

Fall 2007

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Recommended Citation

Ruth Gordon, *Climate Change and the Poorest Nations: Further Reflections on Global Inequality*, 78 U. COLO. L. REV. 1559 (2007).

Available at: <https://scholar.law.colorado.edu/lawreview/vol78/iss4/12>

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CLIMATE CHANGE AND THE POOREST NATIONS: FURTHER REFLECTIONS ON GLOBAL INEQUALITY

RUTH GORDON*

This article considers climate change from the perspective of the Third World and more particularly from the vantage point of the poorest nations in the international system. It concludes that those nations that are the most geographically and economically vulnerable will also have the least impact on mechanisms to halt the progress of this impending disaster. Hence, climate change is examined as yet another chapter in Third World powerlessness. Despite the fact that low-income nations participate in international deliberations, they do so from an exceedingly weak position that puts them in the untenable position of being on the receiving end of whatever policies richer nations and peoples decide to pursue. Climate change and other environmental problems are no different. Ultimately this means that whether and the extent to which climate change will be addressed is in the hands of wealthy nations, and at this point, things do not look good.

INTRODUCTION

There is no longer any question that the earth's climate is warming. We can, and must, continue to question and ponder the rate of this transformation, as well as the potential effects on different parts of the planet. The debate as to *whether* this shift is actually underway, however, is over.¹ It is just as certain that anthropogenic forces are at the root of this change.

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1. See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2007), <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> [hereinafter CLIMATE CHANGE 2007].

Nevertheless, even as the dire, and more ominously unpredictable, consequences of climate change become increasingly evident, it is equally apparent that humankind is hesitant to take the kind of decisive action that will halt this probable disaster.² For example, take the case of the United States, which is the leading emitter of the greenhouse gases that are at the heart of this impending calamity and thus in the position to have the greatest impact in reversing global warming. America has chosen to stand on the sidelines, as other nations undertake measures that are likely to be inadequate but certainly superior to not acting at all.³ There is a rich literature on this somewhat surprising and quite remarkable lack of action by nations such as the United States,⁴ as well as an extensive literature on the Kyoto Protocol, which is the legal instrument embodying the very modest steps the international community has managed to agree upon thus far.⁵ Indeed, this paper will briefly consider aspects of the diverse and generally inadequate international response to this enormous and quite complex problem. These issues will then be explored from the perspective of the true subjects of this essay—the nations of the South, and especially the poorest and most vulnerable members of this part of the international community, the segment now sometimes termed the “Fourth World.”

Unfortunately, these nations are between a proverbial enormous rock and an exceedingly hard place. Impoverished, small Third World nations are among the most vulnerable to the effects of global warming, while simultaneously being in the weakest position to halt its progress. Their vulnerability in

2. See, e.g., Elisabeth Rosenthal & Andrew C. Revkin, *Science Panel Says Global Warming is 'Unequivocal,'* N.Y. TIMES, Feb. 3, 2007, at A1 (describing Secretary of Energy Samuel Bodman's opposition to “unilateral limits on emissions” despite evidence of global warming).

3. See Dominick J. Graziano, *Global Warming: An Introduction to the State of the Science and a Survey of Some Legal Responses*, FLA. BAR J., Oct. 2005, at 34, 34; R.T. Pierrehumbert, *Climate Change: A Catastrophe in Slow Motion*, 6 CHI. J. INT'L L. 573, 592 (2006); *infra* notes 120, 247 and accompanying text (concerning U.S. actions regarding climate change).

4. See, e.g., Eileen Claussen, *Climate Change: Present and Future*, 27 ECOLOGY L.Q. 1373 (2001); *U.S. Rejection of Kyoto Protocol Process*, *Contemporary Practice of the United States Relating to International Law*, 95 AM. J. INT'L L. 626, 647 (Sean D. Murphy ed., 2001).

5. See, e.g., Anita M. Halvorssen, *The Kyoto Protocol and Developing Countries—The Clean Development Mechanism*, 16 COLO. J. INT'L ENVTL. L. & POL'Y 353 (2005).

the inevitable advance toward a warmer planet is part and parcel of their overall weakness within the international system.⁶ In this instance, however, the consequences may be annihilation, in the case of small island states and the indigenous communities of the North, or a slow death in ecologically vulnerable and technologically lacking low-income nations.

The most impoverished states, and especially small island states,⁷ have been part of the dialogue regarding climate change. With few exceptions, however, in the final analysis their influence has been negligible. The agreements that address climate change, to the extent the problem is being confronted, do incorporate Third World nations,⁸ but the emphasis and reality is that large industrializing nations are the intended and primary beneficiaries.⁹ The dilemmas faced by the

6. This author has written extensively about the powerlessness of poor nations in the international system. See Ruth Gordon, *Sub-Saharan Africa and the Brave New World of the WTO Multilateral Trade Regime*, 8 BERKELEY J. AFR.-AM. L. & POL'Y 79 (2006) [hereinafter Gordon, *Brave New World*]; Ruth E. Gordon & Jon H. Sylvester, *Deconstructing Development*, 22 WIS. INT'L L.J. 1 (2004).

7. Because climate change may mean their total destruction, it has been widely acknowledged that small island states have a special interest in the issue. They have been accorded a special status in the negotiations, albeit to no avail. See William C. Burns, *Global Warming—The United Nations Framework Convention on Climate Change and the Future of Small Island States*, 6 DICK. J. ENVTL. L. & POL'Y 147, 149–50 (1997) [hereinafter Burns, *Global Warming*]; Alexander Gillespie, *Small Island States in the Face of Climatic Change: The End of the Line in International Environmental Responsibility*, 22 UCLA J. ENVTL. L. & POL'Y 107, 107–08 (2003–2004); Tuiloma Neroni Slade, *The Making of International Law: The Role of Small Island States*, 17 TEMP. INT'L & COMP. L.J. 531, 539–40 (2003).

8. For criticism of broad-based participation during the early stages of the negotiations to address climate change, see Albert Mumma, *The Poverty of Africa's Position at the Climate Change Convention Negotiations*, 19 UCLA J. ENVTL. L. & POL'Y 181, 205–06 (2001–2002); Laura Thoms, *A Comparative Analysis of International Regimes on Ozone and Climate Change with Implications for Regime Design*, 41 COLUM. J. TRANSNAT'L L. 795, 844 (2003).

9. For example, the Clean Development Mechanism (CDM) allows Annex I Parties to pursue projects that reduce emissions in countries that are non-Annex I Parties in exchange for certified emission reductions. See Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 22, 38 [hereinafter Kyoto Protocol]; Clean Development Mechanism (CDM), http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php (last visited Apr. 8, 2007). Most of these projects have gone to large industrializing nations, however. See CDM: Registration, <http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html> (last visited July 14, 2007).

most impoverished and least industrialized are usually given lip service, but those nations are generally marginalized.¹⁰

Ultimately, industrialized, and eventually industrializing, nations will decide whether and how greenhouse gases will be abated and the rates at which that abatement will, or will not, take place. If these nations decide not to act, or if they act inadequately or too slowly, all nations will suffer the consequences, including those that did the least to cause the problem and are least able to absorb the adverse effects. Indeed, it may be that the lack of action will be due in part to the uneven impact of climate change, which initially may be more calamitous for southern nations. This paper will explore this sad truth within the context of the overall weakness of impoverished, unindustrialized nations. Of course, as always, if the poorest nations enter the debate at all, it is by way of the discourse through which they always enter deliberations on the international stage—development.¹¹ There is little doubt these states will strive to find a way to use climate change to support their development efforts, and indeed, there are treaty mechanisms to spur these efforts.¹² Nevertheless, it is highly unlikely that this strategy will be particularly effective, and whether it is or is not is entirely in the hands of others.

This essay proceeds from the universal to the particular, beginning with an overview of the climate change quandary and the international response, and then turning to climate change from the perspective of the broader Third World and specifically the particular concerns and problems of the most vulnerable and powerless members of the Third World. It is

10. There are several mechanisms directed at what are often termed "least developed" nations in the Kyoto Protocol and its attendant instruments. See David A. Wirth, *The Sixth Session (Part Two) and Seventh Session of the Conference of the Parties to the Framework Convention on Climate Change, Current Developments*, 96 AM. J. INT'L L. 648, 651 (2002) (citing the "least-developed-countries fund," which is part of the Global Environment Facility). The central issue is their likely effectiveness, however. See Burns, *Global Warming*, *supra* note 7, at 185; Gillespie, *supra* note 7, at 128; Patricia Nelson, *An African Dimension to the Clean Development Mechanism: Finding a Path to Sustainable Development in the Energy Sector*, 32 DENV. J. INT'L L. & POL'Y 615, 633-34 (2004); Slade, *supra* note 7, at 541.

11. This paper utilizes such terms as "Third World" and "southern" in an effort to avoid the term "developing countries." See Gordon & Sylvester, *supra* note 6. The term is so pervasive, however, that sometimes its use is unavoidable.

12. *E.g.*, the Clean Development Mechanism, described in article 12 of the Kyoto Protocol, *supra* note 9.

structured as follows. Part I describes the problem, a task that must, and continually will, be renewed and revised as fresh data materializes and modeling and prediction capabilities evolve.¹³ Given the mounting concrete evidence of the reality of global warming, an account of its scope and breadth must be documented and continually updated as the planet reacts to the human assault upon it. This part also examines another evolving story: the actual and potential impact of climate change on the planet as a whole, as scientists refine and revise their analysis of how the adaptations they are observing are affecting and will affect the global environment. Part II briefly surveys the international response to global warming, including the UN Framework Convention on Climate Change and the Kyoto Protocol. With Part III, this essay turns to climate change and the nations of the Third World. Part III examines the asymmetrical consequences of global warming, which will disproportionately affect southern-tier nations. It chronicles climate change's particularly harsh impact upon Africa, small island nations, and the indigenous communities of the Arctic region. For a variety of reasons, these communities are probably most at risk for catastrophic consequences.

Part IV focuses on broader Third World perspectives regarding climate change, including areas of general agreement and areas of disagreement due to differences regarding the consequences of climate change for various segments of this broad coalition. It then turns to how the treaty regime deals with Third World nations, including the concept of differential responsibilities for industrialized versus developing nations. The Clean Development Mechanism is singled out for a more extensive discussion, as it is one of the means specifically designed to directly involve Third World nations in dealing with

13. Numerous climate models have been devised by scientists in an effort to determine the causes and effects of global climate change. In 2001, however, the Intergovernmental Panel on Climate Change (IPCC) showed, through incontrovertible evidence, that the primary cause of climate change is the human-generated increase of greenhouse gases in the atmosphere. Anna da Costa, *The Stern Review: The Science of Climate Change*, THE ECOLOGIST, Jan. 12, 2006, http://www.theecologist.org/archive_detail.asp?content_id=714. For actual conclusions of the panel, see INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS (2001), http://www.grida.no/climate/ipcc_tar/wg1/index.htm [hereinafter CLIMATE CHANGE 2001]. For commentary, see Andrew C. Revkin, *Warming's Likely Victims*, N.Y. TIMES, Feb. 19, 2001, at A4.

climate change. This Part also offers some insight into the role these nations played in the development of the international treaty regime instruments and analyzes the likelihood that these devices will actually assist either the poorest nations or the international community as a whole through an actual reduction in greenhouse gases.

Part V then narrows the focus to those sometimes termed "Fourth World," interrogating the problem of global warming from the perspective of the nations at the bottom of the international hierarchy. While these nations are part of the Third World and thus share many of the interests and viewpoints articulated by this diverse group, the poorest and smallest nations actually occupy a unique position on the international stage, meriting a distinct examination. This Part begins with an examination of the Clean Development Mechanism and African nations, demonstrating that these nations are unlikely to be active participants in one of the few devices actually directed toward southern nations and thus will be marginal actors at best in international efforts to deal with climate change. This lack of voice is examined within the larger context of the problem of their overall powerlessness on the international stage, a difficulty that is found in other international regimes. Despite the fact that low-income nations participate in international deliberations, they do so from an exceedingly weak position that puts them in the untenable position of being on the receiving end of whatever policies richer nations and peoples decide to pursue. Climate change and other environmental problems are no different. If wealthy nations, which are the primary emitters of greenhouse gases, decide to do something, poorer nations will benefit, even if they are peripheral and are not the primary intended beneficiaries. If wealthy nations decide not to take action, poorer nations will suffer with absolutely no recourse within the international system.¹⁴ Thus,

14. The United Nations has recognized that, outside of any treaties, each state has the "responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction and to play their due role in preserving and protecting the global and regional environment in accordance with their capacities and specific responsibilities." G.A. Res. 44/207, ¶ 4, U.N. DOC. A/RES/44/207 (Dec. 22, 1989). See also United Nations Framework Convention on Climate Change, Preamble, at 1, May 9, 1992, S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 165 [hereinafter UNFCCC]. The Inuit have used this as a basis for a complaint against the

climate change appears to be yet another chapter in the increasing powerlessness and irrelevance of poor nations within an increasingly global system. As the Conclusion notes, however, the consequences in this case are deadly.

I. UNDERSTANDING CLIMATE CHANGE

A. *The Theory*

Climate change¹⁵ is the consequence of what is a very normal and necessary process that has gone seriously awry because of human activity.¹⁶ In the natural course of events, incoming solar radiation is balanced by outgoing terrestrial radiation, and this balance is maintained by what are known, because of their greenhouse-like effect, as greenhouse gases (GHGs).¹⁷ A basket of approximately thirty mostly trace gases makes it harder for outgoing infrared radiation to escape the earth's atmosphere,¹⁸ thereby trapping heat near the earth's

United States founded on the American contribution to climate change. *See infra* notes 190–207 and accompanying text.

15. Climate has been defined as “the average weather over a certain period of time and space. With recorded surface temperatures today ranging from +58°C to -89°C, Earth's regional climates are highly variable from equator to poles, and across its latitudes.” Da Costa, *supra* note 13. The wide variation is due to a number of complex factors, including how the sun falls upon various parts of the planet. It has also led to the enormous variety of flora and fauna found on our planet. *Id.* Our discussion, however, considers earth's global climate, which is less variable. *See id.*

16. As with many international ecological problems, such as depletion of the ozone layer, not much thought was given to how these activities might affect the global ecology. The result was not planned or even contemplated and thus at least initially might be thought of as innocent. Of course, as evidence of ill effects accumulated, this innocence has faded.

17. This terminology originated in 1824 when a French scientist by the name of Jean-Baptiste-Joseph Fourier formulated the notion that incoming and outgoing solar radiation are balanced. He compared this action with how a hothouse operates. F. Sherwood Rowland, *Atmospheric Changes Caused by Human Activities: From Science to Regulation*, 27 *ECOLOGY L.Q.* 1261, 1279, 1279 n.61 (2001). *See also* Pierrehumbert, *supra* note 3, at 575; Richard Wolfson & Stephen H. Schneider, *Understanding Climate Science*, in *CLIMATE CHANGE POLICY: A SURVEY* 3, 7–10 (Stephen H. Schneider et al. eds., 2002); *CLIMATE CHANGE* 2001, *supra* note 13, at 5–6. For a brief history of the development of the science of global warming, see ELIZABETH KOLBERT, *FIELD NOTES FROM A CATASTROPHE: MAN, NATURE, AND CLIMATE CHANGE* 35–44 (2006) [hereinafter KOLBERT, *FIELD NOTES*].

18. Rowland, *supra* note 17, at 1263. For a list of greenhouse gases, see *CLIMATE CHANGE* 2001, *supra* note 13, at 244–45.

surface. Thus, the greenhouse effect is natural—allowing the atmosphere to trap heat and warm the earth, keeping it at a sustainable and comfortable temperature. Without it, our planet would be uninhabitable.¹⁹ Nonetheless, it is possible to have too much of a good thing, and human activities over the last two hundred years have unintentionally caused this natural process to go seriously awry. By the late nineteenth century, scientists began to calculate a warming effect caused by increasing concentrations of carbon dioxide in the atmosphere, although because the concentrations exist in such minute amounts, measuring and thus confirming this transformation was no small matter.²⁰ Nevertheless, eventually the science advanced to the point that scientists are certain about the connection between GHGs, which include carbon dioxide (CO₂), water vapor, nitrous oxide (N₂O), methane, ozone, and others,²¹

19. Without the greenhouse effect, average temperatures would drop from the current 60 degrees Fahrenheit to 5 degrees Fahrenheit, which is “too cold to sustain life as we know it.” Clare Breidenich et al., *The Kyoto Protocol to the United Nations Framework Convention on Climate Change, Current Developments*, 92 AM. J. INT’L L. 315, 316 n.7 (1998). Greenhouse gases absorb energy reflected from the earth’s surface and emit it in all directions, including back toward earth. This keeps some energy from escaping back into space and traps heat in the atmosphere. The effect warms the surface of the earth more than if the radiation would escape directly back into space. Clouds create a similar effect; however, clouds create a slight cooling effect because they reflect more radiation into space than they absorb and trap. The part of the greenhouse effect that occurs naturally is known as the natural greenhouse effect, while the effects of human activity create the enhanced greenhouse effect. CLIMATE CHANGE 2001, *supra* note 13, at 89–90, 93.

20. Rowland, *supra* note 17, at 1279–84 (detailing the growth in monitoring stations and other methods to accurately measure and confirm this suspected increase in GHGs). Professor Rowland played an important role in accurately measuring these gases. *See id.* at 1281.

