ST. J., Dec. 17, 2009, at A10.

⁶⁵ *Id.*

⁶⁶ See *id.*

the Kyoto Protocol from being killed off.⁶⁷ Yet, Green Party leader Caroline Lucas notes that we have “[a]n empty accord with no legally binding framework, no targets, and no money guaranteed to be over and above existing aid budgets. It’s deeply disappointing.”⁶⁸ Negotiations must continue until a proper deal is struck. Ed Miliband explains that transparency will come when countries submit their target pledges.⁶⁹

It is worth proceeding with cautious optimism. One hundred and fifteen heads of state and government took the time to come to the Copenhagen Conference to address climate change.

Thanks to informal consultations led by UN Secretary-General Ban Ki-moon, the COP 15 agreed to take note of the Copenhagen Accord.⁷⁰ While the Accord includes a 2°C target, developed countries did not agree to legally-binding emission targets, nor did the international community set a global goal, such as eighty percent below 1990 emissions levels by 2050.⁷¹ Instead, the Accord relies upon a trickle-up approach listing an annex of 2020 country pledges.⁷² Yet, the Accord makes reference to a future temperature cap below 1.5°C.⁷³ While the basis for operationalizing funding via the Copenhagen Accord remains unclear, the instrument’s near and long-term financing constitutes one of the most important outcomes of the Copenhagen Conference. The Accord creates (1) the Copenhagen Green Climate Fund, (2) a High Level Panel under the COP to review implementation of funding, (3) a forestry mechanism on REDD-plus, and (4) a Technology Mechanism.⁷⁴

Inclusive international decision-making that involves a wide array of stakeholders in a participatory manner can avert increased tensions as equity is shunted to the side in the name of efficiency. The international community has faced collective action challenges in the past and has never been more economically interdependent. With this global perspective we can return to the full Negotiating Text and keep working until brackets are removed in a spirit of good faith and trust. Building on the financing

⁶⁷ Watts, *supra* note 44.

⁶⁸ *Climate Summit Most Chaotic Show on Earth—Miliband*, BBC NEWS, Dec. 20, 2009, <http://news.bbc.co.uk/2/hi/8423227.stm>.

⁶⁹ *Id.*

⁷⁰ *Sentiment Mixed on Copenhagen Accord*, UPI.COM, Jan. 5, 2010, http://www.upi.com/Science_News/Resource-Wars/2010/01/05/Sentiment-mixed-on-Copenhagen-accord/UPI-67761262710800/.

⁷¹ *See Copenhagen Accord*, *supra* note 21.

⁷² *Id.* at ¶ 4.

⁷³ *Id.* at ¶ 12.

⁷⁴ *Id.* at ¶¶ 9-11.

success of Copenhagen we can commit to targets that do not settle for wiping twenty percent of species off the planet. Transparency, representation, and public participation are procedural values of the UNFCCC process as instrumental as the substantive issues of mitigation, adaptation, funding, technology, carbon sinks, verification, etc. We have learned a great deal about the complexities involved in addressing climate change and must now re-learn the simple lessons of cooperation to achieve sustainable development.

II. TARGETS

The next climate agreement can combine “(1) fixed, binding emission reduction targets for developed countries, (2) binding dynamic targets for the wealthier developing countries and (3) voluntary targets for the least developed countries.”⁷⁵ Mitigation by developed countries should include specific emission reductions that account for that country’s national circumstances. Balancing equity and efficiency in relation to trading emissions permits and innovation cooperation can achieve sustainable development.⁷⁶

Global GHG emissions have increased by fifty percent since 1970 and are likely to grow by another fifty percent by 2030.⁷⁷ James Hansen, director of the NASA Goddard Institute for Space Studies, warns that the European carbon dioxide target of 550 ppm, the most conscientious to date, must be lowered to 350 ppm to avert catastrophic climate change.⁷⁸ Hansen explains that, “[i]f we follow business as usual I can’t see how west

⁷⁵ SWEDISH ENVTL. PROT. AGENCY, KYOTO AND BEYOND: ISSUES AND OPTIONS IN THE GLOBAL RESPONSE TO CLIMATE CHANGE 41 (2002), available at <http://www.e5.org/downloads/KyotoBeyondSwed.pdf>; see also Elizabeth Burleson, *ASIL Insights: The Bali Climate Change Conference*, AM. SOC’Y OF INT’L L., Mar. 18, 2008, <http://www.asil.org/insights/080318.cfm> [hereinafter Burleson, *ASIL Insights*]; Elizabeth Burleson, *Multilateral Climate Change Mitigation*, 41 U.S.F. L. REV. 373, 388-89 (2007).

⁷⁶ Burleson, *ASIL Insights*, *supra* note 75; see also CARBON MITIGATION INITIATIVE, THE STABILIZATION TRIANGLE: TACKLING THE CARBON AND CLIMATE PROBLEM WITH TODAY’S TECHNOLOGIES 4-7, http://www.summits.ncat.org/docs/Wedges_Concept_Game_Materials_2005.pdf (describing the Stabilization Triangle and how it balances strategies to reduce carbon emissions); Burleson, *supra* note 75, at 385-87 (discussing the Stabilization Triangle and how the concept promotes sustainable development).

⁷⁷ Krattivas Mukherjee, *U.N. Climate Chief Says Industry Keen On Deal*, REUTERS, Feb. 6, 2009, <http://www.reuters.com/article/idUSTRE5143WV20090205>.

⁷⁸ Ed Pilkington, *Climate Target is Not Radical Enough—Study*, GUARDIAN.CO.UK, Apr. 7, 2008, <http://www.guardian.co.uk/environment/2008/apr/07/climatechange.carbonemissions>.

Antarctica could survive a century. We are talking about a sea-level rise of at least a couple of metres this century.”⁷⁹ His silver lining is that fossil fuel reserves have been over-estimated, necessitating a swift transition to alternative energy sources irrespective of climate change.⁸⁰ Hansen notes that a moratorium on coal power stations could lower carbon dioxide levels to below 400 ppm.⁸¹ Al Gore has also called for a new global target of 350 ppm, noting that levels are already over 380 ppm, having increased from a pre-industrial revolution level of 280 ppm.⁸²

The International Energy Association notes that the next climate agreement must include the five major greenhouse gas emitters—China, US, EU, India, and Russia—who produce almost two-thirds of the world’s emissions.⁸³ Leadership is called for.

The United States Congress should show global leadership by enacting an economy-wide cap-and-trade program that auctions allowances and that equitably contributes to the global target of carbon emissions below 350 ppm. The International Union for Conservation of Nature (“IUCN”) called upon parties to conclude negotiations by the Conference of Parties in Copenhagen in 2009 to avert a gap between the first and second commitment period of the Kyoto Protocol.⁸⁴ The IUCN urged countries to commit to “binding quantified emission reduction targets by all developed countries in the upper range of 25% to 40% emission reductions below 1990 levels by 2020, and 80% to 95% below 1990 levels emission reductions by 2050.”⁸⁵ Developing countries should take on significant, measurable, and verifiable actions that are consistent with nationally appropriate mitigation actions and supported by capacity building and

⁷⁹ *Id.*

⁸⁰ *Id.*

⁸¹ *Id.*

⁸² David Adam, *Al Gore Calls for Tougher Global Limit on CO₂ Levels*, GUARDIAN.CO.UK, Dec. 12, 2008, <http://www.guardian.co.uk/environment/2008/dec/12/al-gore-carbon-emissions-poznan>.

⁸³ INT’L ENERGY ASS’N, WORLD ENERGY OUTLOOK 2008 EXECUTIVE SUMMARY 12 (2008), available at http://www.worldenergyoutlook.org/docs/weo2008/WEO2008_es_english.pdf.

⁸⁴ INT’L UNION FOR CONSERVATION OF NATURE, CLIMATE CHANGE MITIGATION: POSITION PAPER 1, http://cmsdata.iucn.org/downloads/unfccc_cop14_mitigation_pp_19_nov_08_final.pdf.

⁸⁵ *Id.*; see also David Adam, *Analysis: Has the Kyoto Protocol Worked?*, GUARDIAN.CO.UK, Dec. 8, 2008, <http://www.guardian.co.uk/environment/2008/dec/08/kyoto-poznan-environment-emissions-carbon>; Djekunkuye (za uvage), Dir. Gen., Int’l Union for Conservation of Nature, Closing Speech at U.N. Climate Convention Conference of the Parties (COP14) High-Level Segment (Dec. 12, 2008), available at http://cmsdata.iucn.org/downloads/julia_closing_speech_1.pdf (noting that “[h]ealthy ecosystems can also be efficient carbon sinks.”) *Id.*

financing in a measurable, reportable, and verifiable manner.⁸⁶ Technology cooperation should lower emissions while remaining mindful of biodiversity, ecosystem services, and livelihoods.⁸⁷ Climate resilient communities can be achieved with the support of global research, development, deployment, and diffusion of environmentally sound energy technologies and processes.⁸⁸

Ireland has pointed out that the latest IPCC report is dangerously out of date and that global carbon neutrality in the second half of the century is crucial.⁸⁹ The 2007 IPCC Report reflected political and scientific consensus between 2000 and 2005.⁹⁰ Much has since been discovered by the scientific community regarding the pace and scope of climate change.⁹¹ The UN negotiating process is tied to outdated IPCC results.⁹² Jonathon Porritt argues that the emerging new data necessitates an intermediate

⁸⁶ PEW CTR. ON GLOBAL CLIMATE CHANGE, FOURTEENTH SESSION OF THE CONFERENCE OF THE PARTIES TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE AND FOURTH SESSION OF THE MEETING OF THE PARTIES TO THE KYOTO PROTOCOL 3 (2008), available at <http://www.pewclimate.org/docUploads/PewCenterCOP14Summary.pdf>; *Toward a Post-2012 Climate Treaty: Select H. Comm. on Energy Independence and Global Warming*, 111th Cong. para 2 (2009) (statement of Elliot Diringer, Vice President, International Strategies, Pew Center on Global Climate Change), available at <http://www.pewclimate.org/testimony/diringer/02-04-09>; see also Burleson, *ASIL Insights*, *supra* note 75.

⁸⁷ INT'L UNION FOR CONSERVATION OF NATURE, *supra* note 84, at 3.

⁸⁸ CLIMATE ACTION NETWORK, SUBMISSION TO AWG-LCA ON FINANCE FOR MITIGATION AND LOW CARBON AND CLIMATE-RESILIENT DEVELOPMENT (2009), available at <http://unfccc.int/resource/docs/2008/smsn/ngo/093.pdf>. Public financing must also be utilized to support and encourage private financing. *Id.*

⁸⁹ Tomilola Akanle et al., *Summary of the Fourteenth Conference of Parties to the UN Framework Convention on Climate Change and Fourth Meeting of the Parties to the Kyoto Protocol: 1–12 December*, EARTH NEGOTIATIONS BULL., Dec. 15, 2008, at 16, available at <http://www.iisd.ca/download/pdf/enb12395e.pdf>.

⁹⁰ Jonathon Porritt, *Press the Panic Button*, GUARDIAN.CO.UK, Dec. 10, 2008, <http://www.guardian.co.uk/commentisfree/2008/dec/10/comment-porritt-poznan-copenhagen-environment>.

⁹¹ Cordelia Dean, *Even Before Its Release, World Climate Report Is Criticized as Too Optimistic*, N.Y. TIMES, Feb. 2, 2007, available at <http://www.nytimes.com/2007/02/02/science/02oceans.html> (noting that the Report does not include the most recent analysis concerning the rate at which Greenland's ice sheet is melting).

⁹² See Asheline Appleton et al., *Summary of the Thirteenth Conference of Parties to the UN Framework Convention on Climate Change and Third Meeting of Parties to the Kyoto Protocol: 3–15 December 2007*, EARTH NEGOTIATIONS BULL., Dec. 18, 2007, at 4, available at <http://www.iisd.ca/download/pdf/enb12354e.pdf> (discussing the presentation of the Fourth Assessment findings at the Bali Conference); Akanle, *supra* note 89, at 15 (noting that developing countries relied on the Fourth Assessment Report to recommend a “mid-term aggregate emission reduction range for Annex I parties of 25–40% by 2020.”).