21. There is a basket of around thirty GHGs, including methane, nitrous oxide, hydrofluorocarbons (HFCs), and chlorofluorocarbons (CFCs); most GHGs are trace gases. Methane is the second most important GHG, after CO₂, and is “created by microbes that thrive in oxygenless environments . . . [I]t abounds in swamps, farts, and belches.” TIM FLANNERY, *THE WEATHER MAKERS* 30–31 (2005). The prediction is that methane will cause 15% to 17% of the global warming that will take place this century. Nitrous oxide (laughing gas) comes from burning fossil fuels and biomass and from fertilizers that contain nitrogen. The HFC and CFC families of chemicals are the only GHGs that are man-made. *Id.* They are also instrumental in ozone depletion and have been phased out under international instruments addressing ozone depletion. *See, e.g.*, United Nations, Vienna Convention for the Protection of the Ozone Layer (updated through Nov. 2001), <http://ozone.unep.org/pdfs/viennaconvention2002.pdf>; United Nations, Montreal Protocol on Substances that Deplete the Ozone Layer (updated through March 2000), <http://ozone.unep.org/pdfs/montreal-protocol2000.pdf>.

and their crucial effect on the ability of the earth to emit the radiation that keeps temperatures at a certain level.²² Scientists have also measured the increasing concentrations of these gases in the atmosphere²³ and are certain that they are causing adverse changes to our climate.²⁴

The earth's climate naturally fluctuates between colder and warmer periods,²⁵ and ice core studies in Greenland and Antarctica²⁶ have allowed climate scientists to correlate concentrations of carbon dioxide with these temperature variations. CO₂ levels have ranged between 180 parts per million (ppm) during the coldest parts of the Ice Age to 280 ppm during interglacial periods; the latter is the level at which CO₂ remained over much of the last 10,000 years.²⁷ Since the beginning of the nineteenth century, however, concentrations have continued to climb and now stand at 368 ppm;²⁸ by the middle

22. CLIMATE CHANGE 2001, *supra* note 13, at 89–90, 93; Rowland, *supra* note 17, at 1281.

23. Besides actually collecting data from the atmosphere on current concentrations, scientists can also quantify concentrations extending back hundreds of thousands of years by examining ice cores from glaciers in Antarctica and Greenland. Snow accumulates in layers on glaciers each year and is compressed into a permanent record. CLIMATE CHANGE 2001, *supra* note 13, at 131, 202–03, 250; Elizabeth Kolbert, *Ice Memory*, THE NEW YORKER, Jan. 7, 2002, at 30, 32. These cores hold trapped impurities, including gas bubbles and air. They have been drilled to a depth of 3,600 meters, going down to layers deposited about 420,000 years ago. By examining the composition of these bubbles, scientists can obtain information about the atmosphere from the past 420,000 years. Rowland, *supra* note 17, at 1285. See also J. R. Petit et al., *Climate and Atmospheric History of the Past 420,000 Years from the Vostok Ice Core, Antarctica*, 399 NATURE 429 (1999).

24. “Global warming is the consequence of increasing absorption of outgoing terrestrial infrared radiation by trace atmospheric components such as carbon dioxide, methane, and nitrous oxide.” Rowland, *supra* note 17, at 1263. The additional absorption of heat warms the planet and therefore alters the climate. *Id.* at 1284–85.

25. “During the last million years, the Earth has passed through a series of very cold spells (the Ice Ages) interspersed with warmer, interglacial periods, such as the current one which began about 10,000 years ago.” *Id.* at 1285.

26. Scientists have drilled into glaciers in Greenland and Antarctica that contain inside them “sequential geophysical records of . . . atmospheric and oceanic changes.” Glacial ice cores “preserve these isotopic signatures of winter and summer” that can be counted in layers going back thousands of years. They “also record the ebb and flow of temperature changes during the alternating ice ages and interglacial period.” *Id.* at 1285.

27. *Id.* at 1285–86.

28. *Id.* at 1286. Methane concentrations moved between 0.35 ppm in cold periods and 0.70 in warm times until the early nineteenth century, when they

of the century, CO₂ levels are projected to reach over 500 ppm.²⁹ By 2100, projected surface temperatures range from 59 to 63 degrees Fahrenheit.³⁰ The consequences of such a large rise in temperatures are potentially catastrophic.³¹

While the earth naturally experiences climate variations, what is currently taking place is not at all natural—it is man- and woman-made.³² In the late eighteenth century, England began to industrialize, and large swaths of humanity embarked upon what is known as the industrial revolution.³³ This revolution brought unprecedented economic and social changes, but it was fueled by energy, and eventually that energy was mostly in the form of coal and oil. The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as “a change of climate *which is attributed directly or indirectly to human activity*” and that transcends natural cli-

started rising to the current 1.78 ppm. *Id.* at 1286. *See also* CLIMATE CHANGE 2001, *supra* note 13, at 248.

29. Elizabeth Kolbert, *The Darkening Sea*, THE NEW YORKER, Nov. 20, 2006, at 66, 68 [hereinafter Kolbert, *The Darkening Sea*]. The last time CO₂ concentrations were that high was in the Eocene period, when sea levels were believed to be 300 feet higher. Elizabeth Kolbert, *The Climate of Man—III*, THE NEW YORKER, May 9, 2005, at 52, 55 [hereinafter Kolbert, *Climate of Man—III*].

30. Rowland, *supra* note 17, at 1287. Atmospheric models are used to calculate the extent to which increased concentrations of gases will change the global temperature. These models also account for “the behavior of clouds, of material and energy transfer between atmospheric gases and the oceans, and the presence of atmospheric particles or ‘aerosols,’” as well as volcanic eruptions. *Id.* at 1289. *See also* FLANNERY, *supra* note 21, at 154–65 (2005). The global climate is far less variable than regional climates. It changes over millions of years, and it has fluctuated widely over the earth’s 4.6 billion years, ranging from very cold to very hot temperatures to everything in the middle. These changes have wrought “mass extinctions and explosive innovations.” Da Costa, *supra* note 13.

31. *See infra* notes 69–85 and accompanying text.

32. Effects of global warming “have emerged from the background ‘noise’ of climate variability” as we are in a new age of the Anthropocene, an epoch dominated by man-made influence on the world. KOLBERT, FIELD NOTES, *supra* note 17, at 184.

33. The industrial revolution greatly increased productivity, but the fossil fuels that power productivity—coal, oil, and natural gas—release greenhouse gases such as carbon dioxide, methane, and nitrous oxide into the atmosphere. Leah H. Martinez, *Post Industrial Revolution Human Activity and Climate Change: Why the United States Must Implement Mandatory Limits on Industrial Greenhouse Gas Emissions*, 20 J. LAND USE & ENVTL. L. 403, 404 (2005). *See also* CLIMATE CHANGE 2001, *supra* note 13, at 243; Mark A. Drumbl, *Poverty, Wealth, and Obligation in International Environmental Law*, 76 TUL. L. REV. 843, 872 (2002) (“[I]ndustrial, transportation, and commuter activity, principally the burning of fossil fuels, contribute carbon dioxide, CFCs, methane, and nitrous oxide to the atmosphere.”).

mate changes.³⁴ The increasing amounts of GHGs being emitted into the atmosphere, combined with the destruction of sinks such as forests that absorb the gases, have thrown the natural balance off kilter. Ice cores spanning thousands of years³⁵ establish that since 1750, human activities have led to demonstrably higher worldwide concentrations of carbon dioxide, methane, and nitrous oxide, up to levels that significantly exceed pre-industrial levels.³⁶ Rising CO₂ concentrations are predominantly caused by fossil fuel use and changes in land use.³⁷ Methane and nitrous oxide quantities are rising mainly because of agricultural practices and transformations in land use practices.³⁸ Thus, anthropic emissions of GHGs³⁹ and

34. UNFCCC, *supra* note 14, art. 1 (emphasis added).

35. See Rowland, *supra* note 17, at 1285.

36. See CLIMATE CHANGE 2001, *supra* note 13, at 39, 41–42 (stating that CO₂ has increased from 280 ppm in 1750 to 367 ppm in 1999, methane has increased by 150% since 1750, and nitrous oxide has increased by 16% since 1750).

37. CLIMATE CHANGE 2007, *supra* note 1, at 2. The report explains the following:

[C]arbon dioxide is the most important anthropogenic greenhouse gas The global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm to 379 ppm in 2005. The atmospheric concentration of carbon dioxide in 2005 exceeds by far the natural range over the last 650,000 years (180 to 300 ppm) as determined from ice cores. The annual carbon dioxide concentration growth-rate was larger during the last 10 years (1995–2005 average: 1.9 ppm per year).

Id.

38. The IPCC reported the following in 2007:

The global atmospheric concentration of methane has increased from a pre-industrial value of about 715 ppb [parts per billion] to 1732 ppb in the early 1990s . . . exceed[ing] by far the natural range of the last 650,000 years (320 to 790 ppb) as determined from ice cores. Growth rates have declined since the early 1990s, consistent with total emissions . . . being nearly constant during this period. It is *very likely* [greater than 90% probability] that the observed increase in methane concentration is due to anthropogenic activities, predominantly agriculture and fossil fuel use, but relative contributions from different source types are not well determined. . . . The global atmospheric nitrous oxide concentration increased from a pre-industrial value of about 270 ppb to 319 ppb in 2005. The growth rate has been approximately constant since 1980. More than a third of all nitrous oxide emissions are anthropogenic and are primarily due to agriculture.

Id.

39. The UNFCCC broadly defines greenhouse gases as “those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation.” UNFCCC, *supra* note 14, art. 1. The Kyoto Protocol is more specific, defining greenhouse gases to include carbon dioxide, methane,

their concentration in the atmosphere are increasing, and these rising emissions are causing the earth's climate to change.⁴⁰ Indeed, the third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), the foremost scientific body on climate change,⁴¹ confirmed that human activity is the main force behind rising global temperatures.⁴² Moreover, given the current level of GHGs currently in the atmosphere, our earth will continue to warm over the next few centuries regardless of any measures humanity undertakes.⁴³

chlorofluorocarbons, and nitrous oxide. Kyoto Protocol, *supra* note 9, Annex A. The IPCC has concluded that human emissions of these gases are enhancing the greenhouse effect. CLIMATE CHANGE 2001, *supra* note 13, at 5, 93.

40. See text accompanying note 34, *supra*, for the UNFCCC's definition of climate change.

41. The IPCC is a United Nations-affiliated body that was created in 1988 to report and analyze the changes taking place on the planet. The IPCC, which was established under the auspices of the United Nations Environment Programme and the World Meteorological Organization, replaced the temporary institutions created during previous years in order to create a single international organization dedicated to understanding greenhouse gases, their effect on the climate, and their impact on socio-economic arrangements. See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, 16 YEARS OF SCIENTIFIC ASSESSMENT IN SUPPORT OF THE CLIMATE CONVENTION 4 (2004), <http://www.ipcc.ch/about/anniversarybrochure.pdf>. The IPCC does not engage in research, record climate change, or recommend policies but prepares reports for review by governments and the scientific community. The IPCC consists of three groups: the first monitors the scientific information on climate change, the second studies climate-change impact on the environment and socio-economics, and the third creates possible responses to remedy or reduce climate change. *Id.* at 5. The United Nations General Assembly has endorsed the IPCC. G.A. Res. 43/53, U.N. Doc. A/RES/43/53 (Dec. 6, 1988). The U.S. Environmental Protection Agency says the IPCC is "looked to as the official advisory body to the world's governments on the state of the science of the climate change issue." U.S. EPA, Glossary of Climate Change Terms, <http://epa.gov/climatechange/glossary.html> (last visited 7/14/2007).

42. CLIMATE CHANGE 2001, *supra* note 13, at 10 ("There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.").

43. The February 2007 report of the IPCC states that even if concentrations of all greenhouse gases were kept constant at 2000 levels, there would still be further warming of about 0.1 degree Celsius per decade. CLIMATE CHANGE 2007, *supra* note 1, at 12. Understanding the ultimate consequences begins with the role GHGs play as they "absorb a fraction of terrestrial emissions, and re-emit them in all directions, including back toward Earth," blocking some infrared wavelengths. Rowland, *supra* note 17, at 1287.

B. From Theory to Proof

After decades of vociferous debate and controversy,⁴⁴ the reality of global warming is now indisputable. Concrete evidence of our changing environment is not only discernible but is burgeoning.⁴⁵ According to the IPCC,⁴⁶ the global average surface temperature increased over the twentieth century, with the 1990s being the warmest decade.⁴⁷ Average sea levels also climbed during the twentieth century and the heat content of the world's oceans rose,⁴⁸ as global heating in the lower part of

44. Professor Rowland observes that "public discussion about global warming has been infused with a sense of uncertainty that does not accurately reflect the actual state of the science." *Id.* at 1290. To the extent there is uncertainty, it is as to the great number of phenomena connected with global warming. *Id.*

45. "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level." CLIMATE CHANGE 2007, *supra* note 1, at 5. "The total temperature increase from 1850–1899 to 2001–2005 is 0.76° C." *Id.* (internal brackets omitted).

46. As Elizabeth Kolbert notes, IPCC reports are based on scientific evidence but are also filtered through governments, which have varying interests. Thus, language may be restrained and findings downplayed to reach consensus. Therefore, the reports, while alarming, tend to be conservative and somewhat dated. Elizabeth Kolbert, *Comment: Hot Topic*, THE NEW YORKER, Feb. 12, 2007, at 27, 27.

47. The IPCC reported the following in 2007:

Eleven of the last twelve years (1995–2006) rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850). . . . New analyses of balloon-borne and satellite measurements of lower- and mid-tropospheric temperature show warming rates that are similar to those of the surface temperature record. . . . The average atmospheric water vapour content has increased since at least the 1980s over land and ocean as well as in the upper troposphere. The increase is broadly consistent with the extra water vapour that warmer air can hold. Observations since 1961 show that the average temperature of the global ocean has increased to depths of at least 3000 m and that the ocean has been absorbing more than 80% of the heat added to the climate system. Such warming causes seawater to expand, contributing to sea level rise.

CLIMATE CHANGE 2007, *supra* note 1, at 5–7.

48. "Tide gauge data show that global average sea level rose between 0.1 and 0.2 metres during the 20th century. . . . Global ocean content has increased since the late 1950s." CLIMATE CHANGE 2001, *supra* note 13, at 4. By 2007, the IPCC reported that average sea levels rose an average of 1.8 millimeters per year from 1961 to 2003.

The rate was faster over 1993 to 2003, about 3.1 [2.4 to 3.8] mm per year. Whether the faster rate for 1993 to 2003 reflects decadal variability or an increase in the longer-term trend is unclear. There is *high confidence*

the atmosphere warmed the oceans. Warmer oceans increase the amount of water vapor in the atmosphere, which increases precipitation,⁴⁹ an effect already being observed⁵⁰ along with increases in cloud cover.⁵¹ Moreover, warmer oceans mean more intense storms because warm waters fuel hurricanes and other storms.⁵²

Connected to rising ocean levels are decreased snow cover and, more particularly, glacial thawing. Snow cover has been decreasing, as has the duration of lake and river ice cover in some areas.⁵³ Glaciers are melting at an unprecedented rate, as are snowcaps at the top of mountains.⁵⁴ The twentieth cen-

that the rate of observed sea level rise increased from the 19th to the 20th century. The total 20th century rise is estimated to be 0.17 m.

CLIMATE CHANGE 2007, *supra* note 1, at 7.

49. Rowland, *supra* note 17, at 1291. A 3.5% "increase in precipitation per degree Fahrenheit of warming" is currently predicted. *Id.*

50. These changes include increases in precipitation in some areas of the northern hemisphere and decreases in others. It is also likely that there has been a 2% to 4% increase in the rate of heavy precipitation. CLIMATE CHANGE 2001, *supra* note 13, at 4.

51. The IPCC report concludes that there has been a 2% increase in cloud cover over mid- to high-latitude land areas during the twentieth century, and in most areas, the trend relates highly to the observed decrease in daily temperature ranges. CLIMATE CHANGE 2001, *supra* note 13, at 103.

52. See Kerry Emanuel, *Increasing Destructiveness of Tropical Cyclones Over the Past 30 Years*, 436 NATURE 686 (2005). Hurricanes and cyclones are warm-weather events, and the warmer the water, the greater their intensity. See Burns, *Global Warming*, *supra* note 7, at 170–71; C. D. Hoyos et al., *Deconvolution of the Factors Contributing to the Increase in Global Hurricane Intensity*, 312 SCIENCE 94 (2006) (attributing increase in intensity of hurricanes since 1970 to an increase in sea surface temperature, while eliminating other short-term factors). Of course, no single storm can be specifically attributable to climate change, especially given the natural yearly variation in storm activity. Elizabeth Kolbert, *Comment: Storm Warnings*, THE NEW YORKER, Sept. 19, 2005, at 35, 35 [hereinafter Kolbert, *Storm Warnings*].

53. In 2001, the IPCC concluded that

there are very likely to have been decreases of about 10% in the extent of snow cover since the late 1960s, and ground-based observations show that there is very likely to have been a reduction of about two weeks in the annual duration of lake and river ice cover in the mid- and high latitudes of the Northern Hemisphere, over the 20th century.

CLIMATE CHANGE 2001, *supra* note 13, at 4. Additionally, mountain glaciers have been retreating. *Id.* The IPCC reported in 2007 that "[m]ountain glaciers and snow cover have declined on average in both hemispheres. Widespread decreases in glaciers and ice caps have contributed to sea level rise (ice caps do not include contributions from the Greenland and Antarctic ice sheets)." CLIMATE CHANGE 2007, *supra* note 1, at 7.

54. CLIMATE CHANGE 2007, *supra* note 1, at 5; KOLBERT, FIELD NOTES, *supra* note 17, at 45–66.

tury witnessed a widespread retreat of mountain glaciers in non-polar regions and a decline in Arctic ice.⁵⁵ More alarmingly, the Greenland ice sheet, which climate scientists consider one of the best barometers of climate change, is melting faster than had been predicted⁵⁶ and may now be “in terminal decline.”⁵⁷

The polar regions, and especially the North Pole, may be the canary in the coalmine, raising the alarming prospect that “climate change is accelerating at a rate that current scientific models failed to predict.”⁵⁸ Native communities at the poles are being dispersed and forced to move as their habitats deteriorate to the point that their way of life is unsustainable.⁵⁹ Animal migratory patterns are shifting as flora and fauna at-

55. The IPCC concluded in 2001 that “[i]t is likely that there has been about a 40% decline in Arctic sea-ice thickness during late summer to early autumn in recent decades and a considerably slower decline in winter sea-ice thickness.” CLIMATE CHANGE 2001, *supra* note 13, at 4. In 2007, the IPCC indicated that new data now shows that

losses from the ice sheets of Greenland and Antarctica have *very likely* contributed to sea level rise from 1993 to 2003. . . . Flow speed has increased for some Greenland and Antarctic outlet glaciers, which drain ice from the interior of the ice sheets. The corresponding increased ice sheet mass loss has often followed thinning, reduction or loss of ice shelves or loss of floating glacier tongues. Such dynamical ice loss is sufficient to explain most of the Antarctic net mass loss and approximately half of the Greenland net mass loss. The remainder of the ice loss from Greenland has occurred because losses due to melting have exceeded accumulation due to snowfall.

CLIMATE CHANGE 2007, *supra* note 1, at 7.

56. *Has the Greenland Ice Sheet Tipped?*, THE ECOLOGIST, Feb. 2007, at 9. Scientists were anticipating a loss of 80 km³ in 2006. Satellite data indicate that the actual loss has been 287 km³, and in some areas the lost ice was 2 km deep. *Id.*

57. *Id.*; see also Matthew D. Zinn, *Adapting to Climate Change: Environmental Law in a Warmer World*, 34 ECOLOGY L.Q. 61, 76 nn.71–73 (citing scientific articles describing the unbalance of the Greenland ice shelf).

58. *Has the Greenland Ice Sheet Tipped?*, *supra* note 56.

59. KOLBERT, FIELD NOTES, *supra* note 17, at 8–10 (describing the relocation of the peoples of Shishmaref in Alaska). See also *Summary of the Petition, PETITION TO THE INTER AMERICAN COMMISSION ON HUMAN RIGHTS SEEKING RELIEF FROM VIOLATIONS RESULTING FROM GLOBAL WARMING CAUSED BY ACTS AND OMISSIONS OF THE UNITED STATES* (2005), http://www.earthjustice.org/library/legal_docs/summary-of-inuit-petition-to-inter-american-council-on-human-rights.pdf [hereinafter *Petition Summary*]; Elizabeth Kolbert, *The Climate of Man—I*, NEW YORKER, Apr. 25, 2005, at 56 [hereinafter Kolbert, *Climate of Man—I*]; Margot Roosevelt, *Vanishing Alaska*, TIME, Oct. 4, 2004, at 68.

tempt to adapt to new habitats.⁶⁰ What is most striking is that this transformation is taking place more quickly and more dramatically than had been predicted.⁶¹ Our planet has reached a tipping point toward a warmer climate, regardless of any ameliorating actions mankind might eventually undertake,⁶² and even if the projected consequences of global warm-

60. A recent study has shown that many species have moved their migratory range northward an average of 3.8 miles per decade. *Global Warming Kicks Off a Migration*, CBS NEWS, Jan. 2, 2003, <http://www.cbsnews.com/stories/2003/01/02/tech/main534993.shtml> (describing, for instance, the sooty copper butterfly, which used to be common near Barcelona but now is found about sixty miles north of the city). See also KOLBERT, FIELD NOTES, *supra* note 17, at 64, 67–71; *Climate Change Blamed for Cockroach Migration*, ABC NEWS ONLINE, Mar. 14, 2007, <http://www.abc.net.au/news/newsitems/200703/s1871398.htm> (reporting on a new kind of cockroach in Sydney that likes warmer climates); Andrew C. Revkin, *Warming Is Found to Disrupt Species*, N.Y. TIMES, Jan. 2, 2003, at A1. The National Wildlife Federation and the American Bird Conservancy have produced a report on global warming's possible effects on birds and their migration patterns. JEFF PRICE & PATRICIA GLICK, AMERICAN BIRD CONSERVANCY & NATIONAL WILDLIFE FEDERATION, THE BIRDWATCHER'S GUIDE TO GLOBAL WARMING (2002), <http://www.abcbirds.org/climatechange/birdwatchersguide.pdf>.

61. For example, one scientist has admitted that the ice sheet around Greenland is melting faster "than we thought possible even a decade ago." KOLBERT, FIELD NOTES, *supra* note 17, at 63. The process is being sped up by loops, or feedbacks, where future warming is accelerated by the effects of past warming. One loop involves permafrost, where warming organic matter that was frozen in the permafrost thaws, restarting decomposition and releasing the carbon into the air. See *id.* at 20–22. While this will increase plant growth in the Arctic, the amount of carbon released will outpace the amount of carbon absorbed by new plants. *Id.* at 22. Another loop involves melting sea ice. Frozen water has a high albedo, or ability to reflect light back into space. *Id.* at 29–30. An albedo of one reflects all light, and zero absorbs all light. *Id.* at 30. Snow-covered ice has an albedo of 0.8 or 0.9, while sea water has an albedo of 0.07. *Id.* Therefore, as ice melts and becomes ocean, the planet reflects less energy and absorbs more, leading to further heating that causes more melting. *Id.* at 30–31. This process is known as the ice-albedo feedback. *Id.* at 31. Other feedback loops may influence the rate of warming and other effects, such as the level of ocean expansion. CLIMATE CHANGE 2001, *supra* note 13, at 417–70; CLIMATE CHANGE 2007, *supra* note 1, at 12–13. Another feedback is the water-vapor feedback. KOLBERT, FIELD NOTES, *supra* note 17, at 106. Warm air can hold more water vapor, which is a greenhouse gas, and thus contributes to warmer air. *Id.*

62. The IPCC reports that "[a]nthropogenic warming and sea level rise would continue for centuries due to the timescales associated with climate processes and feedbacks, even if greenhouse gas concentrations were to be stabilized." CLIMATE CHANGE 2007, *supra* note 1, at 17.

ing chronicled in the next section are blunted by prompt action.⁶³

C. *Living in a Warmer World*

It is impossible to state the countless possible results of a warmer planet with absolute certainty, and this uncertainty has been used to deny that global warming is transpiring.⁶⁴ What is certain, however, is that the impact will be diverse, multitudinous, and largely negative. Indeed, perhaps we should be humbled by what we do not know and cannot anticipate, simply because it is impossible to predict what will transpire in a system as complex as our climate and the systems it supports and nurtures. Nonetheless, climatologists predict that climate change will have varying and uneven consequences, many that may be undesirable and some that could be devastating.⁶⁵ It is also certain that Third World peoples will generally be the first peoples affected, will endure the most challenging effects, and be the least equipped to handle them.⁶⁶

The IPCC has carefully and cautiously attempted to estimate the likely effects of global warming,⁶⁷ which will vary de-

63. See Andrew C. Revkin, *Climate Panel Reaches Consensus on the Need to Reduce Harmful Emissions*, N.Y. TIMES, May 4, 2007, at A8 (comparing the CO₂ in the air to unpaid credit card debt).

64. The Bush administration has stated it is inappropriate to take action when the science is unclear. See *Yes, Globe Is Warming, Even If Bush Denies It*, USA TODAY, June 15, 2005, at 10A. "We do not know how much our climate could, or will change in the future." . . . "We do not know how fast change will occur, or even how some of our actions could impact it." *Rewriting the Science*, 60 MINUTES, Transcript of Broadcast on March 19, 2006, available at <http://www.cbsnews.com/stories/2006/03/17/60minutes/main1415985.shtml> (quoting President Bush offering reasons for rejecting the Kyoto Protocol). In defending America's refusal to sign the Kyoto Protocol, Christine Whitman, former head of the EPA, reasoned that because the research is incomplete, "We're still a long way from knowing how to solve the problem," and it would be too early to sign any accord. Elizabeth Kolbert, *Comment: Hot and Cold*, THE NEW YORKER, Aug. 13, 2001, at 25.

65. The UNFCCC defines "adverse effects of climate change" as "changes in the physical environment or biota resulting from climate change which have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare." UNFCCC, *supra* note 14, art. 1.

66. This includes native communities of the polar region, whose habitat is already under severe stress. See Roosevelt, *supra* note 59, at 68 (describing flooding of Eskimo villages).

67. The IPCC 2001 report qualifies its predictions as "virtually certain" (greater than 99% chance that a result is true), "very likely" (90% to 99%), "likely"

pending on the extent and timing of curbs on global emissions. Thus, the task becomes exceedingly complex as scientists attempt to determine likely temperature changes and then what changes will flow from these variants. Moreover, there are feedback loops that may influence the rate of warming and other effects, such as the level of ocean expansion.⁶⁸ Nonetheless, IPCC models predict the following looming effects of climate change.

Snow cover is expected to shrink in the Arctic, along with thawing of permafrost regions.⁶⁹ Dwindling sea ice is anticipated in both the Arctic and Antarctic, with late summer sea ice disappearing almost entirely in some projections.⁷⁰ Glacial melting and contraction of the Greenland ice sheet are projected to continue to contribute to sea level rise as higher temperatures cause it to lose its mass more rapidly than it gains from precipitation.⁷¹ The Greenland ice sheet is enormous, holding billions of tons of fresh water, and if it is released into the Arctic Ocean, sea levels will rise, with a variety of negative consequences such as disrupting weather patterns.⁷² Moreover, if the ice sheet thaws, sea levels could rise seven meters (about 23 feet). Rising ocean levels will place severe stress on

(66% to 90%), "medium likelihood" (33% to 66%), "unlikely" (10% to 33%), "very unlikely" (1% to 10%), and "exceptionally unlikely" (less than 1%). See CLIMATE CHANGE 2001, *supra* note 13, at 2 n.7. The IPCC 2007 report classifies its predictions as "virtually certain" (greater than 99% probability of occurrence), "extremely likely" (over 95%), "very likely" (over 90%), "likely" (over 66%), "more likely than not" (over 50%), "unlikely" (less than 33%), "very unlikely" (less than 10%), and "extremely unlikely" (less than 5%). See CLIMATE CHANGE 2007, *supra* note 1, at 4 n.6.

68. CLIMATE CHANGE 2001, *supra* note 13, at 417–70; CLIMATE CHANGE 2007, *supra* note 1, at 12–13.

69. CLIMATE CHANGE 2007, *supra* note 1, at 369.

70. KOLBERT, FIELD NOTES, *supra* note 17, at 33 (revealing one scientist's prediction that the perennial sea-ice in the Arctic will disappear by 2080). Ocean ice does not affect the ocean levels because the ice displaces water and thus, when it melts, it has no impact on ocean mass. Greenland and Antarctic ice is on land, however, and its melting is a different matter. Wolfson & Schneider, *supra* note 17, at 30. There is a connection between the floating ice and the ice connected to it on land, which ultimately leads to some increase in the ocean level due to the melting of the ice in the ocean. CLIMATE CHANGE 2007, *supra* note 1, at 369.

71. "[T]he Antarctic ice sheet will remain too cold for widespread surface melting and is expected to gain in mass due to increased snowfall," although there could be net loss of ice mass under certain scenarios. CLIMATE CHANGE 2001, *supra* note 13, at 16; CLIMATE CHANGE 2007, *supra* note 1, at 17.

72. *Has the Greenland Ice Sheet Tipped?*, *supra* note 56. The Greenland ice sheet is 2,830,000 km³, which is about the size of mainland Europe. *Id.*

coastal areas and low-lying communities and, in the case of some islands, may mean their disappearance.⁷³

Hot extremes, heat waves, and more hot days are very likely, leading to increased deaths and illness in older populations, heat stress among certain livestock and wild animals, crop damage, and demand for energy.⁷⁴ It is also very likely that there will be higher minimum temperatures, fewer cold and frost days, and fewer cold waves over almost all land areas.⁷⁵ While this will decrease the risk of damage to many crops,⁷⁶ it may broaden the reach and movement of pests and disease vectors.⁷⁷ Heavier and more intense precipitation events are likely over many areas, and they will persist and become more frequent, with the potential for more floods, landslides, and avalanches; more soil erosion and flood runoff; and in industrialized countries, more pressure on government and

73. Burns, *Global Warming*, *supra* note 7, at 165–71. See also WORKING GROUP II CONTRIBUTION TO THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE FOURTH ASSESSMENT REPORT, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY 11 (2007), <http://www.ipcc-wg2.org/index.html> [hereinafter WORKING GROUP II REPORT] (PDF files of report explaining the effects of climate change on small islands); Henry W. McGee, Jr., *Litigating Global Warming: Substantive Law in Search of a Forum*, 16 FORDHAM ENVTL. L. REV. 371, 381–82 (2005) (describing effects global warming could have on islands, including damages to the economy and uninhabitability); Elizabeth Kolbert, *Comment: Global Warming*, THE NEW YORKER, Dec. 12, 2005, at 39 (describing abandonment of an island due to rising sea levels).

74. WORKING GROUP II REPORT, *supra* note 73, at 3, 5–7 (explaining effects of climate change on health, water, ecosystems, food, and industry); Wolfson & Schneider, *supra* note 17, at 32–33. While there may be some benefits to some countries, such as fewer deaths from exposure to cold, those benefits will be offset by many other negative health consequences, “especially in *developing countries*.” WORKING GROUP II REPORT, *supra* note 73, at 8 (emphasis added). See also Andrew Simms, NEW ECON. FOUND., AFRICA—UP IN SMOKE? THE SECOND REPORT FROM THE WORKING GROUP ON CLIMATE CHANGE AND DEVELOPMENT 18 (2005), http://www.oxfam.org.uk/what_we_do/issues/climate_change/downloads/africa_up_in_smoke.pdf?m=234&url=http://www.oxfam.org.uk/what_we_do/issues/conflict_disasters/downloads/asylum_wpaper.pdf [hereinafter UP IN SMOKE].

75. CLIMATE CHANGE 2001, *supra* note 13, at 15; CLIMATE CHANGE 2007, *supra* note 1, at 8. Some of these predicted results have been observed. *Id.*

76. For example, periodically there are what seem to be inevitable cold snaps that wipe out some portion of California or Florida crops. See, e.g., Lini S. Kadaba, *Eating Right Will Cost More*, PHILA. INQUIRER, Jan. 17, 2007, at A01; *Florida Citrus Industry Chilled by Record Cold*, L.A. TIMES, Jan. 22, 1985, § 4, at 1.

77. Wolfson & Schneider, *supra* note 17, at 32. Climate change will also increase flooding and droughts, which will further damage communities and shrink food supplies. WORKING GROUP II REPORT, *supra* note 73, at 7.

private flood disaster relief.⁷⁸ While precipitation is projected to increase in high altitudes, it is likely to decrease in most subtropical land regions,⁷⁹ and thus droughts are projected to increase and intensify in some regions, adversely affecting "agricultural and rangeland productivity."⁸⁰

It is predicted that tropical cyclones, typhoons, and hurricanes will become more powerful, with higher peak wind speeds and heavier precipitation, while extra-tropical storm tracks will move toward the poles.⁸¹ While no storm can be specifically attributed to global warming,⁸² the havoc wrought by Hurricane Katrina demonstrated the kind of catastrophe that more intense storms can bring. Indeed the aftermath of this storm is credited with awakening the American public to the reality of global warming.⁸³ More tropical storms pose a risk to human life, including the risk of infectious disease epidemics and other threats. Storms also increase coastal erosion,

78. Wolfson & Schneider, *supra* note 17, at 32. Millions of additional people will be in flood plains, and the effects especially will be felt on mega-deltas in Africa and Asia, while island nations will be even more exposed to flooding. WORKING GROUP II REPORT, *supra* note 73, at 8. "Adaption for coasts will be more challenging in developing countries than in developed countries, due to constraints on adaptive capacity." *Id.*

79. The increases in precipitation are "very likely" to occur, while the decreases are predicted as "likely." CLIMATE CHANGE 2007, *supra* note 1, at 9.

80. Wolfson & Schneider, *supra* note 17, at 30. As El Niño events increase in many regions, there may also be more floods, leading to decreased agricultural productivity in flood-prone regions. CLIMATE CHANGE 2001, *supra* note 13, at 16; WORKING GROUP II REPORT, *supra* note 73, at 7.

81. This pole-ward movement will cause "changes in wind, precipitation, and temperature patterns, continuing the broad pattern of observed trends over the last half-century." CLIMATE CHANGE 2007, *supra* note 1, at 16.