IPCC review.⁹³ Porritt concludes that if governments can rapidly deliver multibillion-dollar rescue packages in response to bank collapses, then nothing prevents the international community from mobilizing sufficient funds to avert catastrophic climate change.⁹⁴

Similarly, Nichola Groom notes that the rapid population growth and urbanization rates, combined with the dependence upon climate altering fossil fuels, will remain problematic once attention has turned from the subprime meltdown.⁹⁵ The UN Deputy High Commissioner for Refugees, L. Craig Johnstone, explains that climate change is likely to displace six million people each year, forcing up to 250 million people to become refugees by 2050.⁹⁶ The total number of people uprooted in 2007 was sixty-seven million, of which twenty-five million were impacted by natural disasters.⁹⁷ Johnstone notes that, "[y]ou can expect that as you have droughts, as you have scarcity of resources . . . it will increase tensions and it will increase conflict."⁹⁸ The next climate agreement should include provisions for disaster funding, including increasing relief supplies ten to twenty fold.⁹⁹

III. FINANCE

The requisite cooperation in Mexico is still within political reach and has never been more necessary.¹⁰⁰ Political willpower to make funding available is clearly evident.¹⁰¹ India urged the international community

⁹³ Porritt, *supra* note 90 ("[T]he Arctic . . . has seen a 4°C rise in average temperatures over the past few decades. Arctic sea ice reached an all-time low in 2007, the Greenland ice cap is undergoing accelerated melting, and there are growing worries about the melting of the Siberian permafrost . . .").

⁹⁴ *Id.*

⁹⁵ Nichola Groom, *Funding Becoming Harder To Get For Green Startups*, REUTERS, Oct. 27, 2008, <http://www.reuters.com/article/idUSTRE49N3SA20081024>.

⁹⁶ Megan Rowling, *U.N. Says Climate Change May Uproot 6 Million Annually*, REUTERS, Dec. 9, 2008, available at <http://planetark.org/wen/50823>; see also Andrew Dobbie, *Climate Change Could Force Millions from Homes*, REUTERS, Oct. 10, 2008, <http://www.reuters.com/article/idUSTRE497BQK20081008> (noting that it is more likely that low-income persons will be displaced and human trafficking networks could benefit from the serious environmental situations).

⁹⁷ Rowling, *supra* note 96, at 1.

⁹⁸ *Id.*

⁹⁹ See *id.*

¹⁰⁰ Oxfam International, *Oxfam Analysis of the Poznan Conference Outcomes* (Dec. 13, 2008), available at <http://www.oxfam.org/en/pressroom/pressrelease/2008-12-13/oxfam-analysis-poznan-conference-outcomes>.

¹⁰¹ Gerard Wynn, *"Green Growth" Puts Climate Spending in Focus*, REUTERS, Feb. 6, 2009, <http://www.reuters.com/article/idUSTRE5145X520090205>.

not to allow the financial crisis to push climate change aside, noting the ease with which funds were mobilized to avert economic meltdown.¹⁰² Oxfam called upon Copenhagen delegates to ramp up adaptation funding and distribute money via democratically accountable and transparent UNFCCC mechanisms.¹⁰³ The two percent levy on carbon trading through the UN Clean Development Mechanism has generated roughly eighty million dollars, which is far less than what is needed to address climate change.¹⁰⁴ Seeking environmental justice, developing countries urge the international community to offer them funds with which to adapt to climate change that they did not cause.¹⁰⁵

The World Economic Forum explains that environmentally sound energy investment must more than triple to \$515 billion a year to avert catastrophic climate change.¹⁰⁶ Fiscal stimulus packages can invest in wind, solar, waste-to-energy, second-generation biofuels, and geothermal power.¹⁰⁷ The United Nations Environment Program ("UNEP") predicts that more than eight thousand Clean Development Mechanism projects will be operational "or in the pipeline by 2012," making \$25–30 billion USD available to developing countries.¹⁰⁸

Yvo de Boer called upon delegates at the Fourteenth Conference of the Parties in Poland to increase the effectiveness and geographical scope of the Clean Development Mechanism.¹⁰⁹ He also urged the international community to "fully operationaliz[e] the Adaptation Fund to

¹⁰² David Adam et al., *Planet Under Pressure*, GUARDIAN.CO.UK, Dec. 8, 2008, available at <http://www.guardian.co.uk/environment/2008/dec/08/poznan-environment-climate-change2> (noting that, "[t]he Indian government has repeatedly pointed out that developed countries promised under the United Nations framework convention on climate change, adopted in 1992, that poor countries would get cash and knowhow to deal with climate change."). *Id.*

¹⁰³ Press Release, Oxfam International, *supra* note 100.

¹⁰⁴ Richard Black, *Mood Mixed as Climate Summit Ends*, BBC NEWS, Dec. 13, 2008, <http://news.bbc.co.uk/2/hi/science/nature/7781022.stm>.

¹⁰⁵ John Vidal, *Wetter and Wilder: the Signs of Warming Everywhere*, GUARDIAN.CO.UK, Dec. 10, 2008, <http://www.guardian.co.uk/environment/2008/dec/10/poznan-brazil-climate-change-environment>.

¹⁰⁶ Simon Jessop, *Clean Energy Spending Needs to More Than Triple: Report*, REUTERS, Jan. 30, 2009, <http://www.reuters.com/article/idUSTRE50S3KY20090129>.

¹⁰⁷ *Id.*

¹⁰⁸ Anna Mudeva and Michael Szabo, *U.N. Climate Talks to Speed CO2 Offset Approval*, REUTERS, Dec. 12, 2008, <http://www.reuters.com/article/idUSTRE4BA60S20081211>. The approval process for these projects, however, takes about two years. *Id.*

¹⁰⁹ Yvo de Boer, Executive Sec'y, UNFCCC, Statement at the Opening of the Fourteenth Session of the Conference of the Parties (COP 14) (Dec. 1, 2008), available at http://unfccc.int/files/press/news_room/statements/application/pdf/081201_statement_open_cop14.pdf.

enable it to receive concrete project proposals as of next year” and increase the funding by sharing proceeds to other mechanisms under the Kyoto Protocol.¹¹⁰

In Poland, the COP/MOP rendered the Adaptation Fund operational.¹¹¹ Since the Adaptation Fund generates proceeds via a levy on developing country projects rather than developed world donations, developing countries insisted that the fund board have the capacity to distribute funds rather than the Global Environment Facility.¹¹² While this was a successful argument, agreement to expand the sources of financing stalled.¹¹³ Future meetings may reassess expanding the adaptation levy to the Kyoto Protocol’s emissions trading mechanisms.¹¹⁴

IV. COPENHAGEN AND BEYOND

A. *A Shared Vision*

The international community is working towards a shared vision for long-term cooperative action to address climate change. The Ad Hoc Working Group on Long-Term Cooperative Action under the UNFCCC released a Negotiating Text on May 19, 2009.¹¹⁵ The Negotiating Text reflects unresolved material by numbering distinct options, enclosing variations among similar proposals in curly brackets, and footnoting alternative terms.¹¹⁶ Explanatory paragraphs clarify specific issues and are italicized to distinguish them from substantive paragraphs of the Negotiating Text.¹¹⁷ In this manner consensus is built and forums facilitate final treaty language.

The Negotiating Text’s four chapters encompass all aspects of the Bali Action Plan: “I. A shared vision for long-term cooperative action;

¹¹⁰ *Id.*

¹¹¹ *Id.*

¹¹² PEW CENTER ON GLOBAL CLIMATE CHANGE, *supra* note 86, at 4.

¹¹³ *Id.* at 3–4.

¹¹⁴ Akanle at al., *supra* note 89, at 18.

¹¹⁵ UNFCCC, June 1–12, 2009, *Negotiating Text*, 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*]. It is important to note “[t]he depth of coverage of each element of the Bali Action Plan in this Negotiating Text varies according to the depth of consideration that each has received to date.” *Id.* at intro., ¶ 5. For example, the Parties have not fully clarified their position on how to incorporate their goals for adaptation, mitigation, technology, and financing. *Id.*

¹¹⁶ *Id.* at intro., ¶ 7.

¹¹⁷ *Id.* at intro., ¶ 11.

II. Enhanced action on adaptation; III. Enhanced action on mitigation; IV. Enhanced action on financing, technology and capacity-building.”¹¹⁸ The legal form of the agreed outcome of the Bali Action Plan remains undecided.¹¹⁹ Using generic language that focuses on substance, the Negotiating Text seeks to remain neutral on the form of the agreed outcome.¹²⁰

Deep cuts in global greenhouse gas emissions are needed to avert further climate destabilization.¹²¹ The Negotiating Text notes that “[a]n economic transition is needed that shifts global economic growth patterns towards a low-emission economy based on more sustainable production and consumption, promoting sustainable lifestyles and climate-resilient development while ensuring a just transition of the workforce.”¹²² The outcome at Mexico must remain mindful of the UNFCCC commitments to “common but differentiated responsibilities and respective capabilities, as well as the precautionary principle.”¹²³ Outlining a review process, as well as peaks and pathway medium-term goals, remains crucial.¹²⁴ Parties have debated whether the long-term global goal for emission reductions should be set at atmospheric greenhouse gas concentrations of 350 or 450 ppm carbon dioxide equivalent (“CO₂ eq”) and a temperature increase limited to one or two degrees Celsius above the pre-industrial level.¹²⁵ The 2°C commitment would require parties to collectively reduce global emissions by fifty percent from 1990 levels by 2050 while the 1°C commitment would require parties to collectively reduce global emissions by roughly eighty-five percent from 1990 levels by 2050.¹²⁶

Inclusion of historical responsibility, emission debt, and per capita accumulative emission convergence have been advocated by developing countries upon the grounds of equitable allocation of global atmospheric resources.¹²⁷ Emission pathways for global GHG emissions should peak between 2010 and 2015 and decrease thereafter.¹²⁸ Developed countries,

¹¹⁸ *Id.* at intro., ¶ 12.

¹¹⁹ *Id.* at intro., ¶ 20.

¹²⁰ *Id.* at intro., ¶ 18. Parties differed on what the legal form of the final agreement would be. *Id.* at intro., ¶¶ 16–18.

¹²¹ *Negotiating Text*, *supra* note 115, at ch. I, ¶ 3.

¹²² *Id.* at ch. I, ¶ 4. This transition necessitates the participation and cooperation of all the parties. *Id.*

¹²³ *Id.* at ch. I, ¶ 7.

¹²⁴ *Id.* at ch. I, ¶ 9.

¹²⁵ *Id.* at ch. I, ¶ 12.

¹²⁶ *Id.* at ch. I, ¶ 12.

¹²⁷ *Negotiating Text*, *supra* note 115, at ch. I, ¶ 12.

¹²⁸ *Id.* at ch. I, ¶ 13.

as a group, would be asked to reduce their GHG emissions by at least forty percent from 1990 levels by 2020 and by more than ninety-five percent by 2050.¹²⁹ Developed countries will also need to help developing countries, through technology, financing, and capacity building, to reduce GHG emissions fifteen to thirty percent below the baseline by 2020.¹³⁰ Periodic reviews of the overall progress toward the UNFCCC goals and inclusive, fair, and effective mitigation and adaptation can keep pace with the best available scientific information.¹³¹

B. *Mitigation*

Great debate continues over quantified emission limitation and reduction objectives, such as how many tons of CO₂ equivalent as a unit of comparability will each developing country agree to become legally bound to mitigating.¹³² Beyond magnitude, controversy persists regarding developing country commitments in relation to form and legal effect.¹³³ Care must be taken to ensure coherence with relevant provisions of the Kyoto Protocol and related decisions applying to the first commitment period.¹³⁴ For instance, countries should not weaken commitments in relation to time frames and use of base year.¹³⁵

Language in the Negotiation Text that has been agreed upon is un-bracketed while language still in dispute is encased in brackets. Some of the objective criteria that parties have suggested should be used to determine country-specific commitments include:

- (a) Historical responsibility for {emissions} {global temperature increase};
- (b) National and regional development priorities;
- (c) Natural and geographical characteristics; resource endowment;
- (d) Availability of low-carbon energy supply options and opportunities for fuel switching;

¹²⁹ *Id.* at ch. I, ¶ 14.

¹³⁰ *Id.* at ch. I, ¶ 15.

¹³¹ *Id.* at ch. I, ¶¶ 16–17.

¹³² *See id.* at ch. III, ¶ 56(a); *see also id.* at ch. III, ¶ 63 (requiring each developed country to regularly provide updates to their detailed schedules, commitments, and national measures).

¹³³ *See Negotiating Text*, *supra* note 115, at ch. III, ¶ 56(b).

¹³⁴ *Id.* at ch. III, ¶ 56(c).

¹³⁵ *Id.* at ch. III, ¶ 56(d).

- (e) {Trends in} emissions {per capita}, {per unit of gross domestic product (GDP)}, {per energy unit}{and population trends};
- (f) Domestic mitigation potential and mitigation costs, aggregate {and marginal} economic costs, domestic achievement of emission reduction and per capita effort;
- (g) Sector-specific circumstances and sectoral energy efficiency and GHG intensity;
- (h) Degree of access to flexibility mechanisms;
- (i) Relative size of the economy; ability to pay, {and economic and technological capacity};
- (j) Extent of transition to a market economy;
- (k) Position on the human development index.¹³⁶

Establishing a technical panel on comparability could provide comprehensive and transparent technical assessment that is consistent and objective.¹³⁷

Another area of controversy surrounds the percentage of emission reductions that developed countries allocate to domestic action rather than obtained from developing country parties.¹³⁸ Some parties advocate that acquisition of emission reduction units from developing countries should be supplemental, representing no more than ten percent of a developed country's commitment and that the remainder should exclusively derive from domestic actions.¹³⁹ The use of flexibility mechanisms again raises the issue as to whether a new compliance, measurement, and/or reporting institution should be established.¹⁴⁰

Developing countries shall agree to Nationally Appropriate Mitigation Actions ("NAMAs") including:

- (a) Sustainable development policies and measures;
- (b) Low-emission development strategies and plans;

¹³⁶ *Id.* at ch. III, ¶ 57.

¹³⁷ *Id.* at ch. III, ¶ 58 (noting that the panel will consider each country's national circumstances and report to the COP). Other unresolved issues include whether to regulate aviation and marine bunker fuels. *Id.* at ch. III, ¶¶ 135–38. The Negotiating Text states that parties must take steps to reduce emissions from bunker fuels and meet their agreed upon targets by 2011. *Id.* at ch. III, ¶ 137.

¹³⁸ *See Id.* at ch. III, ¶ 65.

¹³⁹ *Negotiating Text*, *supra* note 115, at ch. III, ¶ 65.

¹⁴⁰ *Id.* at ch. III, ¶¶ 68–69.

- (c) Programmatic CDM, technology deployment programmes or standards, energy efficiency programmes and energy pricing measures;
- (d) Cap-and-trade schemes and carbon taxes;
- (e) Sectoral targets, national sector-based mitigation actions and standards, and no-lose sectoral crediting baselines;
- (f) REDD-plus activities and other mitigation actions implemented in different areas and sectors, including agriculture.¹⁴¹

NAMAs can be any actions defined by developing country parties in the context of Articles 4.1(b) and 12.4 of the UNFCCC¹⁴² that do not generate offsets for developed country parties.¹⁴³ The Negotiating Text states that developed countries have a responsibility to show leadership by committing to mitigation efforts and supporting developing countries' NAMAs through funding and technology transfers.¹⁴⁴ Developing country actions must be undertaken in a "measurable, reportable and verifiable manner."¹⁴⁵ Debate continues to rage regarding the scope of the verification process.¹⁴⁶

A program on rapid, near-term climate mitigation will address reducing emissions from black carbon (soot) and other substances that are short-lived in the atmosphere.¹⁴⁷ The phase-down of hydrofluorocarbons ("HFCs") can also be part of this program.¹⁴⁸ The parties will have to determine how to prevent double counting of emissions reductions.¹⁴⁹

¹⁴¹ *Id.* at ch. III, ¶ 73. REDD-plus refers to "issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries." *Id.* at ch. III, n. 19.

¹⁴² UNFCCC, *supra* note 14, at art. 4, ¶ 1(b) (requiring countries to implement national and regional climate change mitigation programs); UNFCCC, *supra* note 14, at art. 12, ¶ 4 (noting developing countries can voluntarily propose funding projects and should estimate all costs and benefits of reducing emissions).

¹⁴³ *Negotiating Text*, *supra* note 115, at ch. III, ¶ 72.

¹⁴⁴ *Id.* at ch. I, ¶ 5.

¹⁴⁵ *Id.* at ch. III, ¶ 71 (noting that the extent of the NAMAs taken by developing countries will depend on the financial and technological support given from developed countries).

¹⁴⁶ *See id.* at ch. III, ¶¶ 94–96. Parties debate between verification to include international auditing of all mitigation and solely for internationally facilitated mitigation by developing countries. *Id.* at ch. III, ¶¶ 94–95.

¹⁴⁷ *Id.* at ch. III, ¶ 144.

¹⁴⁸ *Id.*

¹⁴⁹ *Negotiating Text*, *supra* note 115, at ch. III, ¶ 146.

C. *Adaptation*

Wet regions of the world will become wetter and dry regions will become dryer, according to the Intergovernmental Panel on Climate Change.¹⁵⁰ Former UK chief scientist Sir David King notes that:

[i]t's all very well to demonstrate that we can land a craft on Mars, it's all very well to discover whether or not there is a Higgs boson (a potential mass mechanism); but I would just suggest that we need to pull people towards perhaps the bigger challenges where the outcome for our civilisation is really crucial.¹⁵¹

A comprehensive, cooperative adaptation framework can support national adaptation plans that facilitate climate-resilient development.¹⁵² Each country should implement early warning systems, disaster risk reduction strategies, and risk management plans.¹⁵³ The Negotiating Text points out "[t]he adverse effects of climate change will be felt most acutely by those segments of the population who are already in vulnerable situations owing to factors such as geography, poverty, gender, age, indigenous or minority status and disability."¹⁵⁴ Results-based, country-driven adaptation will need to involve all relevant stakeholders in decision-making.¹⁵⁵ Special emphasis should be directed towards facilitating adaptation in least developed countries ("LDCs") and small island developing States ("SIDS").¹⁵⁶

¹⁵⁰ Intergovernmental Panel on Climate Change [IPCC], *Technical Paper on Climate Change and Water*, at 32, IPCC-XXVIII/Doc.13 (Apr. 9, 2008), available at <http://www.ipcc.ch/meetings/session28/doc13.pdf>.

¹⁵¹ Jonathan Amos, 'Climate Crisis' Needs Brain Gain, BBC NEWS, Sept. 8, 2008, <http://news.bbc.co.uk/2/hi/science/nature/7603257.stm>.

¹⁵² The Negotiating Text, for example, recommends "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." *Negotiating Text*, *supra* note 115, at ch. II, ¶ 24(h).

¹⁵³ See *id.* at ch. II, ¶ 39.

¹⁵⁴ *Id.* at ch. I, ¶ 2.

¹⁵⁵ *Id.* at ch. II, ¶ 22(d).

¹⁵⁶ *Id.* at ch. II, ¶ 22(j)(i). In addition to LDCs and SIDS, support should be directed to: countries in Africa affected by drought, desertification and floods; . . . low-lying and other small island countries, countries with low-lying coastal, arid and semi-arid areas or areas liable to floods, drought and

Adaptation measures will need to be based on emerging and traditional “sound scientific and technological knowledge.”¹⁵⁷ Approaches to adaptation should also be environmentally sound, informed by the best science, as well as sensible from a financial and sustainability standpoint.¹⁵⁸ On-the-ground results will come from “predictable, sustainable, timely, adequate and stable financial resources” on top of official development assistance (“OAD”).¹⁵⁹ Parties will be asked to implement integrated best practices¹⁶⁰ consistent with such international instruments as the United Nations Convention to Combat Desertification, the Convention on Biological Diversity, and the United Nations Declaration on the Rights of Indigenous Peoples.¹⁶¹ Periodic reviews¹⁶² of national adaptation plans should assess and update measures for migration/relocation of climate refugees, increasing resilience through economic diversification, and creation/transfer of adaptation technologies.¹⁶³

1. Climate Resilience

Heat is the leading weather-related killer.¹⁶⁴ The 2003 heat wave killed seventy thousand,¹⁶⁵ including roughly fifteen thousand people in France alone.¹⁶⁶ As Europe warms faster than the world average, countries

desertification, archipelagic countries, and developing countries with fragile mountainous ecosystems; [and] . . . countries with unique biodiversity, tropical glaciers and fragile ecosystems . . .

Id. at ch. II, ¶ 31(b).

¹⁵⁷ *Id.* at ch. II, ¶ 22(k).

¹⁵⁸ See *Negotiating Text*, *supra* note 115, at ch. II, ¶ 22(a)(iii).

¹⁵⁹ *Id.* at ch. II, ¶ 22(c).

¹⁶⁰ *Id.* at ch. III, ¶ 129(f) (stating developed countries should identify the best practices and best available technologies and encourage developed parties to engage in innovation cooperation).

¹⁶¹ *Id.* at ch. II, ¶ 22(i). The Text also 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.

¹⁶² *Id.* at ch. I, ¶ 26 (suggesting reviews every three to four years).

¹⁶³ *Id.* at ch. I, ¶ 25(c)–(e).

¹⁶⁴ John Holusha, *Scorching Heat Blankets East Coast*, N.Y. TIMES, June 10, 2008, available at <http://www.nytimes.com/2008/06/10/us/09cnd-weather.html?partner=rssnyt&emc=rss>.

¹⁶⁵ Angus MacSwan, *FACTBOX—Impacts of Climate Change in Europe*, REUTERS, Sept. 30, 2008, <http://www.reuters.com/article/idUSTRE48R4GW20080928>.

¹⁶⁶ Jeremy Lovell, *London Mayor Unveils Climate Crisis Plan*, REUTERS, Sept. 1, 2008, <http://www.reuters.com/article/idUSLT35340420080829>.

need to strengthen health systems and measures to enable communities to adapt.¹⁶⁷ US cities like Phoenix also experience “killer heat.”¹⁶⁸

The impacts of climate change are being recognized as a public health crisis.¹⁶⁹ The World Health Organization (“WHO”) states “climate change is forcing societies to consider fundamental changes in how they supply energy, transport, housing, food and water.”¹⁷⁰ Global economic prosperity has hastened the rate of climate change.¹⁷¹ Population growth has also contributed by increasing the demand for energy, food, water, and the use of natural resources.¹⁷² Global population has increased “from 5 billion in 1987 to 6.7 billion in 2007”¹⁷³ and will likely hit seven billion by 2012.¹⁷⁴ The World Watch Institute notes that:

¹⁶⁷ MacSwan, *supra* note 165 (noting that human health is seriously compromised by climate change).

¹⁶⁸ Tim Egan, *Why Forest Fires Are Spreading*, Sept. 7, 2007, http://news.bbc.co.uk/2/hi/uk_news/magazine/6983960.stm.

Since 1970, the annual average temperature in the Northeast has increased by 2°F, with winter temperatures rising twice this much.

Over the next several decades, temperatures in the Northeast are projected to rise an additional 2.5 to 4°F in winter and 1.5 to 3.5°F in summer.

U.S. GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 107 (2009), available at <http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf>.

¹⁶⁹ See Deborah Zabarenko, *Climate Change Said to Be a Public Health Issue*, REUTERS, Nov. 6, 2007, <http://www.reuters.com/article/idUSN06412398>; see also Alister Doyle, *Climate Experts to Help Fight Africa's Meningitis*, REUTERS, Nov. 6, 2007, <http://www.reuters.com/article/idUSL0604545120071106> (“Climate and health experts are teaming up to combat meningitis in Africa, fearing that creeping desertification and dust storms will aid a disease that thrives where people suffer from sore throats.”).

¹⁷⁰ WORLD HEALTH ORG., PROTECTING HEALTH FROM CLIMATE CHANGE: GLOBAL RESEARCH PRIORITIES 1 (2009), available at http://www.searo.who.int/LinkFiles/World_Health_Day_2008_Madrid_report_130509.pdf [hereinafter PROTECTING HEALTH FROM CLIMATE CHANGE]. WHO notes that, “a better understanding is required of how key groups of decision-makers—from national policy-makers, to public health professionals, to individual citizens—perceive the health risks posed by climate change, and the kinds of information that would help them to take effective action.” *Id.* at 14.