82. Kolbert, *Storm Warnings*, *supra* note 52, at 35.

83. While this awakening may be the only good thing to come out of the debacle that followed Katrina, it is ironic because the catastrophe was mainly due to man-made forces, to wit, the failure of the levees that were to protect New Orleans and the poor government response to the ensuing flooding. SELECT BIPARTISAN COMMITTEE TO INVESTIGATE THE PREPARATION FOR AND RESPONSE TO HURRICANE KATRINA, 109th Cong., A FAILURE OF INITIATIVE: FINAL REPORT OF THE SELECT BIPARTISAN COMMITTEE TO INVESTIGATE THE PREPARATION FOR AND RESPONSE TO HURRICANE KATRINA 89 (Comm. Print 2006), http://katrina.house.gov/full_katrina_report.htm. See also John McQuaid, *Katrina Trapped City in Double Disasters*, NEW ORLEANS TIMES-PICAYUNE, Sept. 7, 2005, http://www.nola.com/newslogs/breakingtp/index.ssf/?mtlogs/nola_Times-Picayune/archives/2005_09_07.html (describing two different floods that inundated the city). This led one author to conclude that the hurricane was a natural disaster, while the failing levees and subsequent flood were man-made. Louise K. Comfort, *Fragility in Disaster Response: Hurricane Katrina*, 29 AUGUST 2005, 3 FORUM 1, 4 (2005), available at <http://www.bepress.com/forum/vol3/iss3/art1>.

damage coastal structures including infrastructure, and damage coastal ecosystems such as coral reefs and mangroves that will already be under stress because of higher ocean temperatures. Finally, based on current models it is very likely that the meridional overturning circulation (MOC) of the Atlantic Ocean will slow in the twenty-first century, which will cause an increase in temperatures in the Atlantic region.⁸⁴ The major Pacific Ocean fluctuation known as the El Niño/Southern Oscillation could become more persistent, substantially affecting Asia and the Americas.⁸⁵

II. THE INTERNATIONAL LEGAL RESPONSE

The international community has responded to evidence of mounting climate change in two ways: initially scientifically and later with legal mechanisms. The scientific community has joined in an unprecedented manner to gather evidence and study this quite complex problem and has consistently driven this process, in many respects. Indeed, the complexity and impossibility of predicting the consequences with absolute certainty has continually created problems, given the costs entailed in tackling global warming. Consequently, the scientific community has continually been ahead of governments, while the governments of the largest emitters have been the biggest foot-draggers, allowing industry to shape and drive the debate.⁸⁶ This part will briefly survey the steps towards international measures, as paltry as they currently are.⁸⁷

84. The IPCC noted that it is very unlikely the MOC will “undergo a large abrupt transition.” CLIMATE CHANGE 2007, *supra* note 1, at 752. “The Atlantic meridional overturning circulation carries warm upper waters into far-northern latitudes and returns cold deep waters southward across the Equator. Its heat transport makes a substantial contribution to the moderate climate of maritime and continental Europe, and any slowdown in the overturning circulation would have profound implications for climate change.” Harry L. Bryden et al., *Slowing of the Atlantic Meridional Overturning Circulation at 25° N*, 438 NATURE 655 (2005).

85. Wolfson & Schneider, *supra* note 17, at 30. Global warming will serve to increase whatever effects El Niño will have. CLIMATE CHANGE 2001, *supra* note 13, at 16; *see generally* CLIMATE CHANGE 2007, *supra* note 1.

86. *See* Thoms, *supra* note 8.

87. Even if every nation ratified the instruments described in this section and fully met their targets, emission would only be held at 5.2% below 1990 levels. With the concessions made to the Russian Federation so that the Kyoto Protocol would enter into effect, this shrinks to 1.8%. Carter Dougherty, *Revised Kyoto Protocol on Global Warming Seen as Less Rigid*, WASH. TIMES, July 25, 2001, at

A. Precursors to International Governmental Action

International efforts to address climate change began in the scientific community. The World Meteorological Organization (WMO), the United Nations Environment Programme (UNEP) and the International Council of Scientific Unions (CSU) organized the first World Climate Conference in 1979.⁸⁸ Subsequent meetings in the 1980s eventually concluded that there were risks in the direct temperature effects of climate change, as well as hazards resulting from sea-level rise.⁸⁹ In the background was the discovery of the ozone hole and international efforts to address that problem.⁹⁰ In 1988, an international conference on the "Changing Atmosphere: Implications for Global Security" was held in Toronto,⁹¹ and participants realized that no single country, industry, or individual could deal with such a momentous problem. An international framework convention supported by national laws would be required. Scientists recommended a 20% reduction in CO₂ emissions over 1990 levels by 2005, a recommendation known as the "Toronto Targets."⁹² Moreover, in 1988, climate change appeared on the UN General Assembly agenda for the first time, when Malta

B6. The scientific community believes reductions from the current cumulative emission of about 1415 GtC to about 1100 GtC are needed to stabilize emissions at a 1000 ppm feedback level. CLIMATE CHANGE 2007, *supra* note 1, at 17.

88. CTR. FOR SCI. & ENV'T, GREEN POLITICS, GLOBAL ENVIRONMENTAL NEGOTIATIONS 1 (Anil Agarwal et al. eds., 1999) [hereinafter GREEN POLITICS]. This meeting concluded that it "was clearly possible that the increase in carbon dioxide in the earth's atmosphere due to human activities may result in major long-term changes of the climate." *Id.* at 26.

89. *Id.* at 24. Sea level rise, caused by thermal expansion of the oceans from sea ice, would result in high tides, beach erosion, land-use changes, loss of wetlands, frequent and severe flooding, and damage to coastal structures and port facilities, among other negative impacts. *Id.* at 26.

90. *Id.* at 26. Many thought that the successful international effort to address ozone depletion would carry over to dealing with climate change. Thoms, *supra* note 8, at 798. For a number of reasons, this assessment was inaccurate. *Id.* at 822-43.

91. Three hundred and forty individuals from forty-six countries attended this conference, including scientists and policymakers. Information Unit on Climate Change, Climate Change Fact Sheet 215, The Toronto and Ottawa Conferences and the "Law of the Atmosphere," <http://www.cs.ntu.edu.au/homepages/jmitroy/sid101/uncc/fs215.html> (last visited Aug. 28, 2007).

92. GREEN POLITICS, *supra* note 88, at 26-27.

raised it in a declaration that proclaimed the climate as part of the common heritage of mankind.⁹³

Perhaps the peak of the scientific environmental coalition came with the 1989 Noordwijk Ministerial Conference on Atmospheric Pollution, which was attended by representatives of sixty-seven countries, half of which were developing countries.⁹⁴ It was the first high-level political meeting to focus on climate change and the first time the debate was extended to southern-tier countries.⁹⁵ In 1990, the IPCC released a report that formalized the view that if anthropogenic emissions of GHGs continued at the present rate, the average global temperature would increase and the seas would rise faster than they had ever risen before.⁹⁶ This report was released in time for the second World Climate Conference, held in November that year and attended by 137 countries, including many southern-tier countries.⁹⁷

In December of 1990, the United Nations General Assembly established the Intergovernmental Negotiating Committee

93. Daniel Bodansky, *The United Nations Framework Convention on Climate Change: A Commentary*, 18 YALE J. INT'L L. 451, 465 (1993) [hereinafter Bodansky, *Commentary*].

94. The Noordwijk Ministerial Conference on Atmospheric Pollution and Climate Change was convened by the Netherlands. Differences between northern nations and between northern and southern-tier nations were already beginning to emerge by this point. GREEN POLITICS, *supra* note 88, at 27–28; Bodansky, *Commentary*, *supra* note 93, at 467.

95. GREEN POLITICS, *supra* note 88, at 27–28.

96. Mumma, *supra* note 8, at 182. The report predicted that sea levels could rise as much as a meter in the next century, which would push coasts hundreds of meters inland and potentially overtake hundreds of thousands of square kilometers of wetlands and other low-lying areas. COASTAL MANAGEMENT SUBGROUP, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, STRATEGIES FOR ADAPTION TO SEA LEVEL RISE 1–5 (1990), <http://www.epa.gov/climatechange/effects/downloads/adaption.pdf>. Agriculture, livestock, and fresh water supplies could be affected. *Id.* at iv. Small islands would be hurt the most, potentially devastating their economies. *Id.* at 5, 13.

97. The conference was held in Geneva from October 29 to November 7, 1990, and was sponsored by the WMO, UNEP, and other international organizations. Information Unit on Climate Change, Climate Change Fact Sheet 221, The Second World Climate Conference, <http://www.cs.ntu.edu.au/homepages/jmitroy/sid101/uncc/fs221.html> (last visited Sept. 4, 2007). The conference was held at a pivotal time in the climate treaty process. *Id.* The First Assessment of the IPCC provided critical assessments of the problem, although commitments did not follow in its wake. *Id.* However, participation was widespread, making it an important step toward a treaty of whatever kind. *Id.*

for a Framework Convention on Climate Change (INC),⁹⁸ whose purpose was to negotiate a convention to be signed at the 1992 UN Conference on Environment and Development (UNCED).⁹⁹ This goal was met, albeit after much debate and rancor, which set the tone and contours of ensuing national perspectives, opinions, and attitudes, many of which have continued to the present. To wit, European nations have been more willing to commit to targets and timetables, while the United States has been opposed to such targets. Southern-tier nations are determined that obligations and costs be borne by the West, including the transfer of resources to take any actions that might be warranted on their part, while former eastern-block nations have been somewhere in the middle of this morass.¹⁰⁰ Thus began the international legal odyssey to deal with climate change.

B. *The Framework Convention on Climate Change*

International legal efforts to address global warming began in earnest with the United Nations Framework Convention on Climate Change (UNFCCC), which was signed by 154 states and the European community in 1992 at UNCED.¹⁰¹ Lying

98. Mumma, *supra* note 8, at 183.

99. *Id.* The Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC) was established to draft a legally binding climate treaty by the June 1992 Rio Earth Summit. Information Unit for Climate Change, Climate Change Fact Sheet 209, The Intergovernmental Negotiating [sic] Committee for a Framework Convention on Climate Change, <http://www.cs.ntu.edu.au/homepages/jmitroy/sid101/uncc/fs209.html> (last visited Sept. 4, 2007). It became the central forum for the international effort to draft a climate treaty, with 150 government and numerous intergovernmental and non-governmental organizations taking part in the discussions. *Id.* Negotiations took place during five meetings between February 1991 and May 1992. *Id.* While there were vociferous debates, negotiations proceeded rapidly given the scientific appraisals, such as the First Assessment Report of the IPCC and reports from the Second World Climate Conference, which furnished the foundation for INC deliberations. *Id.*

100. *See infra* Part IV.A (discussing the broader perspective of Third World nations).

101. The United Nations Conference on Environment and Development, popularly known as the Earth Summit, was held from June 3 to 14, 1992, in Rio de Janeiro. INFORMATION UNIT ON CLIMATE CHANGE, CLIMATE CHANGE AND THE UNCED "EARTH SUMMIT" (1993), <http://www.cs.ntu.edu.au/homepages/jmitroy/sid101/uncc/fs207.html> [hereinafter EARTH SUMMIT]. It was attended by 172 nations, 108 at the head of state or government level, and 2,400 representatives of non-governmental organizations.

somewhere between a framework convention and a substantive agreement, the UNFCCC contains elements of both.¹⁰² It is a framework convention in that it establishes an institutional structure that permits the parties to move toward more concrete and specific legal obligations,¹⁰³ including a Secretariat to administer the treaty and regular conferences of the parties.¹⁰⁴ Although the UNFCCC establishes more extensive commitments than the Vienna Ozone Convention, the substantive commitments are few and somewhat vague.¹⁰⁵ Indeed, while articulating the objective of "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system,"¹⁰⁶ ultimately the treaty imposed few obligations on its signatories.¹⁰⁷ Resistance by countries with large coal reserves

Among the documents adopted were Agenda 21, the United Nations Convention on Biological Diversity, and the Framework Convention on Climate Change. *Id.*

102. Bodansky, *Commentary*, *supra* note 93, at 493. The Framework Protocol approach has been used to address other international environmental problems where nations are hesitant to enter into binding obligations. *Id.* The framework treaty generally imposes few or no obligations. However, it establishes an institutional structure to promote scientific and other studies of the problem, provides a repository for information on the extent of the problem, and perhaps most importantly, calls for regular meetings where substantive agreements with concrete obligations can be reached. *Id.* at 493–95. It allows lawmaking to proceed, albeit sometimes incrementally, during periods of scientific uncertainty or political unwillingness, while establishing mechanisms to further the science and create conditions for political agreement. *Id.*; see also Burns, *Global Warming*, *supra* note 7, at 173–74 (discussing Bodansky, *Commentary*, *supra* note 93). This method was used with some success to address the problem of ozone depletion, and there were hopes it would be effective in addressing global warming. See Thoms, *supra* note 8. For a number of reasons, including the unwillingness of the United States to take an active role in dealing with global warming, this result has not transpired. See *id.* For an excellent discussion of the differences in addressing ozone depletion versus global warming, see *id.*

103. UNFCCC, *supra* note 14, art. 4.

104. *Id.* art. 8.

105. Bodansky, *Commentary*, *supra* note 93, at 496.

106. UNFCCC, *supra* note 14, art. 2.

107. Specific commitments are found in UNFCCC article 4, where Annex 1 nations, which are OECD nations and nations in transition, commit to various obligations. *Id.* art. 4. Article 4 obligations include, *inter alia*, making available national inventories of anthropogenic emissions; formulating and implementing national programs to mitigate climate change; and developing, applying and diffusing processes that control, reduce or prevent anthropogenic emissions of GHGs not controlled by the Montreal Protocol. *Id.* In terms of sinks, commitments include promoting sustainable management, conservation, and enhancement of sinks and reservoirs; cooperating in preparing for adaptation to the impacts of climate change, including plans for coastal zone management, water resources and agriculture; and protecting and rehabilitating areas affected by drought and

and a dependence on oil meant the parties could only agree to general, long-term goals, leaving future action to be based on available scientific evidence. Arguably, the convention included a duty to reduce GHG emissions to 1990 levels, but the provision was so vague that it was essentially meaningless.¹⁰⁸

In terms of southern-tier nations, the UNFCCC set forth one of the foundations regarding developing nations and climate change: the idea of "differential responsibilities" for industrialized and southern-tier nations.¹⁰⁹ It also articulated the notion that southern nations will need funding and transfer of technology if they are to address climate change. These provisions will be discussed in more detail below,¹¹⁰ but it suffices to say that they were necessary if these nations were to be included in the convention.

The treaty instituted a mechanism to hold regular meetings to draft concrete measures, and a series of meetings, known as the Conference of the Parties (COP), have been and

desertification. *Id.* The Annex I nations are committed to taking climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and employing such measures as impact assessments. *Id.* They agree to promote and cooperate in scientific, technological, technical, and other research, to systematically observe and develop data on climate change, and to exchange relevant scientific, technological, technical, socioeconomic and legal information related to the climate system and climate change. *Id.* They also agree to promote training and public awareness and communicate information related to implementation to the Conference of the Parties. *Id.*; see also Burns, *Global Warming*, *supra* note 7, at 174.

108. Bodansky, *Commentary*, *supra* note 93, at 515–16. Article 4(2) states that Annex 1 nations are to adopt and report on national policies to limit emissions and enhance sinks with the aim of returning to 1990 emissions levels. UNFCCC, *supra* note 14, art. 2. Since the UNFCCC was adopted, it has become clear that Annex 1 nations do not view this as requiring binding emissions reductions to 1990 levels. William C. Burns, *The Second Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change: More Heat Than Light?*, 8 COLO. J. INT'L ENVTL. L. & POL'Y 153, 158 (1997) [hereinafter Burns, *Second Session*] (stating that the United States' appeals for industry to reduce emissions voluntary have failed and that the International Energy Agency has concluded that "none of the twenty-three industrialized nations that belong to the agency are likely to stabilize emissions at 1990 levels by 2010").

109. UNFCCC, *supra* note 14, art. 3, ¶¶ 1–2 (recognizing that climate change was created by, and will affect, countries differently; developed countries should take the lead in fighting climate change; and developing countries will bear a disproportionate burden under the convention); *id.* art. 4 (recognizing differentiated responsibilities of developed and developing nations); see Burns, *Global Warming*, *supra* note 7, at 174–75.

110. See *infra* notes 229–36 and accompanying text.

continue to be held.¹¹¹ In the meantime, as UNFCCC parties met in the 1990s, the IPCC continued to issue reports on the potential effects of global warming caused by GHGs.¹¹² With Bill Clinton's re-election to the White House and Albert Gore's re-election as vice president, the United States began to urge serious negotiations regarding commitments,¹¹³ and at the Third COP, held in Kyoto, Japan, in December 1997, the parties to the UNFCCC adopted the Kyoto Protocol.

C. *The Kyoto Protocol*

The hallmark of the Kyoto Protocol is that, for the first time, industrialized countries have committed to legally binding limits on emissions of CO₂ and other GHGs.¹¹⁴ This exceedingly complex instrument¹¹⁵ requires industrialized nations, by

111. The UNFCCC established a conference of the parties that was to meet every year. UNFCCC, *supra* note 14, art. 7, ¶¶ 1–2. The Conference of the Parties (COP) is the “supreme body” of the convention; it is the highest decision-making authority and is an association of all the countries that are parties to the convention. *Id.*; Burns, *Second Session*, *supra* note 108, at 156. The first COP was held in Berlin between March 26 and April 7, 1995; the issues were the adequacy of industrialized country commitments, the financial mechanism, and criteria for joint implementation. GREEN POLITICS, *supra* note 88, at 46. The second COP took place in Geneva on July 8 and 9, 1996. *Id.* at 47. On its agenda were the 1995 IPCC Second Assessment Report and progress on procedures. *Id.* With the re-election of Bill Clinton, the American delegation supported the IPCC report and urged negotiations on binding emissions. *Id.* The third COP was held in Kyoto, Japan, and it was there that the Kyoto Protocol was negotiated. *Id.* at 56.