¹⁷¹ Michael Perry, *Greenhouse Gas Emissions Hit Danger Mark*, REUTERS, Oct. 9, 2007, <http://www.reuters.com/article/idUSSYD29548220071010>.

¹⁷² UNITED NATIONS ENV'T PROGRAMME, GLOBAL ENVIRONMENT OUTLOOK: GEO4 ENVIRONMENT FOR DEVELOPMENT 21 (2007), available at http://www.unep.org/geo/geo4/report/GEO-4_Report_Full_en.pdf [hereinafter GLOBAL ENVIRONMENT OUTLOOK: GEO4].

¹⁷³ *Id.*

¹⁷⁴ *World Population to Reach 7 Billion in 2012*, USA TODAY, June 19, 2008, available at http://www.usatoday.com/news/world/2008-06-19-worldpopulation_N.htm?loc=

[a] comprehensive climate agreement would acknowledge both the impacts of climate change on vulnerable populations and the long-term contribution that slower growth and a smaller world population can play in reducing future emissions under an equitable climate framework. And it should renew the commitment that the world's nations made in 1994 to address population not by pressuring parents to have fewer or more children than they want but by meeting the family planning, health, and educational needs of women.¹⁷⁵

Climate change, acting as a “multiplier of existing health risks,”¹⁷⁶ requires coordinated efforts to increase the efficiency of water use, deal with infectious disease transmission caused by the presence of dams, and address food security impacts of the rapid development of biofuels.¹⁷⁷

Loss of life due to air pollution is substantially worse than that due to car accidents.¹⁷⁸ The European Environment Agency warns that “air pollution has cut the average life expectancy of Europeans by nearly a year and contributes to the premature deaths of hundreds of thousands of people annually.”¹⁷⁹ Climate change is also likely to increase the toxicity of poison ivy, the pollen distribution of ragweed, and the range of pests.¹⁸⁰

interstitialskip. This is a significant population increase in a relatively short time. *Id.* (“By comparison, the number of people didn’t reach 1 billion until 1800 . . . [i]t didn’t reach 2 billion until 130 years later.”).

¹⁷⁵ Christopher Flavin & Robert Engelman, *The Perfect Storm*, in THE WORLD WATCH INSTITUTE, 2009 STATE OF THE WORLD: INTO A WARMING WORLD 10 (2009), available at <http://www.worldwatch.org/node/5984>.

¹⁷⁶ PROTECTING HEALTH FROM CLIMATE CHANGE, *supra* note 170, at 6.

¹⁷⁷ *Id.* at 12.

¹⁷⁸ *Pollution Seen Deadlier Than Car Crashes in Europe*, REUTERS, Oct. 10, 2007, <http://www.reuters.com/article/idUSL1021191920071010>; see also Megan Rauscher, *Air Pollution Raises Preterm Birth Risk*, REUTERS, Nov. 1, 2007, <http://www.reuters.com/article/idUSPAR17031820071102> (“Women who live in areas with high levels of air pollution are 10 to 25 percent more likely to suffer preterm births than women living in less polluted areas.”). *Id.*

¹⁷⁹ *Pollution Seen Deadlier Than Car Crashes in Europe*, *supra* note 178; see also *Pollution Linked to Appendicitis*, BBC NEWS, Oct. 6, 2008, <http://news.bbc.co.uk/2/hi/health/7654140.stm>; see also Green Spaces ‘Reduce Health Gap,’ BBC NEWS, Nov. 7, 2008, <http://news.bbc.co.uk/2/hi/health/7714950.stm> (noting that access to greenery can lower risks of strokes and heart disease).

¹⁸⁰ Shaila Dewan, *Feeling Warmth, Subtropical Plants Move North*, N.Y. TIMES, May 3, 2007, available at <http://www.nytimes.com/2007/05/03/science/03flowers.html>.

Biodiversity is also dwindling around the globe. Endangered newspapers tell of disappearing seabirds¹⁸¹ and drowning wildebeest.¹⁸² Global warming is threatening many species of trees in the United States.¹⁸³ The concept of invasive species may not be useful as many species expand and retreat in response to climate change.¹⁸⁴ The potato famine should have taught humanity a powerful lesson regarding dependence upon a single food source, yet the global livestock industry is based on a few northern breeds.¹⁸⁵ Approximately half the jobs worldwide rely on fisheries, forestry or agriculture.¹⁸⁶ "Non-sustainable use of natural resources, including land, water, forests and fisheries, can threaten individual livelihoods as well as local, national and international economies."¹⁸⁷

Climate change is increasing ailments from migraines¹⁸⁸ to malaria.¹⁸⁹ The WHO continues to support the use of DDT while exploring alternatives. The Wall Street Journal notes that:

[d]espite the good track record of DDT in controlling malaria, we need to find alternative control options because evolutionary forces predispose DDT resistance. In addition,

¹⁸¹ *'Disastrous' Season for Seabirds*, BBC NEWS, July 18, 2007, http://news.bbc.co.uk/2/hi/uk_news/scotland/highlands_and_islands/6904338.stm ("We're fairly certain that on the east coast, rising sea temperatures are leading to plankton regime shifts, which in turn affects fish like sand eels—a major food source for seabirds.").

¹⁸² *Thousands of Wildebeest Perish in Kenya*, REUTERS, Oct. 10, 2007, <http://www.reuters.com/article/idUSPAR05048720071011> (blaming deforestation for "changing weather patterns and affecting tide levels .").

¹⁸³ See Dewan, *supra* note 180.

By the end of the century, the climate will no longer be favorable for the official state tree or flower in 28 states . . . [because] many bands of the country are a full zone warmer, and a few spots are two zones warmer, than they were in 1990, when the map was last updated.

Id.

¹⁸⁴ David Dodman et al., *Building Resilience*, in THE WORLD WATCH INSTITUTE, 2009 STATE OF THE WORLD: INTO A WARMING WORLD 156 (2009), available at <http://www.worldwatch.org/node/5984>.

¹⁸⁵ *Livestock Breeds Face Meltdown*, BBC NEWS, Sept. 3, 2007, <http://news.bbc.co.uk/2/hi/science/nature/6976322.stm>.

¹⁸⁶ GLOBAL ENVIRONMENT OUTLOOK: GEO4, *supra* note 172, at 4.

¹⁸⁷ *Id.*; see also UK COMMITTEE FOR UNICEF, OUR CLIMATE, OUR CHILDREN, OUR RESPONSIBILITY: THE IMPLICATIONS OF CLIMATE CHANGE FOR THE WORLD'S CHILDREN 12 (2008), available at <http://www.unicef.org.uk/campaigns/publications/pdf/climate-change.pdf>.

¹⁸⁸ Michael Kahn, *Warm Weather Could Cause Migraines, Study Finds*, REUTERS, Mar. 10, 2009, <http://uk.reuters.com/article/idUKTRE5286E720090309>.

¹⁸⁹ UK COMMITTEE FOR UNICEF, *supra* note 187, at 15. Malaria is affected by changing environmental factors such as temperature and humidity. *Id.*

the persistence of DDT in the environment affects non-target organisms as well as food and water supplies. . . . [H]igh levels of serum DDT predicted a statistically significant five-fold increased risk of breast cancer among women who were born after 1931. DDT is dangerous and should be treated as such. To relieve the burden of malaria, we need an arsenal of interventions suitable to local variations in climate, environment, human behavior and practices. Where malaria control is particularly difficult, DDT will remain an option but its use must be carefully controlled by regulatory authorities.¹⁹⁰

As desertification and climate change expand arid regions, hundreds of millions of tons of dust regularly reach the United States from Africa and Asia, carrying pesticide residues, pollens, feces, and industrial chemicals.¹⁹¹

2. Desertification

*With 200 million people projected to become environmentally-induced migrants by 2050, land degradation threatens national and regional stability.*¹⁹²

Desertification resulting from climate change and intensive agriculture within a decade will likely force fifty million people to flee their homes.¹⁹³ Increased arid conditions are likely to impact one-third of

¹⁹⁰ *Considering Which Is the Greater Threat*, WALL ST. J., Nov. 19, 2007, at A16 (noting the DDT campaign ended “in 1969 due to insecticide resistance developed by malaria mosquitoes. Resistance to insecticides is based on genetic changes, or mutations, that will eventually develop in insects exposed to insecticides.”); see also *Floods Raise Disease Risk in West Africa*—WHO, REUTERS, Aug. 20, 2008, <http://www.reuters.com/article/idUSLJ588005.CH.2400> (noting that flooding in West Africa increases the risk of cholera and other deadly diseases).

¹⁹¹ Doug Struck, *Dust Storms Overseas Carry Contaminants to U.S. Scientists Study Whether Diseases Are Also Transported*, WASH. POST, Feb. 6, 2008, available at <http://www.washingtonpost.com/wp-dyn/content/article/2008/02/05/AR2008020502950.html> (stating that a significant amount of particles in US air come from other continents).

¹⁹² *Desertification Poses Security Risks, Ban Warns on World Day*, UN NEWS, June 17, 2009, [http://www.un.org/apps/news/story.asp?NewsID=31171&Cr=desertification&Cr1=\[hereinafter Desertification Poses Security Risks\]](http://www.un.org/apps/news/story.asp?NewsID=31171&Cr=desertification&Cr1=[hereinafter Desertification Poses Security Risks]) (noting that “[o]ne-third of the Earth’s surface is affected by desertification, endangering the livelihoods and development of up to 1 billion people.”).

¹⁹³ Danny Wood, *UN Desertification Budget Setback*, BBC NEWS, Sept. 15, 2007, <http://news.bbc.co.uk/2/hi/africa/6996478.stm> (explaining that there is a close relationship

humanity.¹⁹⁴ Solar cookers save women and children time and energy gathering biomass, as well as mitigating desertification.¹⁹⁵ Tree-planting programs can help reverse desertification but must be carried out in keeping with water availability.¹⁹⁶ "If we want to tackle climate change challenges, we must look to the untapped potential of the soil to sequester carbon," according to Luc Gnacadja, Executive Secretary of the UN Convention to Combat Desertification ("UNCCD").¹⁹⁷ As oceans become more saturated, the soil's role as a carbon sink will become more important.¹⁹⁸ For instance, grasslands in the United States are crucial carbon sinks.¹⁹⁹

between climate change and desertification); see also Rowling, *supra* note 96 (noting that the UN estimates climate change could uproot over six million people annually).

¹⁹⁴ *UN Issues Desertification Warning*, BBC NEWS, June 28, 2007, <http://news.bbc.co.uk/2/hi/africa/6247802.stm>; see also UK COMMITTEE FOR UNICEF, *supra* note 187, at 14 (explaining the lifelong health consequences of drought for children). Further, a small 2°C temperature increase would put an additional 30 to 200 million people at risk for hunger and a 3°C increase could lead 550 million people to be at risk. *Id.*

¹⁹⁵ UK COMMITTEE FOR UNICEF, *supra* note 187, at 33. "With forests storing 283 gigatonnes of carbon in their biomass alone, curbing deforestation—and re-planting trees—is a highly effective way to reduce carbon emissions." *Id.* at 32; see also Yinka O. Omorogbe, *Promoting Sustainable Development through the Use of Renewable Energy: The Role of the Law*, in BEYOND THE CARBON ECONOMY: ENERGY LAW IN TRANSITION 42 (Donald N. Zillman et al. eds., Oxford University Press 2008) ("Gathering biomass is an arduous task done mainly by women and children. It is also unhealthy and time consuming.").

¹⁹⁶ *UN Issues Desertification Warning*, *supra* note 194; see also UK COMMITTEE FOR UNICEF, *supra* note 187, at 10 (noting that "[b]etween 1950 and 1999, there was almost a 20 percent decline in summer rainfall in southern Africa. Even a 10 percent drop in rainfall can reduce river flows by 50 percent or more.").

¹⁹⁷ *Combating Desertification Could Help Tackle Other Global Crises—UN Official*, UN NEWS CENTRE, Oct. 28, 2008, <http://www.un.org/apps/news/story.asp?NewsID=28756> (arguing that desertification is caused by climate change and human activities and "puts at risk the health and well-being of 1.2 billion people in more than 100 countries.").

¹⁹⁸ *Oceans Are 'Soaking Up Less CO₂'*, BBC NEWS, Oct. 20, 2007, http://news.bbc.co.uk/2/hi/uk_news/7053903.stm; see also Flavin & Engelman, *supra* note 175, at 10 (explaining the benefits of soil as carbon sinks). Further:

[s]oil alone could absorb each year an estimated 13 percent of all human-caused carbon dioxide emissions. To the extent we can make the land into a more effective "sink" for these gases we can emit modest levels essential for human development and well-being. Like efficiency, however, an active sink eventually faces diminishing returns. And any sink needs to be secured with "drain stoppers" to prevent easy return of greenhouse gases to the atmosphere when conditions change.

Flavin & Engelman, *supra* note 175, at 10.

¹⁹⁹ Keith Kloor, *Pots of Gold*, AUDUBON MAGAZINE, Dec. 2003, available at http://www.audubonmagazine.org/features0312/pots_of_gold.html.

In the Prairie Pothole Region of the Dakotas, one hundred plant species can be identified in a square yard.²⁰⁰ These native grasses have the capacity to contain carbon.²⁰¹ Yet, roughly 425 square miles of grassland have become farmland from 2002 through 2007 in South Dakota alone.²⁰² The Washington Post notes that:

With rainfall in this part of South Dakota averaging only 17 inches a year, conservation groups say most farmers would not risk the start-up costs of plowing and preparing the ground without crop insurance, on which the federal government pays close to 60 percent of the premium.

....

The House and Senate both voted to deny or delay crop insurance on fragile land that had never been farmed. But last-minute lobbying by some farm organizations and crop-growing interests limited the restriction to five Great Plains states—North and South Dakota, Montana, Iowa, and Minnesota.²⁰³

The next five years may see the loss of an additional 3.3 million acres of native grassland to farming across the Prairie Pothole Region.²⁰⁴ Populations of grassland birds are already down by forty percent.²⁰⁵ The US Fish and Wildlife Service explains that the government money set aside for easements has covered less acreage due to increased land values since

²⁰⁰ Dan Morgan, *Subsidies Spur Crops on Fragile Habitat*, WASH. POST, Dec. 7, 2008, available at <http://www.washingtonpost.com/wp-dyn/content/article/2008/12/06/AR2008120601801.html?sid=ST2008120700210>.

²⁰¹ See OFFICE OF SCI. & OFFICE OF ENERGY EFFICIENCY, U.S. DEPT. OF ENERGY, DOE/SC-0095, *BREAKING THE BIOLOGICAL BARRIERS TO CELLULOSIC ETHANOL—A JOINT RESEARCH AGENDA 59* (2006), available at <http://genomicscience.energy.gov/biofuels/2005workshop/b2blowres63006.pdf>; see also PLAINS CO₂ REDUCTION P'SHIP, UNIV. OF N.D. ENERGY & ENVTL. RESEARCH CTR., *COBENEFITS OF TERRESTRIAL CARBON SEQUESTRATION IN THE PCOR PARTNERSHIP REGION 2* (2008), available at <http://www.undeerc.org/PCOR/newsandpubs/pdf/FactSheet9.pdf>.

²⁰² Morgan, *supra* note 200. One reason for this could be that ethanol refineries in the area have created a “booming market for corn.” *Id.*

²⁰³ *Id.*

²⁰⁴ *Id.*; see generally John Davidson, *Conservation Agriculture: An Old New Idea*, 9 NAT. RES. & ENV'T 20, 20 (1995); Ved P. Nanda, *Agriculture and the Polluter Pays Principle*, 54 AM. J. COMP. L. 317 (2006).

²⁰⁵ Cornelia Dean, *One-Third of U.S. Bird Species Endangered, Survey Finds*, N. Y. TIMES, Mar. 19, 2009, <http://www.nytimes.com/2009/03/20/science/earth/20bird.html> (blaming “[h]abitat destruction, pollution and other problems” for the decline).

the program was established in 1991.²⁰⁶ The government pays each landowner twenty-five percent of the land's assessed value in exchange for a ban on plowing and haying before the end of the bird-nesting season.²⁰⁷

Similarly, the Conservation Reserve Program has also become less effective as land prices have risen since the rates that the federal government pays landowners in annual rent to leave fragile land alone is not competitive with the profits that farmers will make by farming such land.²⁰⁸ According to the USDA, the land that is reserved helps reduce erosion and is a large and effective carbon sink.²⁰⁹ If the latest farm bill continues to authorize increased Conservation Reserve rents, the legislation will reduce the acreage covered by the program.²¹⁰ Governors of Prairie Pothole states are able, but politically restricted, from denying farmers the subsidy on new grassland conversions, otherwise known as sod-busting.²¹¹

It is important to reserve farmland because "[f]arming contributes as much to global warming as all the world's planes, cars and trucks, and that will increase as the world tries to feed an extra 3 billion people by 2050."²¹² Since the third largest carbon sink is soil, transitioning to sustainable land management could reduce the equivalent of twenty-five percent of global fossil fuel emissions.²¹³ The effectiveness of soil as a carbon sink can be enhanced through reduced tillage, minimal nitrogen

²⁰⁶ Morgan, *supra* note 200.

²⁰⁷ *Id.*

²⁰⁸ *Id.*

²⁰⁹ Charles Abbott, *Idled U.S. Farmland May Be Large Carbon Sink: USDA*, REUTERS, Mar. 26, 2009, <http://www.reuters.com/article/idUSTRE52O5H020090326>.

Some 33.7 million acres are enrolled in the reserve at present. The 2008 farm law lowered the enrollment ceiling to 32 million acres. Land owners agree to idle land for 10 years or longer when they enroll in the reserve.

In written testimony, Stephenson said contracts on 3.9 million acres will expire on Sept 30, "so there is some room" for new land to be enrolled in the near future.

USDA says contracts on 4.5 million acres expire at the end of fiscal 2010, 4.4 million acres in fiscal 2011 and 5.6 million acres in fiscal 2012.

Id.

²¹⁰ Morgan, *supra* note 200.

²¹¹ *Id.*

²¹² Gerard Wynn, *Soil Neglected Asset in Greenhouse Gas Fight*, REUTERS, Mar. 20, 2009, <http://uk.reuters.com/article/idUKLNE52J00C20090320> ("Soil could store as much as one-tenth of all the carbon that households and industry spew into the atmosphere.").

²¹³ *No Climate Change Fix Without New Land Use, Farming Policies*, REUTERS, June 4, 2009 (on file with author) (noting that soil can become a significant carbon sink through sustainable land management).

fertilizer, erosion control, use of perennials, livestock methane capture, and rotational grazing.²¹⁴ Between 2009 and 2030, sustainable land management can facilitate soil carbon sink capacity to store the global equivalent of 1.3 to 2 billion tons of CO₂.²¹⁵

Mobilizing resources and information about such sustainable practices as drip irrigation and no-till planting, where appropriate, can break the cycle of desertification exacerbating climate change and vice versa.²¹⁶ Land degradation has required twenty-four million people to leave their land.²¹⁷ Secretary-General Ban Ki-moon notes that agriculture accounts for “70 percent of fresh water use and up to 80 percent of deforestation.”²¹⁸ He also points out that climate change has contributed to the armed conflict in Sudan.²¹⁹ Desertification is not an inevitable outcome for the world’s

²¹⁴ *Id.*

²¹⁵ David Fogarty, *Better Grazing Practices Could Boost CO₂ Trade: Scientist*, REUTERS, Jan. 21, 2009, <http://www.reuters.com/article/idUSTRE50J22020090120>.

²¹⁶ See *Combating Desertification Could Help Tackle Other Global Crisis—UN Official*, *supra* note 197 (noting that increased land production and biodiversity in the soil would help); see also Aseel Kami, *Iraq to Revive Dead Farmland By Sucking Out Salt*, REUTERS, Dec. 2, 2008, <http://www.reuters.com/article/idUSTRE4B06BH20081201> (describing an Iraqi project to flush salt out of the land). By reducing the salinity in the soil, Iraqis are: breathing new life into dying soils and reviving what was once part of “the fertile crescent.”

....
Farming in Iraq has been hit hard by decades of war, instability and poor environmental management. Iraq imports almost all of its food, using receipts from oil to pay for it. Much of the government’s budget is spent on food rations.

Harmful salinity can be reversed by pumping out the groundwater beneath the soil over several years. Such projects, though costly, have helped farmers reclaim salt-deadened land in Australia.

Id.

²¹⁷ *Desertification Poses Security Risks*, *supra* note 192 (noting that twenty-four million people have been forced to leave). Also, “one-third of the world’s cropland has been abandoned in the past four decades.” *Id.*

²¹⁸ *Id.*

²¹⁹ *Sudan ‘Must Address Climate Ills’*, BBC NEWS, June 22, 2007, <http://news.bbc.co.uk/2/hi/africa/6230616.stm>.

[C]ompetition over oil, gas, water, timber and land use are behind the “instigation and perpetuation” of decades of fighting throughout Sudan.

....
With more than five million internally displaced and international refugees, Sudan has the largest refugee population in the world today, the UN says.

It points to the spread of deserts by an average of 100km in the last 40 years, a loss of almost 12% of forest cover in 15 years and overgrazing of fragile soil.

remaining arable land. Soil sinks can play a powerful role in mitigating climate change.

3. Fire Adaptation

Humanity must mitigate as well as adapt to climate change. Andrew Revkin notes that, "watching a fire on TV is a very different experience from fleeing one raging up the hill."²²⁰ Science does not have the precision and accuracy with which to tether each weather event to the problem of climate change, but extreme weather events are collectively on the rise.²²¹ This requires communities to develop effective response measures. Wildfires forced half a million people to evacuate Southern California, marking the highest number of displaced persons in Californian history.²²² Drought and development near wilderness areas are both on the

Refugee camps set up to provide shelter and care for the 2.4 million people who fled their homes amid the ongoing violence are causing further damage, the report says.

The violence in Darfur started in early 2003 when ethnic African rebels took up arms against Sudan's Arab-dominated government.

The rebels said the government was oppressing black Africans in favour of Arabs amid tensions over water, land and grazing rights between the groups.

Id.; see also Andrew Heavens, *Darfur Conflict Ravages Environment*, REUTERS, Dec. 11, 2008, <http://www.reuters.com/article/idUSTRE4B91X420081210> (noting the conflict has caused deforestation and destroyed farmland); see also *Over 11 mln Displaced in Central, East Africa—UN*, REUTERS, May 22, 2009, <http://www.reuters.com/article/idUSN18437643> ("The number of people displaced by conflict and natural disaster in Central and East Africa is now more than 11 million . . . Sudan accounts for the largest proportion, with over 4 million displaced . . .").

²²⁰ Andrew Revkin, *How Dry You Are*, N.Y. TIMES DOT EARTH BLOG (Nov. 1, 2007, 4:00 PM), <http://dotearth.blogs.nytimes.com/2007/11/01/how-dry-you-are/index.html?ex=1351656000&en=2893259e27cad852&ei=5088&partner=rssnyt&emc=rss> (noting that the US government has established www.drought.gov where maps show drought conditions); see also Jill Serjeant, *'Perfect Storm' Overwhelms Well Prepared California*, REUTERS, Oct. 29, 2007, <http://www.reuters.com/article/idUSN2523298420071025> (arguing that, "[i]f we are going to keep having 100-year fires every four years, we have to dramatically adjust our perception of what the fire danger is in California and provide staffing, resources, equipment and training to meet those needs."); see also *Californians Flee as Fires Rage*, BBC NEWS, Oct. 23, 2007, <http://news.bbc.co.uk/2/hi/americas/7055721.stm>.

²²¹ See AM. METEOROLOGICAL SOC., CLIMATE CHANGE: AN INFORMATION STATEMENT OF THE AMERICAN METEOROLOGICAL SOCIETY 3–5 (2007), available at <http://www.ametsoc.org/policy/2007climatechange.html>.