112. Bruce Yandle & Stuart Buck, *Bootleggers, Baptists and the Global Warming Battle*, 26 HARV. ENVTL. L. REV. 177, 180 (2002). For a list of reports, see INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, PUBLICATIONS: ASSESSMENTS AND SPECIAL REPORTS, <http://www.ipcc.ch/pub/reports.htm> (last visited July 16, 2007).

113. GREEN POLITICS, *supra* note 88, at 47. OPEC nations, however, were unwilling to permit necessary action. *Id.* The final Geneva Declaration stressed the need to accelerate talks on strengthening the convention and endorsed the IPCC report, although a great deal of disagreement remained on acceptable GHG emission limits and a number of other matters. *Id.*; Burns, *Second Session*, *supra* note 108, at 161 (stating that by the third meeting, the United States was encouraging the adoption of joint reductions, where one country pays another to reduce without reducing itself).

114. It took two years of preparatory work and eleven days of concerted negotiations to produce the protocol. Breidenich, *supra* note 19, at 315. Industrialized nations are designated as Annex I countries. UNFCCC, *supra* note 14, art. 12, ¶ 2, & Annex I.

115. The complexity reflects the intricate economic, political, scientific, and legal issues raised by human-induced climate change. Breidenich, *supra* note 19, at 315.

2008 to 2012, to reduce total GHG emissions to 5.2% below base year 1990 levels.¹¹⁶ Each nation negotiated specific emission reductions, ranging from an 8% reduction for the European community to a 10% increase for Iceland.¹¹⁷ The Protocol covers a broad range of GHGs¹¹⁸ and takes into account emissions and sequestration from land-use changes and forestry resources.¹¹⁹

Within certain parameters, the protocol permits limited trading in emissions,¹²⁰ although devising a target-based emissions trading system proved elusive during the Kyoto negotiations. Nonetheless, such a system is authorized by Annex B countries, which are the countries that have agreed to reduction targets and timetables.¹²¹ "A country can buy the right to emit a specified amount of carbon dioxide from another country that values the money more than the right to emit,"¹²² although emission trading has not been without controversy.¹²³

116. Countries in transition, which are former eastern-block nations, are permitted to use another base year. See Kyoto Protocol, *supra* note 9, art. 3.

117. The United States, which is the principal greenhouse-gas emitter, was expected to reduce its emissions to 7% below 1990 levels by 2008 to 2012. Kyoto Protocol, *supra* note 9, Annex B. The differences in emission reductions were the result of very intense negotiations, with some nations, such as the United States, arguing for a uniform target and others arguing for differentiated targets. Breidenich, *supra* note 19, at 320–21. Unable to reach agreement on a single target, the parties opted for individual targets. *Id.* Moreover, rather than a single-year target, the protocol establishes a cumulative target that applies to a multi-year "commitment period." *Id.* at 321.

118. Nations can use 1995 as a base year for three synthetic GHG categories: HFCs, PFCs, and SF₆, which are substitutes for ozone-depleting substances and which have been used increasingly rapidly since 1990. Breidenich, *supra* note 19, at 321. There was a great deal of debate over even including these gases, and thus the compromise was making 1995 the base year. *Id.* at 321–22.

119. This is a complex undertaking, given the declining capacity of forests to absorb carbon and the lack of data on this sector, as well as other problems. *Id.* at 317.

120. Kyoto Protocol, *supra* note 9, art. 3, ¶¶ 10–12, & art. 6. Trading must take place within specified parameters, however. See *id.* art. 17. Moreover, the nation buying emissions rights must be in compliance with its obligations under the protocol for measuring emissions, and any trading must be supplemental to domestic actions taken for the objective of reducing emissions. *Id.*; Yandle & Buck, *supra* note 112, at 182.

121. Kyoto Protocol, *supra* note 9, art. 17; Breidenich, *supra* note 19, at 321.

122. Kyoto Protocol, *supra* note 9, art. 3, ¶¶ 10–12, & art. 6; Yandle & Buck, *supra* note 112, at 181.

123. The extent to which the Protocol should permit trading rather than requiring actual reductions was hotly contested. Wirth, *supra* note 10, at 652. The degree to which a state can trade emissions versus absolutely reducing emissions is known as "supplementarity." *Id.* There was also controversy over whether it

The UNFCCC states that parties might “jointly or individually” implement policies and measures to reduce GHG emissions.¹²⁴ Much debate ensued as to exactly what this language meant,¹²⁵ and most especially, whether “joint implementation” permitted emission-reduction credits.¹²⁶ Ultimately, the protocol authorizes four distinct flexibility mechanisms that reduce the cost of implementation and afford Annex I parties an array of options to fulfill their treaty obligations.¹²⁷ “Joint implementation” for Annex I countries means these nations can utilize emissions trading and cooperative projects.¹²⁸ Annex I countries and private sector entities can invest in emission-reduction projects in the territory of other Annex I countries and use emission-reduction credits earned in those projects towards national emission targets.¹²⁹ Projects must

was appropriate to permit trading what was often termed “hot air.” *Id.* Other controversies included a “commitment period reserve” that would prohibit a state from trading more than a certain amount during a particular period, whether credits could be earned from nuclear power emissions, and other disagreements. *Id.*

124. UNFCCC, *supra* note 14, art. 4, ¶ 2.

125. The debate focused on whether Annex I countries would receive credit for projects they undertook in developing countries, which would be cheaper than undertaking domestic reductions. Breidenich, *supra* note 19, at 323. Developing countries also worried that when they attempted to reduce emissions later, industrialized countries would have already bought all their easy reductions and they would be left with the expensive reductions in order to meet their quota. *Id.*; see Kyoto Protocol, *supra* note 9, art. 3, ¶ 1 (maintaining the use of the phrase “individually or jointly”).

126. The joint implementation credits could also be traded among Annex I countries, but there was debate on how they should be counted. Breidenich, *supra* note 19, at 324. The European Union proposed only trades for specific projects that could be measured; however, within their own union, total emissions could be used for trading. *Id.* Non-EU countries wanted the total emissions to be the standard for all nations. *Id.*; see Kyoto Protocol, *supra* note 9, art. 4 (setting out who is responsible for failure to reach emissions goals in trade).

127. Breidenich, *supra* note 19, at 324; see also Wirth, *supra* note 10. Nations can unite in voluntary associations to have their emissions considered on a collective basis. Kyoto Protocol, *supra* note 9, art. 4, ¶ 6; Yandle & Buck, *supra* note 112, at 182. This provision is considered to be of primary interest to the European community, however. Yandle & Buck, *supra* note 112, at 182. This would mean that nations within the European community would not have to trade, even if emissions in one nation were higher than in another. *Id.*

128. Wirth, *supra* note 10, at 652.

129. Breidenich, *supra* note 19, at 324. Countries may create joint projects in one country, with reductions counting toward both of their targets. Kyoto Protocol, *supra* note 9, art. 6; Yandle & Buck, *supra* note 112, at 182. Eligibility for these credits is conditioned on compliance with the measurement and reporting requirements of the protocol. Yandle & Buck, *supra* note 112, at 182; see also Annie Petsonk, *The Kyoto Protocol and the WTO: Integrating Greenhouse Gas Emis-*

entail a reduction in emissions or an enhancement of removals by sinks in addition to any that would otherwise occur—thereby incorporating a concept known as “supplementarity,” which ensures absolute reductions in emissions over and beyond emissions trading.¹³⁰

Flexibility has been a controversial subject. In general, the European Union has favored less access to flexibility mechanisms in the interest of “protecting the environmental integrity of the reduction commitments, while [other Annex I nations] have argued against restrictions as impeding economic efficiency.”¹³¹ Subsequent negotiations proved extraordinarily difficult,¹³² with the balance finally tipping toward the maximum flexibility sought by the Russian Federation. Indeed, once President Bush stated that the United States would not ratify the protocol, all manner of concessions were made to the Federation to induce them to ratify and thus save the protocol.¹³³

Lastly, the final joint implementation mechanism under the Kyoto Protocol permits Annex 1 nations to invest in emission-reduction projects in developing nations, and it is to those nations this article now turns.

sions Allowance Trading Into the Global Marketplace, 10 DUKE ENVTL. L. & POL'Y F. 185 (1999) (discussing emissions-trading market).

130. Kyoto Protocol, *supra* note 9, art. 6, ¶ 1(b); Yandle & Buck, *supra* note 112, at 182. Supplementarity could reduce the gains of trade by all parties. Yandle & Buck, *supra* note 112, at 181. For a discussion of supplementarity within ratification of the Kyoto Protocol, see Matthew Vespa, Note, *Climate Change 2001: Kyoto at Bonn and Marrakech*, 29 ECOLOGY L.Q. 395, 407–09 (2002). For a discussion on the controversy of supplementarity, see *supra* note 123.

131. Wirth, *supra* note 10, at 652.

132. See, e.g., Daniel Bodansky, *Bonn Voyage—Kyoto's Uncertain Revival*, 45 NAT'L INTEREST, Fall 2001, [hereinafter Bodansky, *Bonn Voyage*]; John Knox, *The International Legal Framework for Addressing Climate Change*, 12 PENN ST. ENVTL. L. REV. 135 (2004).

133. Anil Agarwal, *A Southern Perspective on Curbing Global Climate Change*, in CLIMATE CHANGE POLICY: A SURVEY 375, 388–90 (Schneider et al. eds., 2002) [hereinafter Agarwal, *A Southern Perspective*]. European nations basically agreed to let Russia into the World Trade Organization in exchange for the Duma, its legislature, ratifying the convention. KOLBERT, FIELD NOTES, *supra* note 17, at 165–66.

III. THE ASYMMETRICAL CONSEQUENCES OF GLOBAL WARMING: THE VIEW FROM THE SOUTH

While the planet will undoubtedly survive the assault on its climate, regardless of how much damage humans cause, the impact upon its inhabitants, be they flora or fauna, is less certain. We do not know how many species will be lost as flora and fauna attempt to adapt to a rapidly changing climate, nor can we totally understand the potentially infinite effects upon ecosystems under severe stress. While we can readily observe the misfortunes of the polar bear, we cannot completely assess what is happening to rain forests that must quickly adapt, or the impact of losing coral reefs, which are sensitive to rising temperatures and greatly affect ocean ecosystems. We can only be humbled by what we do not know and by the scores of previously unanticipated effects that have already come to pass.¹³⁴

What we do know, however, is that southern-tier nations will be disproportionately affected by climate change, and many of these nations will be the least equipped to deal with these consequences.¹³⁵ This Part will begin with a focus on African nations, which face a variety of harms and, because of their poverty, will have an especially difficult time dealing with them. It will then turn to small island nations, which face annihilation, and then briefly to the native peoples of the Arctic region, who are giving us a glimpse into one possible future. Both small island nations and Arctic peoples face the most catastrophic consequences: the total destruction of their habitat and thus of their culture, community, and way of life. For them, global warming means the unmitigated end of life as they have always known it.

134. Instead of ice on glaciers sinking, scientists discovered it was moving away at an accelerating speed. KOLBERT, *FIELD NOTES*, *supra* note 17, at 54. The golden toad, a rare species of frog in Costa Rica, recently disappeared, and its apparent extinction has been linked to changing weather patterns caused by climate change. *Id.* at 80–82. Effects on marine life including coral and plankton have also been linked to climate change and rising carbon dioxide levels, which affect the pH level of oceans by turning them more acidic. Kolbert, *The Darkening Sea*, *supra* note 29, at 67.

135. One study concludes that “[d]eveloping countries are twice more vulnerable to the adverse effects of climate change than industrialized countries, and island states are three times more vulnerable.” GREEN POLITICS, *supra* note 88, at 16.

A. Africa

Climate change is already a reality for poor African nations, with Kenya, Sudan, Ethiopia, Somalia, and Chad witnessing the consequences; indeed, the conflict in Darfur may be the first climate change conflict and an indication of similar future wars.¹³⁶ Climate change is leading to “reduced rainfall and shrinking areas of arable land,”¹³⁷ and the number of food emergencies in sub-Saharan Africa each year has tripled since the 1980s.¹³⁸ Desert lands are advancing into once-arable rain-fed areas, and wetter parts of Africa are getting wetter, often leading to devastating floods.¹³⁹ Yet African nations have contributed very little to global warming,¹⁴⁰ with emissions of less than 8% of the world’s GHGs and most of this low sum coming from South Africa.¹⁴¹ The continent is particularly vulnerable to the effects of global warming, which will have a disproportionate impact on low-income unindustrialized nations, many of which also happen to be the nations that are, and will continue to be, least able to handle it.¹⁴² In other words, the

136. Scott Baldauf, *Africans are Already Facing Climate Change*, CHRISTIAN SCI. MONITOR, Nov. 6, 2006, at 4. Mr. Baldauf maintains that part of the conflict in Sudan’s Darfur region may be due to lack of resources and, more particularly, water. *Id.* On one side are farmers and on the other are herders, with weapons making the situation unmanageable and extraordinarily dangerous. *Id.* Similar tensions arose in Niger, where refugees from Chad, many of them Arab cattle herders, fled fighting in the country. *Id.* Fighting and rising tensions resulted as they encroached on farmlands and water supplies in Niger. *Id.*

137. *Id.* (quoting Francis Kornegay, a senior analyst at the Center for Policy Studies in Johannesburg).

138. *Id.* Mr. Baldauf notes that more than twenty-five million Africans faced a food crisis in 2006. *Id.*

139. *Id.*

140. Nelson, *supra* note 10, at 633–34.

141. South Africa depends considerably on coal for energy and accounts for about 1.4% of global GHG emissions. Ogunlade R. Davidson & Youba Sokana, *Africa and the Clean Development Mechanism: Perspectives for Growth*, in UNEP COLLABORATING CENTRE ON ENERGY AND ENVIRONMENT, AFRICAN PERSPECTIVES ON THE CLEAN DEVELOPMENT MECHANISM (Aug. 1999), <http://uneprisoe.org/CDM/Accra/AccraPapers.pdf> [hereinafter AFRICAN PERSPECTIVES ON THE CLEAN DEVELOPMENT MECHANISM] (series of papers presented at a regional workshop, New Partnerships for Regional Development: The Clean Development Mechanism under the Kyoto Protocol, in Accra, Ghana, Sept. 21–24, 1998). Otherwise, emissions from Africa are likely to continue to be low in the foreseeable future. *Id.*; see also Neil Ford, *Paying for the Sins of Others*, AFR. BUS., Jan. 1, 2007, at 36.

142. While this article limits its scope to specific impoverished regions, the lack of capacity to address the adverse impacts of climate change is not limited to

world's poor will be shouldering yet another burden not of their making.¹⁴³

Africa is particularly at risk to climate change, in part because of its poverty and a lack of resources to deal with a problem that is beyond its control. Taken as a whole, it is the poorest continent in the world and probably the least industrialized.¹⁴⁴ Technological and economic resources are minimal.¹⁴⁵ Drought, floods, and food scarcity are already problems in some areas, and these problems are likely to multiply and intensify. In countries already vulnerable to drought, less rainfall is predicted, which will raise particular difficulties regarding water resources.¹⁴⁶ Fourteen countries in Africa al-

these regions. For the consequences of climate change being experienced in poor nations in regions such as South Asia, see Juliet Eilperin, *Climate Shift Tied to 150,000 Fatalities; Most Victims Are Poor, Study Says*, WASH. POST, Nov. 17, 2005, at A20. Areas of the Caribbean, as well as areas in Southern and Central America, are also vulnerable to the effects of climate change due to poverty and less ability to adapt. Magdalena A.K. Muir, *Oceans and Climate Change: Global and Arctic Perspectives*, 7 SUSTAINABLE DEV. L. & POL'Y 50, 51 (2006); see also ANDREW SIMMS, NEW ECON. FOUND., UP IN SMOKE? LATIN AMERICA AND THE CARIBBEAN, THE THIRD REPORT FROM THE WORKING GROUP ON CLIMATE CHANGE AND DEVELOPMENT 18 (2006).

143. Jeffrey Gettleman, *Annan Faults Frightening Lack of Leadership for Global Warming*, N.Y. TIMES, Nov. 16, 2006, at 18.

144. According to the World Bank, a higher percentage of people live on less than one dollar a day in Sub-Saharan Africa than in any other region in the world: 46.4% of people in Sub-Saharan Africa lived on less than one dollar a day in 2002, with 38.4% forecasted to be living at that level in 2015. WORLD BANK, GLOBAL ECONOMIC PROSPECTS 2006: ECONOMIC IMPLICATIONS OF REMITTANCES AND MIGRATION 9 (2006), http://www-wds.worldbank.org/servlet/WDSCContentServer/WDSP/IB/2005/11/14/000112742_20051114174928/Rendered/PDF/343200GEP02006.pdf.