²²² *Why Wildfires Get Worse and Worse*, WALL ST. J., Oct. 27, 2007, <http://online.wsj.com/>

increase, prompting Allstate to pull out of the catastrophe-prone Californian housing insurance market.²²³ In contrast to east coast homeowners being placed in high-risk pools, many of their western counterparts are simply being required to fire-safe their homes in the wake of such costs as the \$1.33 billion San Diego "Witch Fire."²²⁴ Some insurers force homeowners to clear up to fifteen hundred feet buffer zones around homes in fire zones, fifteen times more than California's legal requirements.²²⁵

Wildfires in Utah threaten gas pipelines, coalmines, and methane wells, increasing the need to fund fire adaptation measures.²²⁶ National Public Radio notes that:

[s]atellites provide broad-brush strategic information about the fires in a given area. But the satellites pass overhead only twice a day. That makes them of little value to firefighters battling fast-moving blazes, like those currently burning in Southern California. Airplanes, and now drones, provide much more useful, real-time information.

Other technological advances also help crews contain wild fires: C-130s, the military cargo plane, have been refitted with side-mounted water-cannons that shoot precise streams of flame retardant. A newly designed intake hose

article/SB119344584759873573.html.

Officials estimated damages would top \$1 billion in San Diego County alone, and could reach as high as \$1.6 billion statewide. By comparison, losses for wildfires in 2003 reached \$2.3 billion.

The federal government, wary of repeating its ineffectual response during Hurricane Katrina, moved swiftly to make helicopters, troops and supplies available. But some local officials warned that California remains unprepared for blazes that are likely to become more frequent.

Id.

²²³ *Id.*

²²⁴ M.P. McQueen, *Where Wildfires Burn, Insurers Get Cold Feet: Homeowners in Western U.S. Find Tougher Requirements, Fewer Options for Coverage*, WALL ST. J., Aug. 14, 2008, available at <http://online.wsj.com/article/SB121867195558038891.html> ("So now, most insurers have capped their payouts at a percentage above the home's insured value, usually 25% or 50%, to help curb losses."). Most policies no longer offer 'guaranteed replacement' and those who do charge a higher premium. *Id.*

²²⁵ *Id.* Homes that are considered hazardous are given a specific period of time to correct the issues or risk having their policies dropped. *Id.*

²²⁶ John Holusha, *Conditions Spark New Wildfires in Western States*, N.Y. TIMES, July 12, 2007, available at <http://www.nytimes.com/2007/07/12/us/12cnd-fire.html>. For example, "[i]n southern Utah, a fire burned to within half a mile of the Aberdeen mine, one of the larger coal producers in the region. If it were to shut down, power supplies in several western states could be affected." *Id.*

for helicopters can douse fires with 2,000 gallons of water slurped in 30 seconds from ponds, rivers and the ocean.

One of the more promising technologies, still in the research stage, is "fire-behavior modeling." The idea is to measure the "fuel content" of a forest—in other words, how much timber and brush is in the path of a fire—and then determine in which direction, and how quickly, it's likely to grow.²²⁷

Technologies have contributed to accelerated climate change but, if used in an environmentally sound manner, can become part of the solution to addressing adaptation and mitigation.²²⁸ IBM and Dutch engineers have been developing sensors that can augment volunteers that currently visually inspect dikes during storms.²²⁹ Further:

[t]he country has a 220-mile-long coastline and is also a delta where the Rhine and Meuse rivers flow into the North Sea. Increasing temperatures from global warming would not only cause sea levels to rise, but also cause river levels to rise because of more runoff from melting glaciers and greater precipitation in the Alps. Since the excess water in the rivers can't flow into the sea when the sea level rises, the risks of flooding are "drastically increased" in large areas of the Netherlands, according to the commission's findings.

Some 60% of the population lives in the most vulnerable areas. And 65% of economic output is produced in the lowest part of the Netherlands, which is home to the largest city, Amsterdam, and the seat of government, The Hague.²³⁰

Broad telecommunication capacity can enhance the effectiveness of disaster early warning systems and save lives.²³¹

²²⁷ Eric Weiner, *High Tech Drone Joins Battle Against Calif. Flames*, NPR NEWS, Oct. 23, 2007, available at <http://www.npr.org/templates/story/story.php?storyId=15620612&ft=1&f=1001>.

²²⁸ See Leila Abboud, *Before the Deluge: A Warmer World Is Coming; the Dutch Want to Make Sure They Are Ready for It*, WALL ST. J., Mar. 9, 2009, available at <http://online.wsj.com/article/SB123620725724333601.html> (noting examples of Dutch technologies to combat climate change).

²²⁹ *Id.*

²³⁰ *Id.*

²³¹ *Past Decade the Warmest Ever, Says UN Meteorological Agency*, UN NEWS, Dec. 13, 2007, available at <http://www.un.org/apps/news/story.asp?NewsID=25054&Cr=climate>

4. Adapting to Accelerated Climate Change²³²

Scientists have subdivided climate-related effects upon sea level into two categories.²³³ First, there are alterations in the total amount of ocean water.²³⁴ This can vary depending upon the quantity of rain, snow, and runoff that enters the ocean.²³⁵ The second contribution that climate can have involves a thermal expansion or contraction.²³⁶ A rise or fall in temperature or salinity can alter the density of the ocean.²³⁷ Thus, an increase in temperature can lead to an expansion of water within the ocean basin.²³⁸ Such a temperature rise would also melt snow in high altitudes and polar caps.²³⁹ This in turn would cause an increase in runoff of fresh water.²⁴⁰ Even a small rise in temperature could alter

&Cr1=change ("We have seen through first-hand experience the power and potential of telecommunications to save lives in times of disaster.") The ITU Framework for Cooperation in Emergencies ("IFCE") "seeks to make telecommunications resources available for government agencies which are responsible for disaster relief, humanitarian workers, as well as victims of disasters." *Id.*; see also Robert Evans, *Countries Urged to Create Disaster Warning Systems*, REUTERS, Nov. 29, 2007, <http://www.reuters.com/article/idUSL28678896> (arguing that both developing and developed countries should invest in early warning systems).

²³²

Worldwide CO₂ emissions rose at a faster rate in 2000–2004 than the worst-case scenario imagined in this year's UN reports on climate, according to new research.

The rise over the first four years of this century is also greater than in the 1990s—3.1% a year between 2000–2004, up from an average of 1.1% a year during the 1990s.

Hilary Osborne, *CO₂ Emissions Rise Outpaces Worst-Case Scenario*, GUARDIAN.CO.UK, May 22, 2007, <http://environment.guardian.co.uk/climatechange/story/0,,2085595,00.html?gusrc=rss&feed=12>.

²³³ See Centers for Ocean Sciences Education Excellence, *Ocean Systems—Thermal Expansion and Sea Level Rise*, http://cosee.umaine.edu/cfuser/resources/tr_sea_level.pdf (last visited Dec. 28, 2009) [hereinafter *Ocean Systems*].

²³⁴ *Id.*

²³⁵ Overview: Aviso, <http://www.aviso.oceanobs.com/en/news/ocean-indicators/mean-sea-level/overview/index.html> (last visited Dec. 28, 2009).

²³⁶ *Ocean Systems*, *supra* note 233.

²³⁷ NASA GODDARD SPACE FLIGHT CTR. SCIENTIFIC VISUALIZATION STUDIO, *SEA SURFACE TEMPERATURE, SALINITY AND DENSITY* (2009), <http://svs.gsfc.nasa.gov/vis/a000000/a003600/a003652/>.

²³⁸ See New England Aquarium: Climate Change and the Oceans, http://www.neaq.org/conservation_and_research/climate_change/climate_change_and_the_oceans.php (last visited Dec. 28, 2009).

²³⁹ *Id.*

²⁴⁰ *Id.*

major ocean currents.²⁴¹ We have seen how influential the El Niño effect has been to weather patterns.²⁴²

It is hard to imagine the ramifications of simultaneous current changes throughout the world. It has been suggested that climate change could affect deep ocean upwellings.²⁴³ Like altering current flows, this could change the location and frequency of local wind and precipitation patterns.²⁴⁴ Since biological life concentrates in ocean upwellings, alterations of this kind could have serious effects upon fishery populations.²⁴⁵ Wetlands, coral reefs and mangrove forests provide natural storm buffers.²⁴⁶ In addition to preserving existing ecosystems, sustainable safe building methods minimize loss of life during disasters.²⁴⁷

Expansion of water as oceans absorb heat from the atmosphere contributes to sea level rise, as does melt water from ice caps and glaciers.²⁴⁸ Climate change adaptation measures should include coordinated regional contingency plans and disaster response exercises.²⁴⁹ Funds should be mobilized to support preparedness.²⁵⁰ Disaster shelters should be ecologically sound and rely upon existing traditional wisdom.²⁵¹ Indigenous and local knowledge can substantially mitigate disaster risks.²⁵²

²⁴¹ *Id.*

²⁴² See, e.g., Ocean Upwelling, http://www.windows.ucar.edu/tour/link=/earth/Water/ocean_upwelling.html&edu=high (last visited Dec. 28, 2009).

²⁴³ John Koopman, *Salmon Fishing off California, Oregon Banned*, S.F. GATE, Apr. 10, 2008, <http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2008/04/10/BAO6103NBB.DTL>.

²⁴⁴ See Ocean Upwelling, *supra* note 242.

²⁴⁵ See *id.*; see also Koopman, *supra* note 243.

²⁴⁶ UN INT'L STRATEGY FOR DISASTER REDUCTION, HYOGO FRAMEWORK FOR ACTION 2005–2015: BUILDING THE RESILIENCE OF NATIONS AND COMMUNITIES TO DISASTERS col. 4 (2009), available at <http://www.unisdr.org/eng/hfa/docs/HFA-brochure-English.pdf>.

²⁴⁷ See *id.* ("lack or non-enforcement of building codes often cause more deaths than natural hazards themselves.").

²⁴⁸ Joe Palca, *Morning Edition: In a Strategic Reversal, Dutch Embrace Floods* (NPR radio broadcast Jan. 22, 2008), available at <http://www.npr.org/templates/story/story.php?storyId=18229027>. The ten cities at the highest risk for flooding are: Mumbai, Guangzhou, Shanghai, Miami, Ho Chi Minh City, Calcutta, greater New York City, Osaka-Kibe, Alexandria, and New Orleans. *Id.*

²⁴⁹ UN INT'L STRATEGY FOR DISASTER REDUCTION, *supra* note 246, at col. 5.

²⁵⁰ *Id.*

²⁵¹ INT'L STRATEGY FOR DISASTER REDUCTION, INDIGENOUS KNOWLEDGE FOR DISASTER RISK REDUCTION: GOOD PRACTICES AND LESSONS LEARNED FROM EXPERIENCES IN THE ASIA-PACIFIC REGION 13 (2008), available at http://www.unisdr.org/eng/about_isdr/isdr-publications/19-Indigenous_Knowledge-DRR/Indigenous_Knowledge-DRR.pdf.

²⁵² *Id.* at 39.

Recent flooding around the world has been catastrophic.²⁵³ Floodwaters carry “a toxic stew of garbage, chemicals, fertilizers, manure and fuel.”²⁵⁴ In Africa, educations are interrupted as schools are turned into shelters.²⁵⁵ In Mexico, military helicopters rescue people from rooftops.²⁵⁶ One-fourth of British homes are at risk of flooding—a challenging prospect given that three billion pounds of damage resulted from the summer 2007 floods alone.²⁵⁷ Japan has ordered over half a million households to evacuate in the Aichi region due to flooding.²⁵⁸ In India, food riots have come in the wake of floods that lapped at the Taj Mahal compound.²⁵⁹ Over two million Indians have been forced to flee their homes.²⁶⁰ In China,

²⁵³ See John Sinnott, *Disasters Quadruple Over Last 20 Years—Oxfam*, REUTERS, Nov. 26, 2007, <http://www.reuters.com/article/idUSL25184802> (“We have seen floods in South Asia, across the breadth of Africa and Mexico that have affected more than 250 million people.”); see also UK COMMITTEE FOR UNICEF, *supra* note 187, at 23 (noting that scientists believe that climate change will “increase the risk of severe flooding in [the] future.”).

²⁵⁴ *Ongoing Midwest Flooding Threatens Mississippi River Levees*, PBS NEWSHOUR, June 17, 2008, http://www.pbs.org/newshour/bb/weather/jan-june08/leveetrouble_06-17.html; see also UK COMMITTEE FOR UNICEF, *supra* note 187, at 23 (noting that flooding can contaminate drinking waters and breed infectious diseases).

²⁵⁵ *African Floods Prompt Aid Appeal*, BBC NEWS, Sept. 21, 2007, <http://news.bbc.co.uk/2/hi/africa/7005969.stm>; see also Jijo Jacob, *FACTBOX—Impact of Recent Floods in Southern Africa*, REUTERS, Jan. 9, 2008, <http://www.reuters.com/article/idUSL0872209> (detailing recent floods in Africa).

In Mozambique, torrential rains and hurricanes caused the death of forty-five people and left 285 thousand people homeless. *Id.* The damage would cost the country \$71 million to repair. *Id.* Floods in Zambia caused significant damage to the country’s crops of maize, cassava, sorghum, and millet in March 2007. *Id.* In 2007, flash floods and mudslides caused more than 110 people to die in Angola and thousands were without clean water. *Id.* As a result, the population was affected by Cholera and intestinal infections. *Id.*

²⁵⁶ Elisabeth Malkin, *Floodwaters Devastate Mexican State of Tabasco*, N.Y. TIMES, Nov. 3, 2007, available at <http://www.nytimes.com/2007/11/03/world/americas/03mexico.html> (noting that “[m]ore than 30,000 people were being housed in shelters, which were full to capacity.”).

²⁵⁷ Simon Challis, *One in Four UK Homes at Risk of Flood, Says RMS*, REUTERS, June 25, 2008, <http://www.reuters.com/article/idUSL24346834> (“The insurance industry faces a bill of over 3 billion pounds . . . which left large swathes of central and southern England under water.”). The majority of the damage was caused by heavy rain overwhelming drainage systems. *Id.*

²⁵⁸ Yoko Kubota, *Floods Swamp Hundreds of Homes in Central Japan*, REUTERS, Sept. 1, 2008, <http://www.alertnet.org/thenews/newsdesk/T328346.htm> (noting that a record amount of rain, 5.7 inches, fell on the city in one hour).

²⁵⁹ Jatindra Dash, *Flood Riots in East India, Flood Waters Lap Taj Mahal*, REUTERS, Sept. 25, 2008, <http://www.reuters.com/article/idUSDEL285954> (“Officials in eastern India struggled to provide aid to tens of thousands of flood victims after riots broke out on Wednesday, as flood waters lapped the Taj Mahal compound.”). *Id.*

²⁶⁰ *Id.*; Kritivas Mukherjee, *Food Riots as Indian Floods Destroy 250,000 Homes*, REUTERS,

flooding has forced more than one million people to evacuate, affecting nine provinces.²⁶¹ In Darfur, more than two million people from armed conflicts reside in makeshift camps within flood plains.²⁶² Floods have left hundreds of thousands of Sudanese homeless due to last year's record floods.²⁶³

In 2008, over twenty million individuals "have been displaced by climate-related sudden-onset natural disasters."²⁶⁴ The Global Humanitarian Forum notes that:

[t]he multilateral funds that have been pledged for climate change adaptation funding currently amount to under half a billion US dollars.

... Cyclone Sidr, which struck Bangladesh in 2007, demonstrates how well adaptation and prevention efforts can pay off. Disaster preparation measures, such as early warning systems and storm-proof houses, minimized damage and destruction.²⁶⁵

In Bangladesh, approximately twelve to seventeen million people have been displaced in recent decades because of environmental disasters.²⁶⁶

Aug. 27, 2008, <http://in.reuters.com/article/domesticNews/idINDEL14385520080827>.

"Stranded villagers waved at passing helicopters and sent text messages to local authorities from rooftops of flooded buildings. 'Time is running out for me and there is no relief in sight and I have not eaten for days,' a message from flood victim Sanjeev Kumar read." Mukherjee, *supra* note 260; see also Alister Doyle, *Hurricanes, Floods Show Risks of Climate Change—UN*, REUTERS, Sept. 3, 2008, <http://uk.reuters.com/article/idUKL155749220080901> (noting that "[t]he Kosi River burst a dam in Nepal" leading to the worst flooding in Bihar in 50 years).

²⁶¹ *Million Flee South Chinese Floods*, BBC NEWS, June 15, 2008, <http://news.bbc.co.uk/2/hi/asia-pacific/7455239.stm>; see also Nick Macfie & Ho Binh Minh, *Rain Cuts Off 20,000 China Quake Victims, 14 Die*, REUTERS, Sept. 26, 2008, <http://www.alertnet.org/thenews/newsdesk/PEK199852.htm> (noting that "[h]eavy rain caused flash floods, cave-ins and landslides in mountainous Sichuan province near the epicentre of the quake, where survivors are still living in tents and pre-fabricated houses.").

²⁶² Ophera McDoom, *Six Die in Sudan Floods, Khartoum Says Ready*, REUTERS, Aug. 19, 2008, available at <http://www.reuters.com/article/idUSLI101418.CH.2400>.

²⁶³ *Id.* ("Last year Sudan experienced the worst floods in living memory.").

²⁶⁴ Siri Elverland, *20 Million Climate Displaced in 2008*, NORWEGIAN REFUGEE COUNCIL, June 8, 2009, <http://www.alertnet.org/thenews/fromthefield/nrc/124446213466.htm>.

²⁶⁵ GLOBAL HUMANITARIAN FORUM, HUMAN IMPACT REPORT: CLIMATE CHANGE: THE ANATOMY OF A SILENT CRISIS 4 (2009), available at http://ghfgenewa.org/Portals/0/pdfs/human_impact_report.pdf.

²⁶⁶ Shankar Vedantam, *Climate Fears Are Driving 'Ecomigration' Across Globe*, WASH. POST, Feb. 23, 2009, available at <http://www.washingtonpost.com/wp-dyn/content/article/>

While internationally coordinated relief efforts have increased in capacity, adaptation and mitigation need to outpace the rate of climate change.²⁶⁷ This can best be accomplished through preventative measures.²⁶⁸ The Global Humanitarian Forum notes that:

black carbon from soot, released by staple energy sources in poor communities, is likely causing as much as 18 per cent of warming. The provision of affordable alternative cooking stoves to the poor can, therefore, have both positive health results, since smoke is eliminated, and an immediate impact on reducing emissions, since soot only remains in the atmosphere for a few weeks.

Integrating strategies between adaptation, mitigation, development and disaster risk reduction can and must be mutually reinforcing. Climate change adaptation, mitigation, humanitarian assistance and development aid underpin each other, but are supported by different sets of institutions, knowledge centres, policy frameworks and funding mechanisms.²⁶⁹

The international community can address the global impact of climate change on human displacement, security, food, health, poverty, and water.²⁷⁰ The United Nations General Assembly is poised to adopt the

2009/02/22/AR2009022202378.html. President Anote Tong of Kiribati reached out to the international community asking for aid in relocating entire countries to higher ground. *Id.* President Tong appealed for international funding to purchase land for the project. *Id.* For example, "citizens of Kiribati are attempting to migrate to New Zealand, and Tong said he is arming his people with skills in vocations such as plumbing that would be valuable in other countries." *Id.*

²⁶⁷ GLOBAL HUMANITARIAN FORUM, *supra* note 265, at 4.

²⁶⁸ One problem is that once climate change sets in, people are unable to provide for their families. *Id.* at 2. Preventative measures, therefore, would do the most good.

²⁶⁹ *Id.* at 4 ("Many people are not resilient to extreme weather patterns and climate variability. They are unable to protect their families, livelihoods and food supply from negative impacts of seasonal rainfall leading to floods or water scarcity during extended droughts. Climate change is multiplying these risks.") *Id.*; see also V. Ramanathan & G. Carmichael, *Global and Regional Climate Changes Due to Black Carbon*, NATURE GEOSCIENCE, Mar. 23, 2008, at 226, available at <http://www.nature.com/ngeo/journal/v1/n4/pdf/ngeo156.pdf> (the study was funded by NSF, NOAA, and NASA) ("China and India produce 25 to 35% of global black carbon emissions."). *Id.*

²⁷⁰ See GLOBAL HUMANITARIAN FORUM, *supra* note 265, at 82 ("There is a particular need today for a new solidarity around the concept of climate justice."). For example, globally, there are twenty-six million people displaced from climate change. *Id.* at 81.

first resolution linking climate change to international peace and security.²⁷¹ Countries should commit to addressing forced displacement and migration in the context of climate change.²⁷²

D. *Funding Arrangements*

Financial arrangements are more likely to be effective, efficient, fair, and transparent if they are supportive of national institutional arrangements and are fully accountable to the Conference of the Parties to the UNFCCC.²⁷³ Parties differ as to whether monitoring, reporting and/or providing feedback should occur as part of a compliance mechanism or through existing multilateral funding and development institutions.²⁷⁴ Establishing a forum for parties to exchange views on measures could facilitate the creation of shared “(a) Insurance and financial risk management; (b) Modeling, analytical and methodological tools; [and] (c) Economic diversification.”²⁷⁵

New funding contributed by developed countries can be based on a variety of considerations, such as equity principles, respective responsibilities and capabilities of countries, gross domestic product (“GDP”), the polluter pays principle, current emissions, and past funding or target commitments, or a collectively agreed upon percentage of GDP.²⁷⁶ Alternatively, contributions could be based on some combination of population, GDP, and greenhouse gas emissions.²⁷⁷ The Negotiating Text notes that additional funding can also come from any:

auctioning of assigned amounts and/or emission allowances; levies on CO₂ emissions; taxes on carbon-intensive products and services from Annex I Parties; levies on international and maritime transport; shares of proceeds on the clean

²⁷¹ Neil Macfarquhar, *Islanders Fearing Climate Change Press a UN Debate*, N.Y. TIMES, May 29, 2009, at A4. The resolution, initiated by twelve Pacific island states, argues that climate change deserves significant UN attention because it is “a possible source of upheaval worldwide.” *Id.*; see also U.N. Council Hits Impasse over Debate on Warming, N.Y. TIMES, April 18, 2007, at A6, available at <http://select.nytimes.com/gst/abstract.html?res=F10912FC355B0C7B8DDDDAD0894DF404482&partner=rssnyt&emc=rss>.

²⁷² Elverland, *supra* note 264.

²⁷³ See *Negotiating Text*, *supra* note 115, at ch. IV, ¶ 166(a)–(b).

²⁷⁴ *Id.* at ch. II, ¶ 53.

²⁷⁵ *Id.* at ch. III, ¶¶ 164–65.

²⁷⁶ *Id.* at ch. IV, ¶ 173.

²⁷⁷ *Id.*

development mechanism (CDM), joint implementation and emissions trading; levies on international transactions; [or] fines for non-compliance with commitments²⁷⁸

Other revenue suggestions include auctioning of emission allowances, a global tax on fossil fuel emissions and/or on carbon-intensive products and services, a percentage of the proceeds from CDM and JI projects, and emissions trading.²⁷⁹ Debate continues as to whether funding shall be distributed as grants alone or additionally as concessional loans.²⁸⁰ Availability of funding is also riddled with discord over who decides which countries should have access to funds and upon what terms.²⁸¹ Thankfully, developing countries have among the most plentiful sources of renewable energy in the world.²⁸²

E. Technology

Technology appropriateness, affordability, and accessibility can be facilitated through a new technology body under the authority of the Conference of the Parties to the UNFCCC.²⁸³ A technology action plan could “include specific policies, actions, and funding requirements for technologies in the public domain, patented technologies and future technologies.

²⁷⁸ *Id.* at ch. II, ¶ 36. For further explanation of CDM and Joint Implementation (“JI”), see UNFCCC: Mechanisms Under the Kyoto Protocol, http://unfccc.int/kyoto_protocol/mechanisms/items/1673.php (last visited Dec. 28, 2009).

²⁷⁹ *Negotiating Text*, *supra* note 115, at ch. III, ¶ 173. “Some proposals suggest that financial resources to support action on mitigation should amount to approximately USD 200 billion per year by 2020, and financial resources to support adaptation actions should amount to at least USD 67 billion per year by 2020.” *Id.* at n.31.

²⁸⁰ *See id.* at ch. IV, ¶ 166(h).