145. Of course, Africa is an enormous and diverse continent with varying levels of industrialization and poverty. See WORLD BANK, AFRICA DEVELOPMENT INDICATORS 2006, at 25 (2006), http://siteresources.worldbank.org/INTSTATINAFR/Resources/ADI_2006_text.pdf. Moreover, given its size, varying populations, and industrialization, it varies climatically. See *Summary for Policymakers—Africa*, in INTERGOV'TAL PANEL ON CLIMATE CHANGE, IPCC SPECIAL REPORT ON THE REGIONAL IMPACTS OF CLIMATE CHANGE: AN ASSESSMENT OF VULNERABILITY, Robert T. Watson et. al. eds. (1998), available at <http://www.grida.no/climate/ipcc/regional/index.htm> (last visited July 11, 2007) [Hereinafter ASSESSMENT OF VULNERABILITY]. Consequently, global warming may have variable effects throughout the continent. For a comparison of some telecommunication capabilities in Africa and other areas of the world, see International Telecommunication Union, Maps and Graphs, <http://www.itu.int/ITU-D/ict/statistics/maps.html> (last visited Sept. 5, 2007).

146. CLIMATE CHANGE 2007, *supra* note 1, at 6 (explaining that drying has been observed in Southern Africa and parts of Asia and that more intense and longer droughts have been observed in the tropics and subtropics).

ready suffer from water insufficiency, and it is estimated that another eleven nations will join this unenviable club within the next twenty-five years.¹⁴⁷ Where water resources are shared, there is a potential for conflict as nations clash over an increasingly insufficient supply.¹⁴⁸ Moreover, there are already discussions regarding the prospect of "climate change refugees," to portray the large scale and pervasive displacement of African peoples.¹⁴⁹ Desertification is expected to intensify as there is less rainfall and land becomes increasingly scarce.¹⁵⁰

Global warming is expected to put an additional 80 to 120 million people at risk of hunger, and 70% to 80% of these people will be located in Africa.¹⁵¹ As weather patterns become more unpredictable, farmers are having a difficult time determining where and what to plant.¹⁵² Food insecurity is expected to increase as agricultural production declines due to lack of water and changing ecosystems. It is predicted that climate change could lead to a 5% drop in the production of food crops.¹⁵³

Rapidly changing ecosystems also raise the specter of risks to biodiversity and natural resource productivity. Many impoverished peoples depend on the diversity of surrounding ecosystems to support their way of life. Global warming, however, will have potentially devastating effects on habitats and the diversity found within already fragile ecosystems; between 25% and 40% of Africa's natural plant habitats could be lost by 2085.¹⁵⁴ The Working Group on Climate Change and Development predicts that as plant species used in traditional medicines become extinct, local peoples' capacity to combat illnesses will become increasingly impaired.¹⁵⁵ Vector- and water-borne diseases are expected to escalate, especially in areas with an

147. UP IN SMOKE, *supra* note 74, at 13.

148. *Id.* at 42. There are also concerns that water security could be an issue in and around Australia and New Zealand. WORKING GROUP II REPORT, *supra* note 73, at 9.

149. UP IN SMOKE, *supra* note 74, at 30.

150. *Id.* at 13.

151. *Id.* at 6.

152. *Id.* at 14.

153. This includes sorghum in Sudan, Ethiopia, Eritrea, and Zambia; maize in Ghana; millet in Sudan; and groundnuts in Gambia. Baldauf, *supra* note 136.

154. WORKING GROUP II REPORT, *supra* note 73, at 449.

155. UP IN SMOKE, *supra* note 74, at 6. The WTO estimates that 80% of the population in developing countries relies on plants as the primary source of health care. *Id.*

inadequate health infrastructure.¹⁵⁶ Heat stress, air pollution, water failures, water- and food-borne diseases, and food insecurity present other potential health hazards that are particularly problematic in the absence of sufficient medical services.¹⁵⁷ Women may bear the brunt of these disasters, having limited access to land, education, and credit, while producing 80% of the crops. Their traditional knowledge may be crucial in addressing these issues, even if this knowledge alone is insufficient.¹⁵⁸

Finally, global warming is expected to intensify coastal erosion, flooding,¹⁵⁹ and subsidence, problems that already plague Africa's coastal areas. Coastal zones are vulnerable to rising sea levels, with roads, bridges, buildings, and other infrastructure at risk of flooding, and populations that are vulnerable to the kind of disaster flooding brings.¹⁶⁰ Rising sea levels could destroy an estimated 30% of Africa's coastal infrastructure.¹⁶¹

B. *Small Island States*

Like their counterparts in impoverished nations, small island states did not contribute to climate change to any measurable extent;¹⁶² most are unindustrialized, relying mainly on tourism and light industry to support their economies.¹⁶³ Yet, despite their lack of responsibility, these nations are likely to suffer especially abysmal consequences, including paying the

156. WORKING GROUP II REPORT, *supra* note 73, at 7; UP IN SMOKE, *supra* note 74, at 18.

157. UP IN SMOKE, *supra* note 74, at 18..

158. *Id.* at 29.

159. "[R]ising sea levels could jeopardize 30% of Africa's coastal areas, placing cities such as Cape Town, Lagos and Alexandria in danger of flooding." Anver Versi, *Global Warming and Africa*, AFR. BUS., Dec. 6, 2006, at 11.

160. WORKING GROUP ON CLIMATE CHANGE AND DEVELOPMENT, AFRICA—UP IN SMOKE 2 6 (2006),⁴ http://www.oxfam.org.uk/what_we_do/issues/climate_change/downloads/africa_up_in_smoke_update2006.pdf [hereinafter AFRICA—UP IN SMOKE 2].

161. Baldauf, *supra* note 136.

162. Gillespie, *supra* note 7, at 113; see UNFCCC, *supra* note 14, art. 3, ¶¶ 1–2.

163. See *Summary for Policymakers—Small Island States*, in ASSESSMENT OF VULNERABILITY, *supra* note 145; see also *Chapter Nine: Small Island States*, *id.*; Charles W. Schmidt, *Keeping Afloat: A Strategy for Small Island Nations*, 113 ENVTL. HEALTH PERSP. 606 (2005).

ultimate price—their possible annihilation.¹⁶⁴ This may be the definitive manifestation of unsustainability.¹⁶⁵

Small island states are “especially vulnerable to the effects of climate change, [such as] sea level rise and extreme events,”¹⁶⁶ and the prospect of rising oceans is especially dangerous and threatening. Climate change has been linked to deteriorating weather patterns that will include more severe storms, tornadoes, hurricanes, and cyclones,¹⁶⁷ and islands are more likely to be in areas where many of these events take place. Predictions of how much the oceans will rise over the next one hundred years range from a best case scenario of .18 meters to a worst case of .59 meters, if melting glacial ice sheets are not taken into account.¹⁶⁸ If this melting is included, in one hundred years, ocean levels could rise by four to six meters, and perhaps as high as seven meters.¹⁶⁹ Many small island states are less than three to four meters above the

164. WORKING GROUP II REPORT, *supra* note 73, at 11.

165. See Gillespie, *supra* note 7, at 108.

166. WORKING GROUP II REPORT, *supra* note 73, at 11. See also *Summary for Policymakers—Small Island States*, in ASSESSMENT OF VULNERABILITY, *supra* note 145.

167. See Gillespie, *supra* note 7, at 114. It may be that the disaster wrought by Katrina shifted the debate on global warming, changing it from a discussion of “if” to “when” and “how.” Joseph P. Tomain, *To a Point*, 52 LOY. L. REV. 1201, 1201–02 (2006). Moreover, given the extraordinarily poor response to an admittedly disastrous storm by the richest nation on earth, one shudders to consider what is in store for more impoverished and less well-equipped nations and communities. On the extraordinarily poor response in the aftermath of Hurricane Katrina, see generally U.S. HOUSE OF REPS., SELECT BIPARTISAN COMM. TO INVESTIGATE THE PREPARATION FOR AND RESPONSE TO HURRICANE KATRINA, FINAL REPORT: A FAILURE OF INITIATIVE (2006), available at http://katrina.house.gov/full_katrina_report.htm. See also Claudia Dreifus, *Earth Science Meets Social Science in Study of Disasters*, N.Y. TIMES, Mar. 14, 2006, at F2; James Janega, *Gulf's Hurricane Alley Bowls Over Experts: Global Warming Shares the Blame, Some Say*, CHI. TRIB., Sept. 24, 2005, at 7; Nahal Toosi, *Gore Says Storms Warn of Global Warming*, TIMES UNION (Albany, N.Y.), Sept. 18, 2005, at D6.

168. CLIMATE CHANGE 2007, *supra* note 1, at 13. This would be 0.295 to 2.88 feet. Other estimates predict that ocean levels will rise 0.09 to 0.88 meters between 2000 and 2100. See Gillespie, *supra* note 7, at 112.

169. See Jonathan T. Overpeck et. al., *Paleoclimatic Evidence for Future Ice-Sheet Instability and Rapid Sea-Level Rise*, 311 SCIENCE 1747, 1747 (2006) (by 2100, global warming expected to result in temperatures similar to last interglacial period, when sea levels were 4 to 6 meters higher than present). See also WORKING GROUP II REPORT, *supra* note 73, at 15 (“The complete melting of the Greenland ice sheet and the West Antarctic ice sheet would lead to a contribution to sea level rise of up to 7 m and about 5 m respectively.”). This translates into thirteen to nineteen feet or as high as almost twenty-three feet.

present mean sea level,¹⁷⁰ and thus the potential to be completely inundated is undeniable.¹⁷¹ Sea levels have already begun rising and pervasive and irreversible changes at the poles have commenced.¹⁷² The Kilinailau Islands have shrunk, and some have been cut in half by the sea.¹⁷³ Salt water has encroached upon land, making it impossible to grow breadfruit and forcing the inhabitants to relocate.¹⁷⁴ The island nations of Kiribati, Tuvalu, and Niue and the Marshall Islands are already beginning to contemplate relocating their inhabitants, looking toward Australia.¹⁷⁵ Indeed, some inhabitants of islands in Kiribati have already been forced to relocate.¹⁷⁶

Rising sea levels will present other problems. They will exacerbate coastal and other low-lying area flooding,¹⁷⁷ and intensify storm surges, erosion, and other coastal hazards. This in turn will threaten vital infrastructure, settlements, and facilities that support the livelihood of island peoples.¹⁷⁸ Rising sea levels may also directly affect freshwater resources, agricultural production, and island biodiversity.¹⁷⁹ By mid-century, water resources in many small islands are predicted to

170. Or 9.8 to 13.12 feet above sea level.

171. For Majuro Atoll, located in the Marshall Islands, a rise in sea level of one meter could cause a loss of 80% of the land. See Gillespie, *supra* note 7, at 113.

172. See e.g., CLIMATE CHANGE 2007, *supra* note 1, at 7–8; Elizabeth Kolbert, *Chilling*, NEW YORKER, Mar. 20, 2006, at 67; Kolbert, *Climate of Man—I*, *supra* note 59, at 56, 59.

173. Elizabeth Kolbert, *Global Warning*, NEW YORKER, Dec. 12, 2005, at 39, 39.

174. *Id.* Papua New Guinea is forced to bear the costs of the relocation.

175. Steve Lewis, *Climate Refugees Here by 2016*, AUSTRALIAN, Oct. 24, 2006, at 2. See also Burns, *supra* note 7, at 167–68.

176. Emma O'Brien, *Global Warming Action Comes Too Late to Help Pacific*, BLOOMBERG NEWS SERV., Feb. 15, 2007, available at http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aaC50Lp_M1nE.

177. See Gillespie, *supra* note 7, at 113.

178. See *Summary for Policymakers—Small Island States*, in ASSESSMENT OF VULNERABILITY, *supra* note 145.

179. *Id.*; Slade, *supra* note 7, at 540. See also Chapter 9: *Small Island States* in ASSESSMENT OF VULNERABILITY, *supra* note 145. This concern is no longer limited to island states. Arti Mulchand, *Is Spore Ready for the Next Big Flood?*, STRAITS TIMES (Singapore), June 24, 2007 (stating that around 50% of Asia's biodiversity could be at risk); Andrew C. Revkin, *Frog Killer Is Linked to Global Warming*, N.Y. TIMES, Jan. 12, 2006, at A12 (explaining that global warming caused the increase in a fungus that killed species of frogs); Moises Velasquez-Manoff, *Creating 'Escape Routes' for Wildlife*, CHRISTIAN SCI. MONITOR, June 21, 2007, at 25 (explaining that species in the rainforest may not be able to adjust to a changing environment without human help to migrate, thus threatening the existence of many unique species).

reach the point where they become inadequate to meet the needs of their inhabitants during low rain periods.¹⁸⁰

Increasing ocean temperatures may also stress ocean ecosystems, destroying habitats and altering migratory patterns of some ocean species.¹⁸¹ Coral reefs, which have been termed the rainforests of the ocean, are acutely sensitive to water temperature and thus are at particular risk.¹⁸² Coral reefs grow slowly and take many years to recover from damage.¹⁸³ Their destruction has very serious implications because "fish depend on coral reefs for food and shelter, while coastal inhabitants depend on coral reefs for culture and food."¹⁸⁴ Increasing ocean temperatures may also cause the migratory patterns of some ocean species to change, which could destroy habitats.¹⁸⁵ In addition, higher temperatures may cause non-native species invasions to increase.¹⁸⁶

Finally, many island states heavily depend on tourism for income and foreign exchange,¹⁸⁷ and there is little doubt that

180. WORKING GROUP II REPORT, *supra* note 73, at 11; see also *Summary for Policymakers—Small Island States*, in ASSESSMENT OF VULNERABILITY, *supra* note 145.

181. See Gillespie, *supra* note 7, at 115.

182. WORKING GROUP II REPORT, *supra* note 73, at 6. The coral reefs in the Caribbean are in particular danger. One monitoring site in the U.S. Virgin Islands reports a coral mortality rate of 30%. Although scientists do not understand precisely why, when the water becomes warmer than usual corals evict their zooxanthellae symbiotes, resulting in a condition referred to as "bleaching" because the corals turn white. Kenneth Chang, *Corals Take Double Punch in Caribbean*, N.Y. TIMES, Apr. 4, 2006, at F3.

183. *Id.* The damage to corals in the Caribbean in 2005 was worse than it had been in the last twenty years combined, and because corals grow only a fraction of an inch per year, it is expected to take centuries for them to return.

184. Dafna Hopenstand, *Global Warming and its Impact on Near-Shore Communities: Protecting Regimes for Fish and Coastal People Affected by Coral Reef Damage*, 8 WIS. ENVTL. L.J. 85, 86 (2002).

185. *Id.* at 115.

186. WORKING GROUP II REPORT, *supra* note 73, at 689 (noting that this is particularly true on middle and high latitude islands).

187. For example, between 1995 and 2003, international tourism receipts accounted for 74.64% of total exports in the Bahamas. DIVISION FOR SUSTAINABLE DEVELOPMENT, UNITED NATIONS DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS, TRENDS IN SUSTAINABLE DEVELOPMENT 24 (2006), http://www.un.org/esa/sustdev/publications/trends2006/trends_rpt2006.pdf. See also Kristie L. Ebi, Nancy D. Lewis, & Carlos Corvalan, *Climate Variability and Change and Their Potential Health Effects in Small Island States: Information for Adaptation Planning in the Health Sector*, 114 ENVTL. HEALTH PERSP. 1957 (2006) (stating that tourism is 33% of the Maldives' GDP and is being stressed by climate change); Schmidt, *supra* note 163 (explaining that tourism is one of the main industries in small island states around the world but puts all of the na-

these negative effects have great potential to disrupt tourism.¹⁸⁸ Beach erosion, soil salinization, increased stresses on coastal ecosystems, and damage to the infrastructure can only have a negative impact on tourism.¹⁸⁹ Thus, at best, these nations face a tremendous assault upon their environment and, since their economies are intimately tied to the environment, their economies are likely to decline, perhaps drastically. At worst, they face the total destruction of their homes, cultures, and communities—that is the end of their existence as a community.

C. *Native Communities of the North*¹⁹⁰

Island nations might look to the societies of the Arctic as a window into their future. Arctic communities are already being displaced as their surroundings become uninhabitable.¹⁹¹ The Arctic is extremely vulnerable to the effects of current and projected climate change, and it is already experiencing some of “the most rapid and severe climate change on earth.”¹⁹² Given this vulnerability,¹⁹³ the region is already experiencing “deterioration in ice conditions, a decrease in the quantity and quality of snow, changes in the weather and weather patterns, and a transfigured landscape as permafrost melts at an alarming rate, causing slumping, landslides, and severe erosion in some

tions’ eggs in one basket that could be affected by climate change); Bonnie Tsui, *Saving Coral Reefs Becomes a Tourism Priority*, N.Y. TIMES, June 24, 2007, § 5, at 13 (stating that coral reef tourism is a \$9.6 billion industry worldwide and is threatened by climate change). Studies even show that climate change would devastate some tourism industries in the United States. See Wade Rawlins, *Climate Change Could Hit Homes, Beaches, Business*, NEWS & OBSERVER (Raleigh, N.C.), June 21, 2007, at A10.

188. See Gillespie, *supra* note 7, at 114.

189. *Id.*

190. Except where otherwise noted, the information in this section is taken from the summary of a suit filed by the Inuit peoples of the Arctic regions of the United States and Canada. *Petition Summary*, *supra* note 59; see also Chapter 3: *The Arctic and the Antarctic*, in ASSESSMENT OF VULNERABILITY, *supra* note 145.