²⁸¹ *See id.* at ch. IV, ¶ 174 (describing various options for management of the funds). The Text does make it clear, however, that access to the funds should be “simplified and improved . . . and provided in an expeditious, effective, equitable and timely manner” and that the funds should be delivered following a “programmatic approach, using a project approach when appropriate, and be country-driven.” *Id.* at ch. IV, ¶ 166(e)–(f).

²⁸² Robert Engelman, *Sealing the Deal to Save the Climate*, in THE WORLD WATCH INSTITUTE: 2009 STATE OF THE WORLD: INTO A WARMING WORLD 188 (2009), available at <http://www.worldwatch.org/node/5984>.

²⁸³ *Negotiating Text*, *supra* note 115, at ch. IV, ¶ 180. The mechanism should “[a]ddress all stages of the technology development cycle including R&D, deployment, diffusion and transfer of affordable environmentally sound technologies to enable all Parties, particularly developing country Parties, to enhance action on mitigation and adaptation.” *Id.* at ch. IV, ¶ 180(b).

The plan shall also include clear actions for the first three years, and be updated for successive three-year periods.”²⁸⁴ Parties can also facilitate innovative environmentally sound technologies and international cooperation by sharing national technology road maps.²⁸⁵

A controversial proposal would allow least developed countries (“LDCs”) to be exempt from patent protection of climate-related technologies for adaptation and mitigation.²⁸⁶ The same proposal also calls for genetic resources, including varieties essential for agricultural adaptation, to remain in the public domain.²⁸⁷ The Negotiating Text also currently suggests “sharing publicly funded technologies and making the technologies available in the public domain at an affordable price.”²⁸⁸ It further calls for taking into account other relevant international forums that address intellectual property rights.²⁸⁹

Similarly, voluntary technology agreements could enhance “cooperative R&D and large-scale demonstration projects, technology deployment projects, cooperation on specific sectors or gases, and cooperation on climate observation and warning systems for enhancing resilience.”²⁹⁰

²⁸⁴ *Id.* at ch. IV, ¶ 183.

²⁸⁵ *Id.* at ch. IV, ¶ 185 (further noting that national technology roadmaps can include: “(a) Identification of technological options for specific sectors; (b) Obstacles to the development and transfer of identified technological options; (c) Policy instruments and infrastructure required for the deployment, diffusion and transfer of identified technological options; [and] (d) Capacity-building needs.”)

²⁸⁶ *Negotiating Text*, *supra* note 115, at ch. IV, ¶ 189.

²⁸⁷ *Id.*

²⁸⁸ *Id.* at ch. IV, ¶ 188(b).

²⁸⁹ *Id.* at ch. IV, ¶ 188(c) (such as the Doha Declaration on the Trade-Related Aspects of Intellectual Property Rights Agreement and Public Health).

²⁹⁰ *Id.* at ch. IV, ¶ 192. The Text further notes that:

For the purpose of meeting its quantified emission limitation and reduction commitments and requirements for monitoring, reporting and verification, a Party may transfer to, or acquire from, other Parties emission reduction units resulting from projects and programmes that accelerate the diffusion or transfer of environmentally sound technologies, provided that:

- (a) Voluntary participation is approved by each Party involved;
- (b) Any such project results in measurable, reportable and verifiable reductions of GHG emissions by sources or enhancements of removals by sinks;
- (c) The project contributes to the achievement of the technology targets and objectives of the host Party;
- (d) The host Party has allocated assigned amount units or environmentally sound technology rewards (ESTRs) to the project or programme;

Technology information could be distributed through the development of an international database housing green technologies and best practices.²⁹¹ A new body on technology transfer could also implement technology transfer mechanisms and such related enabling activities as technical training, capacity-building, and R&D cooperation.²⁹² Such a technology body could facilitate sectoral technology cooperation by sharing best practices and best available technologies, both current and emerging.²⁹³ It could also help diffuse and transfer environmentally sound technologies to all relevant sectors.²⁹⁴

A new body on technology transfer and financing under the UNFCCC could oversee a climate technology fund.²⁹⁵ A multilateral climate technology fund, or developed country parties' contributions to existing funds, can support networks and centers on both regional and national levels.²⁹⁶ These networks could:

- (a) Promote joint R&D activities in the context of South-South, North-South and triangular cooperation;
- (b) Promote the transfer of environmentally sound technologies to developing country Parties;
- (c) Stimulate capacity-building, in particular for endogenous technologies;
- (d) Improve access to information on existing and new technologies;
- (e) {Promote the sharing of IPRs}.²⁹⁷

The parties in Copenhagen agreed to establish a technology mechanism, climate technology center, and technology executive committee.²⁹⁸ Remaining wrinkles to iron out involve how such a committee and center would

-
- (e) The project/programme is registered under the Convention;
 - (f) Participants in the ESTR mechanism may involve private and public companies.

Id. at ch. IV, ¶ 191.

²⁹¹ *Id.* at ch. IV, ¶ 195.

²⁹² *See id.* at ch. IV, ¶ 196.

²⁹³ *Negotiating Text*, *supra* note 115, at ch. IV, ¶ 196.

²⁹⁴ *Id.*

²⁹⁵ *Id.*

²⁹⁶ *Id.* at ch. IV, ¶ 198.

²⁹⁷ *Id.* at ch. IV, ¶ 197.

²⁹⁸ UNFCCC: Ad Hoc Working Group on Long-Term Cooperative Action Under the Convention, Dec. 7-15, 2009, *Enhanced Action on Technology Development and Transfer*, ¶ 7, U.N. Doc. FCCC/AWGLCA/2009/L.7/Add.3 (Dec. 15, 2009).

interact and be funded. Intellectual property rights ("IPRs") also remain one of the many areas in need of greater dialogue.

F. *Capacity-Building*

International cooperation can facilitate capacity-building for "[e]ducation, training and public awareness, with special focus on youth, women and indigenous peoples."²⁹⁹ Developing countries need capacity-building for such activities as reviewing and verifying NAMAs as well as for creating and reviewing adaptation and technology plans.³⁰⁰ It remains to be seen whether individual developed country parties will be legally bound to provide support for capacity building in the developing world.³⁰¹ Collectively, developed country parties do have an obligation to facilitate a capacity-building fund or some comparable means by which to support capacity building.³⁰² This support can facilitate developing countries to establish and implement adaptation and mitigation measures.

CONCLUSION

The international community can agree to a global target of no more than 350 ppm of atmospheric carbon. This requires both short and long term mitigation of emissions reaching carbon neutrality by the second half of the century. Kevin Watkins notes that developing countries:

account for the bulk of the projected increase in CO₂ emissions to 2030, with coal-fired economic growth in China and India the main driver.

. . . For millions of vulnerable people in drought-prone areas of Africa, flood zones in South Asia, and elsewhere, dangerous climate change is happening now.

. . . .

. . . [t]he world needs a Marshall Plan for low-carbon financing and technology transfer. Scaling-up emissions trading must be part of that plan, alongside wider multi-lateral mechanisms.³⁰³

²⁹⁹ *Negotiating Text*, *supra* note 115, at ch. IV, ¶ 199(f). "Countries lacking sufficient capacity to respond to the challenges of climate change require access to opportunities to obtain this capacity in a timely manner." *Id.* at ch. I, ¶ 6.

³⁰⁰ *See Negotiating Text*, *supra* note 115, at ch. IV, ¶ 199.

³⁰¹ *See id.* at ch. IV, ¶ 201.

³⁰² *Id.*

³⁰³ Kevin Watkins, *Poznan Is a Shambles*, GUARDIAN.CO.UK, Dec. 6, 2008, <http://www.guardian.co.uk/commentisfree/2008/dec/06/poznan-conference-climate-change>.

Ramping-up adaptation financing is crucial and can be done through broadening the adaptation levy.³⁰⁴ Sufficient public support can also catalyze private investment and technological cooperation.³⁰⁵ Affordable, environmentally sound technology can be utilized on a global scale to reduce greenhouse gas emissions to 350 ppm.³⁰⁶

Future negotiations will need to balance equity and efficiency considerations in relation to supporting developing countries efforts to protect forests. While one-fifth of greenhouse gas emissions result from deforestation,³⁰⁷ indigenous communities must be part of international efforts to reduce emissions from deforestation and degradation.³⁰⁸

The next global climate agreement must expand and strengthen cap-and-trade as well.³⁰⁹ The international community needs to respond effectively to both economic and climate crises and can do so by investing in environmentally sound technology that transforms global use of energy.³¹⁰

The Bali Roadmap called for global commitment to a new climate agreement to be signed at Copenhagen.³¹¹ Sovereignty has led to a “glacial pace” of climate mitigation.³¹² Yet, sovereignty loses meaning without economic and ecological viability.

International institutions, states, non-governmental organizations, the private sector, and civil society have the capacity to avert catastrophic climate change before it becomes beyond our ability to return to 350 ppm. The World Resource Institute notes that, “[t]he task is doable; of all the hundreds of scientists presenting diverse opinions on the climate problem,

³⁰⁴ See Dodman et al., *supra* note 184, at 164 (“[R]evenue generated from the CDM levy alone is projected to be between \$160 million and \$950 million.”).

³⁰⁵ See Elizabeth Burleson, *A Climate of Extremes: Transboundary Conflict Resolution*, 32 VT. L. REV. 477, 485 (2008) (noting how “civil society participation” was crucial at the Bali Conference).

³⁰⁶ See *infra* Part IV.E for discussion of possible technology measures.

³⁰⁷ David Adam, *Road to Copenhagen*, GUARDIAN.CO.UK, Dec. 8, 2008, <http://www.guardian.co.uk/environment/2008/dec/08/poznan-environment-climate-change1>.

³⁰⁸ See *Negotiating Text*, *supra* note 115, at ch. III, ¶ 109.

³⁰⁹ See Burleson, *ASIL Insights*, *supra* note 75.

³¹⁰ *Climate Change Green, Easy and Wrong: Why a Verdant New Deal Would Be a Bad Deal*, THE ECONOMIST, Nov. 6, 2008, at 15.

³¹¹ *Bali Action Plan*, *supra* note 28, at ¶ 1; see also Burleson, *ASIL Insights*, *supra* note 75; Appleton et al., *supra* note 92, at 1.

³¹² See Katherine Hille & Edward Luce, *Biggest Emitters Fail to Show the Way Forward*, FIN. TIMES, June 10, 2009, available at http://www.ft.com/cms/s/0/eef40346-55d4-11de-ab7e-00144feabdc0.html?ncklick_check=1; see also Glenn Thrush & Louise Roug, *Hints of a Deal*, POLITICO, Dec. 18, 2009, http://www.politico.com/blogs/glennthrush/1209/Hints_of_a_deal.html.

no prominent one has spoken up to say it is already too late to act.”³¹³ While this has always been an inter-generational dilemma, it is also a matter of life or death for millions of people of all ages today. Human innovation can help us step back from the precipice. Without altering the incentive to create, emerging international law can help maintain peace and security through effective climate change stabilization.³¹⁴ Transboundary problems are often most effectively resolved through transboundary agreements.

The international community has spent a great deal of energy arriving at scientific consensus. For that effort to have been worthwhile, countries must now implement the climate convention and other international agreements. The World Resource Institute notes that, “[a] new protocol to specify what will follow the Kyoto first commitment period could engage all countries in a globally transparent effort to monitor emissions of as many significant greenhouse gasses as possible.”³¹⁵ Ultimately, we must ask ourselves if we can move beyond the famous Danish Poet, Piet Hein’s notion that, “we are global citizens with tribal souls.”³¹⁶ We must enlarge our paradigms to encompass a global reality and reliance upon global participation.

³¹³ Engelman, *supra* note 282, at 187.

³¹⁴ UN Secretary-General Ban Ki-moon has maintained that the impacts of climate change could spark an international crisis. See *UN Chief Warns on Climate Change*, BBC NEWS, Mar. 2, 2007, http://news.bbc.co.uk/2/hi/in_depth/6410305.stm.

³¹⁵ Engelman, *supra* note 282, at 183. (“Many other industrial gases that trap atmospheric heat remain outside of any negotiated framework and are not currently even monitored”). *Id.*

³¹⁶ NIGEL DOWER & JOHN WILLIAMS, *GLOBAL CITIZENSHIP: A CRITICAL READER* 146 (Edinburgh University Press 2002).