191. See *supra* note 59 and accompanying text.

192. Susan Joy Hassol, *Executive Summary to IMPACTS OF A WARMING ARCTIC: ARCTIC CLIMATE IMPACT ASSESSMENT 10* (2004), <http://amap.no/acia/> (select ACIA Overview Report, then select Executive Summary) [hereinafter IMPACTS OF A WARMING ARCTIC]. For example, “Annual average Arctic temperatures are increasing more than twice as fast as temperatures in the rest of the world.” *Petition Summary*, *supra* note 59, at 2.

193. WORKING GROUP II REPORT, *supra* note 73, at 11.

coastal areas.”¹⁹⁴ One of the most important changes has been in the sea ice, which has diminished and become thinner, and is freezing later and thawing earlier.¹⁹⁵ This has had a profound impact, as the Inuit depend on ice of a certain thickness to travel, hunt, harvest, and communicate between communities.¹⁹⁶ “The quality, quantity and timing of snowfall have also changed,” with implications for igloo building and travel.¹⁹⁷ “Permafrost, which holds together unstable underground gravel and inhibits water drainage, is melting at an alarming rate, causing . . . landslides, severe erosion and loss of ground moisture, wetlands and lakes.”¹⁹⁸ This erosion has had a devastating effect on Inuit tribes, forcing relocations in some cases.¹⁹⁹ There have been changes in water levels,²⁰⁰ more unpredictable weather,²⁰¹ and changes in the location, characteristics, amount, and health of plant and animal species.²⁰² “Increased temperatures and sun intensity have heightened the risk of previously rare health problems.”²⁰³

194. *Petition Summary*, *supra* note 59, at 2. The petition notes that these changes are confirmed by scientific studies, as well as Inuit knowledge of their environment, especially from hunters and elders who have an intimate knowledge of their environment. See *infra* section IV.A, regarding the monopoly on scientific knowledge by western scientists and how this monopoly works to the disadvantage of poor nations.

195. *Petition Summary*, *supra* note 59, at 2.

196. *Id.* (“Because of the loss in the thickness, extent and duration of the sea ice, these traditional practices have become more dangerous, more difficult or, at times, impossible. In many regions, traditional knowledge regarding the safety of the sea ice has become unreliable. As a result, more hunters and other travelers are falling through the sea ice into the frigid water below.”).

197. *Id.*

198. *Id.* Increasingly violent storms have exacerbated erosion, which exposes permafrost to warmer air and water. KOLBERT, *FIELD NOTES*, *supra* note 17, at 9, 24.

199. *Petition Summary*, *supra* note 59, at 2.

200. *Id.* at 3. The changes in precipitation have also led to sudden spring thaws. When the melting water combines with the falling precipitation, rivers and lakes flood and also cause erosion of streambeds. Fish stocks are negatively affected, and there is less fresh water for drinking after the floods. *Id.* at 2–3.

201. *Id.* Elders used to be able to predict the weather through observing clouds and wind directions, but such forecasting has become less reliable, making travel planning extremely difficult. *Id.*

202. *Id.* According to the Arctic Climate Impact Assessment, polar bears, seals, walruses, and marine birds are expected to face declining populations, if not extinction, in addition to the observed decrease in fish stocks. Other animals have had to change locations to stay alive, making them inaccessible to the Inuit, and caribou seem to be suffering from health problems. *Id.* at 3.

203. *Id.* at 3–4. These include “sunburn, skin cancer, cataracts, immune system disorders and heat-related problems.” *Id.* The impact on game animals has

All of these changes have wrought profound changes upon the Inuit community, gravely affecting their way of life. The projected impact, however, may mean total destruction of their way of life. In the Arctic Climate Impact Assessment,²⁰⁴ it is predicted, *inter alia*, that:

- warming will increase four to seven degrees Celsius or twice the global average rate;
- precipitation will increase, winters will become shorter and warmer, and snow and ice cover will substantially decrease;
- reductions in sea ice will drastically shrink marine habitats for a number of species;
- land based creatures will likely be increasingly stressed as climate change alters breeding grounds, food sources, and migration routes;
- species ranges will shift northward;
- more diseases will shift from animals to humans;
- rising sea levels and a reduction in sea ice will result in higher waves and thus contribute to coastal erosion;
- thawing permafrost will weaken coastal lands; and
- flooding in coastal wetlands will increase.

The species upon which many indigenous peoples depend “not only for food and to support the local economy, but also as the basis for cultural and social identity,” are at severe risk.²⁰⁵ Moreover, it will be increasingly difficult to safely travel to access these species, posing perhaps insurmountable challenges to human health and food security.²⁰⁶ Because of this intimate connection between Inuit culture and the health of their environment, the “widespread environmental upheaval resulting from climate change violates the Inuit’s right to practice and enjoy the benefits of their culture.”²⁰⁷

affected the protein source of the Inuit, and the danger of foraging for food has also increased and caused more accidents. *Id.*

204. IMPACTS OF A WARMING ARCTIC, *supra* note 192, at 10–11.

205. *Id.* at 11. Species at risk include the polar bear, walrus, seals, caribou, herding reindeer, and various fish.

206. *Petition Summary*, *supra* note 59, at 5.

207. *Id.*

IV. ADDRESSING CLIMATE CHANGE: THE VIEW FROM THE SOUTH

A. *Responsibility, Development, Diversity*

The scientific community drove the initial discussions on climate change, and the debate continues to be influenced by the assessments emanating from the IPCC. "There is an enormous disparity in North-South participation in the IPCC"; IPCC working groups are almost completely composed of American and European scientists.²⁰⁸ With a smaller scientific and technological base, southern nations were, and perhaps still are, at a distinct disadvantage in influencing the scientific debate.²⁰⁹ For unindustrialized nations with few if any scientific institutions, participation in this aspect of the process is non-existent. Thus, at least initially, the climate change discussion was entirely driven by industrialized nations, despite the potentially devastatingly adverse impacts on the South.²¹⁰ Moreover, science has been used to implicate southern countries in the climate change quandary, either by maintaining that their future emissions are increasing and would make current action by industrialized nations counterproductive, or by failing to distinguish between southern survival emissions and northern luxury emissions.²¹¹

208. Agarwal, *A Southern Perspective*, *supra* note 133, at 379.

209. *Id.* Science is often viewed as being impartial, but, of course, this is not accurate. Scientists are influenced, even if sub-consciously, by their cultural biases and views. See, e.g., Richard K. Coll, *Probing Scientists' Beliefs: How Open-Minded Are Modern Scientists?*, 26 INT'L J. SCI. EDUC. 757, 775 (2004) (reporting evidence that "personal beliefs, along with their scientific training, influence scientists' thinking"). Presumably then, there might be more emphasis on the effects of climate change on North America and Europe than on the nations of Africa.

210. While many believe science is neutral, it is shaped by its participants, who come with their inevitable political, social and cultural biases that shape foci and research. Some have maintained that such biases have shaped the emphasis on the consequences of global warming in favor of northern hemisphere consequences and may have led to blaming poor nations for increases in methane. See, e.g., GREEN POLITICS, *supra* note 88, at 20.

211. See, e.g., Agarwal, *A Southern Perspective*, *supra* note 133, at 377. The IPCC also responds to the concerns of governments and thus is not without political bias. For example, it tends to be more conservative in its predictions given pressure by western governments, such as the United States, that do not want to undertake emission limits. See, e.g., Elizabeth Kolbert, *Hot Topic*, NEW YORKER, Feb. 12, 2007, at 27.

Once climate change also became a political question directly involving governments, southern-tier nations, generally represented by the Group of 77 and China,²¹² promptly and vociferously contended that climate change was a problem created by industrialized nations, who were thereby obligated to undertake measures to deal with it.²¹³ Southern-tier nations maintain that "industrialized countries owe their current prosperity to years of historical emissions, which have accumulated in the atmosphere since the start of the industrial revolution [while] developing countries have only recently set out on the path of industrialization and their GHG emissions are still low."²¹⁴

Hence, Third World nations have tended to view climate change in developmental as well as environmental terms,²¹⁵ with a decided emphasis on development. Given climate change's intimate connection to industrialization, these nations have insisted that any multilateral treaty adopted by the international community not hinder their development efforts, perceiving a palpable distinction between opulent rich nation emissions and their necessary development emissions.²¹⁶ Of course, the stark reality is that wealthy nations became affluent without any restraints on the discharge of GHG emissions, and thus emission reductions or targets by Third World nations

212. Numerous negotiating groups emerged, with a number crossing typical North-South divisions. Bodansky, *Commentary*, *supra* note 93, at 478–81. Small island states have banded together to address climate change. *See, e.g.*, Small Island Developing States Network, Climate Change & Sea-Level Rise, <http://www.sidsnet.org/1f.html> (last viewed Sept. 6, 2007).

213. It is undeniable that the biggest emitters of GHGs are industrialized nations on both an absolute and a per capita basis. *See, e.g.*, GREEN POLITICS, *supra* note 88, at 22–23. *See also* G.A. Res. 44/228 ¶ 12 (Dec. 22, 1989) ("Gravely concerned that the major cause of the continuing deterioration of the global environment is the unsustainable pattern of production and consumption, particularly in industrialized countries."). Climate change was originally put on the agenda by Malta as part of the common heritage of mankind. Bodansky, *Commentary*, *supra* note 93, at 465.

214. Agarwal, *A Southern Perspective*, *supra* note 133, at 376. As discussion on the Kyoto Protocol unfolded, developing countries comprised three-fourths of the world's population yet emitted only one-third of all CO₂. Thus, they believe they should not be obligated to reduce their emissions. Richard H. Steinberg, *Power and Cooperation in International Environmental Law*, in RESEARCH HANDBOOK IN INTERNATIONAL ECONOMIC LAW 485, 507 (Andrew T. Guzman & Alan O. Sykes eds., 2007).

215. Bodansky, *Commentary*, *supra* note 93, at 474.

216. GREEN POLITICS, *supra* note 88, at 22–23.

could freeze existing global inequalities.²¹⁷ Indeed, Third World nations see limits on carbon emissions as “a limit on economic growth, turning climate change mitigation into an intensely political issue.”²¹⁸ A number have argued for their fair share of the atmosphere,²¹⁹ with some nations arguing that they are entitled to let their emissions grow to the same per capita level found in industrialized nations.²²⁰ To wit, industrialized nations have depleted their share of the atmosphere, a common resource that belongs to all peoples, and the rest of the world’s inhabitants are now entitled to their fair share of this resource as they industrialize.²²¹ They have demanded room to industrialize, refusing to commit to emission cuts at their current stage of modernization.²²²

On the other hand, the South has not been a unified block with the same positions and interests when it comes to this issue. On one end of the spectrum, oil-producing nations have favored no action because of the undesirable effects regulation will undoubtedly have on their interests.²²³ Conversely, small

217. Agarwal, *A Southern Perspective*, *supra* note 133, at 377. A comparison of per capita incomes among countries in different regions of the world shows that OECD countries still far outpace other countries in terms of income. WORLD BANK, WORLD DEVELOPMENT REPORT 2006: EQUITY AND DEVELOPMENT 62 (2006), http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2005/09/20/000112742_20050920110826/Rendered/PDF/322040World0Development0Report02006.pdf.

Poverty has declined worldwide, but not in every region, especially in Africa. *Id.* at 66. “[A] discussion of new developing country commitments could be seen as an attempt by rich countries to avoid changes in their wasteful energy habits by shifting responsibility to the poor.” Seth Dunn, *Can the North and South Get in Step?*, WORLD WATCH, Nov./Dec. 1998, at 19, 22.

218. Agarwal, *A Southern Perspective*, *supra* note 133, at 377.

219. See, e.g., GREEN POLITICS, *supra* note 88, at 22–23. Through past emissions, industrialized nations have already used their share of the common resource of the atmosphere, and need to take the lead in reducing emissions now. Agarwal, *A Southern Perspective*, *supra* note 133, at 377.

220. GREEN POLITICS, *supra* note 88, at 22–23; Agarwal, *A Southern Perspective*, *supra* note 133, at 387; Bodansky, *Commentary*, *supra* note 93, at 479; Mumma, *supra* note 8, at 188. “Developing nations feel entitled to the same access to cheap energy that drove development in industrialized nations.” Thoms, *supra* note 8, at 825.

221. Agarwal, *A Southern Perspective*, *supra* note 133, at 377.

222. *Id.*

223. Regulation will affect industrialized nations’ access to cheap energy that fueled their development and prosperity. Thoms, *supra* note 8, at 825. Even within nations, groups that will be harmed by regulation oppose action while those who stand to benefit support regulation. *Id.* at 832. In the United States, the fossil fuel, energy, and chemical sectors that oppose regulation are bigger and

island states have persistently and stridently fought for immediate, wide-ranging mandatory measures. They formed the Alliance of Small Island States (AOSIS), which is "a coalition of small island and low-lying coastal countries that share similar development challenges and concerns about . . . their vulnerability to the adverse effects of global climate change."²²⁴ This organization has been a determined and strong negotiating voice for small-island developing states (SIDS), although its success is debatable.²²⁵

In contrast, African states have been present at most negotiations, but have had very little input in the negotiations²²⁶ and little impact on the final product. Indeed, while SIDS contemplate total destruction, many African nations view climate change as a distant problem that does not directly affect them, at least in the short term, and view mitigation efforts as still another mandate from the West that will further dampen their development efforts.²²⁷ Large industrializing countries such as

block action. *Id.* at 833. Turning to ethanol has created other problems that may harm the poor. See Alexei Barrionuevo, *Rise in Ethanol Raises Concerns About Corn as a Food*, N.Y. TIMES, Jan. 5, 2007, at C7. Corn in the United States is being diverted from food to ethanol production, causing the crop to reach records of almost four dollars per bushel and increasing prices for meat, poultry, and dairy products, which are produced using corn-fed livestock. *Id.* There are concerns that agricultural runoff from the increased farming of corn will pollute areas such as the Chesapeake Bay. Andy Rosen, *Increased Corn Production for Ethanol in and Around Md. Worries Environmental Groups*, DAILY RECORD (Balt., Md.), July 19, 2007. The poor are often hardest hit, and there have already been protests over the price of tortillas in Mexico City. Ray Nothstine, Opinion, *The Unintended Consequences of the Ethanol Quick Fix*, CHRISTIAN SCI. MONITOR, July 27, 2007, at 9. In Brazil, where ethanol is made from sugar cane, some have said a rise in the price of sugar cane will encourage farmers to produce more ethanol, leading to widespread deforestation and other problems. *Id.*

224. Alliance of Small Island States, <http://www.sidsnet.org/aosis/> (last visited July 12, 2007). Member states are Antigua and Barbuda, Bahamas, Barbados, Belize, Cape Verde, Comoros, Cook Islands, Cuba, Cyprus, Dominica, Dominican Republic, Fiji, Federated States of Micronesia, Grenada, Guinea-Bissau, Guyana, Haiti, Jamaica, Kiribati, Maldives, Marshall Islands, Mauritius, Nauru, Niue, Palau, Papua New Guinea, Samoa, Singapore, Seychelles, Sao Tome and Principe, Solomon Islands, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Tonga, Trinidad and Tobago, Tuvalu, and Vanuatu. *Id.*

225. See *infra* note 328 and accompanying text. Small island states have been extraordinarily active, having formed a negotiating group that has been actively supported by Northern nations, in terms of funding and assistance.

226. Bodansky, *Commentary*, *supra* note 93, at 481 ("Although most [of the least developed countries] attended the negotiations, their actual participation in the discussions was nominal.").

227. See *id.* (discussing how developing countries were concerned that "the North . . . could use the [enforcement] mechanisms to criticize developing coun-

China and India have been active participants in the deliberations leading to adoption of the UNFCCC and in subsequent UNFCCC Conferences of the Parties. Indeed, some commentators believe they have been too active, given their lack of concrete obligations under the Convention.²²⁸

Despite these differences, some southern-tier demands have been consistent, such as funding and a transfer of technology to carry out whatever obligations might eventually be imposed.²²⁹ Most reasoned that industrialized nations should pay for abatement measures since they were responsible for the damage.²³⁰ Interestingly, industrialized countries agreed that funding was necessary, but eschewed acceding that they were responsible for damages, only agreeing that they should provide financing based on their greater capacity to pay.²³¹ This stance is not surprising, as the industrialized West has consistently rejected any responsibility for injury to the Third World.²³² Given their indisputable role in causing climate

tries and interfere with their sovereign right to develop," while "for many of the least developed countries, climate change remained a distant . . . threat"). See also Agarwal, *A Southern Perspective*, *supra* note 133, at 377. This author has presented some of the theses presented in this paper to groups of scholars who come from Third World nations or whose interests are focused on impoverished nations, and the antipathy was palpable.

228. Bodansky, *Bonn Voyage*, *supra* note 132, at 50.

229. These goals were recently extended for another year at the twelfth meeting of the Conference of the Parties. UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, PART TWO: ACTION TAKEN BY THE CONFERENCE OF THE PARTIES AT ITS TWELFTH SESSION (2007), <http://unfccc.int/resource/docs/2006/cop12/eng/05a01.pdf>. The ozone regime set the stage for Third World countries insisting on additional funds to implement comprehensive environmental agreements. In the wake of the Montreal Protocol, which set definitive targets for ozone depleting substances, these nations contended that they would not accept obligations to limit ozone depleting substances without funding and technology. Funding mechanisms were established in the London Amendments to help developing countries implement the Montreal Protocol. Bodansky, *Commentary*, *supra* note 93, at 439. See London Amendment to Montreal Protocol, Agreed by the Second Meeting of the Parties June 27–29, 1990, Art. 1 ¶ T, http://ozone.unep.org/Treaties_and_Ratification/2Bi_1_London_amendment.shtml (last visited Sept. 9, 2007).

230. Mumma, *supra* note 8, at 182. The position of oil-producing states might diverge from these interests. Bodansky, *Commentary*, *supra* note 93, at 481.

231. Bodansky, *Commentary*, *supra* note 93, at 480.

232. Gordon & Sylvester, *supra* note 6, at 89–90 (stating that post-developmentalism continues to emphasize a lack of responsibility by the West for the condition of developing nations today). The West views the situation in developing nations as its past, before it industrialized, without consideration of the differences in resources and current global conditions. Ruth Gordon, *Contemplating*

change, however, this omission is particularly glaring. Third World nations also insisted that addressing climate change not slow down their development efforts.

Other Third World demands were also met in the UNFCCC, including, perhaps most importantly, recognition of "differentiated responsibilities" for industrialized as opposed to southern-tier nations, although this is a feeble version of the "polluter pays" principle.²³³ The Convention acknowledges the special vulnerabilities and needs of developing countries, especially those of island nations, although it also cites the special difficulties of oil-producing nations.²³⁴ The right to promote sustainable development is included, albeit not the *right* to development, which has been consistently rejected by the United States.²³⁵ In addition, the Convention codifies the belief that southern nations would need special funding and technology transfers if they are to undertake measures to mitigate climate change, and thus a financial mechanism was established in the UNFCCC even as nations failed to reach agreement on its particulars.²³⁶ The real action, however, came in the aftermath of the UNFCCC, when the parties hammered out the details and particulars of concrete mitigation measures as well as the role of Third World nations.

the WTO From the Margins, 17 BERKELEY LA RAZA L.J. 95, 109 [hereinafter Gordon, *Margins*]. Therefore, the West expects developing nations to eventually reach the prosperity of the West. *Id.*

233. UNFCCC, *supra* note 14, art. 3 ¶ 1; Agarwal, *A Southern Perspective*, *supra* note 133, at 380.

234. UNFCCC, *supra* note 14, pmb. (explicitly "*recognizing* the special difficulties of those countries, especially developing countries, whose economies are particularly dependent on fossil fuel production, use and exportation, as a consequence of action taken on limiting greenhouse gas emissions").

235. *Id.* art. 3 §§ 2, 4 ("The Parties have a right to, and should, promote sustainable development."). Development has been acknowledged in international instruments, with sustainability becoming more prominent. See, e.g., Kyoto Protocol, *supra* note 9, art. 2. For a discussion of the debates behind these measures, see, for example, Bodansky, *Commentary*, *supra* note 93, at 495, 499.

236. Although its particulars are left to a later meeting, in the interim the Global Environmental Facility (GEF) and other entities assumed these obligations. UNFCCC, *supra* note 14, art. 11, 21. Besides the GEF, the World Bank and UNEP were interim administrators. For a discussion of the debates behind these measures, see *id.* at 538-42.

B. *The Kyoto Protocol*

The Kyoto Protocol continued the concept of a different regime for what are designated as developing countries, giving them special consideration under the protocol.²³⁷ These nations, which include China, India, Mexico, South Korea, and 130 other countries, have the option of using a different base year than 1990 to measure their GHG reductions (if reductions are undertaken), and are afforded a “certain degree of flexibility” by the protocol’s Conference of the Parties.²³⁸ Developing countries can voluntarily assume binding emissions targets, and must do so as a precondition to emissions trading.²³⁹ Moreover, Third World nations have complained that the opportunity to trade emission-reduction credits is limited to An-

237. Under the UNFCCC, the parties to the Convention are to give special consideration to

- (a) Small island countries;
- (b) Countries with low-lying coastal areas;
- (c) Countries with arid and semi-arid areas, forested areas and areas liable to forest decay;
- (d) Countries with areas prone to natural disasters;
- (e) Countries with areas prone to drought and desertification;
- (f) Countries with areas of high urban atmospheric pollution;
- (g) Countries with areas with fragile ecosystems, including mountainous ecosystems;
- (h) Countries whose economies are highly dependent on income generated from the production, processing and export, and/or on consumption of fossil fuels and associated energy-intensive products; and
- (i) Landlocked and transit countries.

UNFCCC, *supra* note 14, art. 4, ¶ 8.

Additionally, parties are directed to account for the needs and situations of the least-developed countries regarding their funding and technology. *Id.* art. 4, ¶ 9. The Kyoto Protocol reiterates that the parties must consider these needs through referring back to article 4, paragraphs 8 and 9 of the UNFCCC. Kyoto Protocol, art. 2, ¶ 3; art. 3, ¶ 14. An updated list of the least-developed countries as named by the UNFCCC can be found at UNFCCC, Least Developed Countries, http://unfccc.int/cooperation_and_support/ldc/items/3097.php (last viewed Sept. 11, 2007).

238. Kyoto Protocol, *supra* note 9, art. 3 §§ 6–7.

239. The lack of concrete commitments by industrializing nations was a source of severe consternation by the United States, which seized upon it as one of the reasons for refusing to ratify the protocol. The United States asserts that addressing climate change will be too expensive for the American economy and make U.S. businesses less competitive with corporations in excepted developing nations. Whether this can possibly justify the largest emitter of GHG from not taking part in the international effort to reduce GHGs, it may be that exempting such rising industrial giants as China and India may make it difficult, if not impossible, to adequately address climate change. GREEN POLITICS, *supra* note 88, at 50–52.

nex B countries.²⁴⁰ Third World nations consider emission rights and credits as property rights that they should be able to acquire, since trading credits can be quite profitable.²⁴¹

The end result seems to be that developing nations face few, if any, limits under the protocol, even as Annex I nations are purportedly undertaking concrete commitments to reduce GHG to 1992 levels.²⁴² Annex II nations that are designated as countries in transition are even permitted to increase their emissions. As UNFCCC parties negotiated the protocol, the United States insisted on "meaningful participation of key developing countries,"²⁴³ a position those nations viewed as attempting to shift the onus for climate change onto industrializing nations, even though industrializing nations have much lower per capita emissions than do affluent nations. The United States' insistence not only delayed substantive action and obstructed G77 unity²⁴⁴ but also served to shift attention to developing countries, which are now perceived as preventing

240. Certified Emission Reductions credits are to offset the emission reduction obligations of Annex B countries that are subject to an emissions cap. Non-Annex B nations are not subject to a cap and are therefore limited to the secondary credit market, where they can obtain credits only through the CDM process. Kyoto Protocol, *supra* note 9, art. 4, 16.

241. See Nelson, *supra* note 10, at 636. Various proposals to address this disparity include distributing credits to all states; permitting developing countries to fund CDM projects and earn credits as investors; allocating credits on a per-capita basis, reflecting the view that every inhabitant on the planet has an equal right to use the atmosphere; allotting credits based on the Poverty Index, which reflect a country's need to develop; and basing credits on emissions forgone rather than emissions reduced. *Id.* The latter proposals were from African delegations, while the former were from larger industrializing Third World nations. See *infra* notes 275–77 and accompanying text on how these positions reflect widening differences in interests.

242. See *supra* notes 116–118, 133 and accompanying text, discussing how commitments under the Protocol were diluted. While emissions initially were to be reduced by a paltry 5.2%, concessions to obtain the participation of Japan, Canada, Australia and Russia drastically reduced the commitments undertaken.

243. See, e.g., *The Kyoto Protocol: A Framework for Action*, 3 GLOBAL ISSUES 6, 8 (1998), <http://usinfo.state.gov/journals/itgic/0498/ijge/ijge0498.pdf> (last viewed July 16, 2007) (presenting excerpts of remarks by Undersecretary of State Stuart E. Eizenstat to the Senate Committee on Foreign Relations).

244. The United States managed to get Argentina and South Korea to agree to "voluntary" commitments and then cited these commitments as examples for other "key developing countries." Agarwal, *A Southern Perspective*, *supra* note 133, at 380; Jennifer Yelin-Kefer, Note, *Warming Up to an International Greenhouse Gas Market: Lessons From the U.S. Acid Rain Experience*, 20 STAN. ENVTL. L.J. 221, 263 (2001).

the United States from ratifying emission reduction commitments.²⁴⁵

C. *The Clean Development Mechanism*

The Clean Development Mechanism (CDM) began as a Brazilian proposal for a compensatory clean development fund²⁴⁶ that would directly assist the development efforts of low- and middle-income nations.²⁴⁷ It evolved into a market-based North-South tool for emissions trading²⁴⁸ that is one of four flexible market mechanisms in the Kyoto Protocol to assist industrialized nations in reaching their GHG emission reduction targets.²⁴⁹ Annex I countries can invest in sustainable GHG emission reduction projects in non-industrialized (non-Annex I) countries,²⁵⁰ and these projects generate certified emission reductions (CERs) credits that can be used to meet emission reduction commitments.²⁵¹ CDM projects must result

245. See *infra* notes 331–32 and accompanying text, regarding the obstructionist stance of the United States.

246. Agarwal, *A Southern Perspective*, *supra* note 133, at 381.

247. Brazil originally proposed a Clean Development Fund, which originated from a Latin American regional workshop held before Kyoto. GREEN POLITICS, *supra* note 88, at 60. Negotiations turned the fund into a mechanism for trading carbon credits, which has nothing to do with compliance, but which Brazil proudly promoted and encouraged developing countries to accept. *Id.* at 61. Some developing nations were wary that trading could mean that industrialized nations could meet their emission goals without actually lowering emissions domestically, but small island nations and South American nations supported the CDM, and it was passed. *Id.*; see also Nelson, *supra* note 10, at 620.

248. Agarwal, *A Southern Perspective*, *supra* note 133, at 381.

249. Kyoto Protocol, *supra* note 9, art 12. The idea of a clean development mechanism was first suggested by Brazil as a means to address non-compliance. Breidenich, *supra* note 19, at 325. Under the Kyoto Protocol, each Annex I party must not exceed its total assigned amount of GHG emissions over the first five-year commitment period, and this assigned amount is set at least 5% below 1990 emissions. See *supra* notes 115–17 and accompanying text.

250. Kyoto Protocol, *supra* note 9, art 12, § 2:

The purpose of the Clean Development Mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.

251. Breidenich, *supra* note 19, at 325; Kyoto Protocol, *supra* note 9, art 12, § 8. Under the CDM, private corporations and government agencies earn certified emission reductions (CERs) as a form of credit that they can use to meet a portion of their emission-reduction obligations under the Kyoto Protocol or that they can sell. CERs are calculated by subtracting the actual emissions from the baseline emissions and adjusting for leakage, using the registered project monitoring

in GHG declines that are "additional to any reductions that would occur in the absence of project activity,"²⁵² and these CERs can be traded.²⁵³

Private parties located within Annex 1 countries, in addition to government agencies, can invest in CDM projects,²⁵⁴ a process that is undoubtedly motivated by risk and potential profits²⁵⁵ and thus tends to concentrate projects in a handful of countries.²⁵⁶ To participate in CDM projects, both parties must have ratified the Kyoto Protocol, and the host country must have an established Designated National Authority (DNA), which decides whether the proposed CDM project promotes the country's sustainable development goals.²⁵⁷ Finally, the CDM is supervised by an executive board and is subject to the guidance of the Conference of the Parties, which develops rules and guidelines for its operation.²⁵⁸

The CDM professes to provide non-Annex I parties with the opportunity to participate in GHG emissions trading and sustainable development while simultaneously providing Annex I parties an additional method to meet their committed Kyoto emissions reduction targets.²⁵⁹ It purports to involve non-Annex I parties in GHG emissions trading without requir-

methodology. Some portion of the emission reductions can be credited towards meeting emission goals. Kyoto Protocol, *supra* note 9, art 12, § 3(b); Breidenich, *supra* note 19, at 325. Emission reductions available for credits must be in addition to any that would occur in the absence of the certified project activity. Kyoto Protocol, *supra* note 9, art 12, § 5(c).

252. Kyoto Protocol, *supra* note 9, art 12; Mindy G. Nigoff, *The Clean Development Mechanism: Does the Current Structure Facilitate Kyoto Compliance?*, 18 GEO. INT'L ENV'T'L L. REV. 249, 252 (2006).

253. Wirth, *supra* note 10, at 648.

254. See Nigoff, *supra* note 252, at 252. "Annex-I countries can provide financing for CDM projects either via equity investment (co-)financing the emission reduction project, via forward purchases or by buying the already produced 'certified emission reduction' (CER) on the secondary market." Martina Jung, *Host Country Attractiveness for CDM Non-Sink Projects* (HWWA Discussion Paper No. 312, 2005), at 3, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=704265 (citation omitted).

255. See Nelson, *supra* note 10, at 620.

256. See *infra* discussion in Part V.

257. See Nigoff, *supra* note 252, at 250–51 n.6 (citing UNFCCC, *Report of the Conference of the Parties on its Seventh Session, Held at Marrakesh from 29 October to 10 November 2001, Addendum*, Decision 17/CP.7, at 20, U.N. Doc. FCCC/CP/2001/13/Add.2 (Jan. 21, 2002), available at http://cdm.unfccc.int/Reference/COPMOP/decisions_17_CP.7.pdf [hereinafter *Marrakesh*]).

258. Kyoto Protocol, *supra* note 9, art. 2(7).

259. *Id.* art. 12(2); Nigoff, *supra* note 252, at 251.

ing them to participate in the Kyoto emissions trading scheme, which would require an absolute GHG emissions cap.²⁶⁰ Evidently designed to facilitate GHG reductions in developing countries,²⁶¹ the CDM has been termed a mechanism for North-South cooperation,²⁶² even if its creation was controversial and opposed by the South. Annex I nations view the CDM as a cost-effective means to meet their emission-reduction targets, while promoting the transfer of climate-friendly technology.²⁶³ Southern nations, however, worry that industrialized nations will use such mechanisms "as a way to avoid taking domestic action to reduce GHG emissions."²⁶⁴ They also fear that the CDM will permit industrialized nations to "buy up all the relatively cheap and easy emission reductions leaving only the most expensive reductions when they are obligated to attain emissions targets."²⁶⁵ It also has the potential to subsidize carbon-based energy production, which is usually the least costly form of mitigation, rather than forward-looking, alternative forms of energy, which make the inevitable measures that will eventually have to be put in place more expensive.²⁶⁶

Nonetheless, the CDM professes to be designed to promote cooperation between industrialized and developing countries, reflecting the industrialized nation goal of reducing the cost of compliance and the Third World objective of obtaining no-cost or low-cost transfer of funds and technology.²⁶⁷ It is designed

260. Nigoff, *supra* note 252, at 252.

261. Wirth, *supra* note 10, at 658.

262. Dunn, *supra* note 217, at 25.

263. Breidenich, *supra* note 19, at 323.

264. *Id.*

265. *Id.*; see also Agarwal, *A Southern Perspective*, *supra* note 133, at 381. There was a great deal of debate over the "terms of eligibility" and the extent to which CERs should be tradable.

For example, certain countries, most notably Russia, have large amounts of unused emission rights because of negative economic growth since the base year of 1990. Some have questioned the appropriateness of trading these excess emissions. . . . Another issue was the extent to which a state may meet its obligations by relying on trading instead of reductions in domestic emissions, an issue known as 'supplementarity.'

Wirth, *supra* note 10, at 652. Additionality was also on the table. *Id.*

266. Agarwal, *A Southern Perspective*, *supra* note 133, at 385.

267. See Nelson, *supra* note 10, at 620. Third World countries maintain that those who have caused the problem and have more capabilities to correct it should assume a large share of the financial burden. Because there is an additional cost to environmentally conscious development, these nations believe industrialized countries should subsidize it.

to facilitate the transfer of wealth and technology, allowing southern-tier nations to industrialize and improve their standard of living while contributing less to global warming than they would otherwise.²⁶⁸ Indeed, one commentator believes the CDM has the potential to be particularly effective, attributing southern contributions to global warming primarily to poor management, unlike over-consumption, which can be corrected without large capital investments.²⁶⁹

D. Supplementary Funding

A share of the proceeds of CDM projects is to be used to finance adaptation to climate change in particularly vulnerable developing countries, as well as to cover the administrative expenses of the mechanism.²⁷⁰ Southern nations demanded financial "additionality," however, arguing that CDM projects should entail funds above and beyond official development assistance and direct investment flows from industrialized nations.²⁷¹ The principle funding mechanism for climate-related activities has been the Global Environmental Facility (GEF), which funds projects implemented by such agencies as the World Bank.²⁷² Additional agreements created three new funds: "a special climate-change fund; a least-developed countries fund; and an adaptation fund," and expert groups have been established on technology transfer and least developed countries.²⁷³ Moreover, there have been discussions regarding "minimizing adverse social, environmental, and economic ef-

268. *See id.*

269. *See id.* at 622.

270. *Id.* at 621. One commentator has described this as "taxing the poor to pay the affected poor" and notes that there is no such provision in other joint implementation and emissions-trading mechanisms. Agarwal, *A Southern Perspective*, *supra* note 133, at 385.

271. Without additionality, already allotted development funds could simply be redirected to CDM projects. Agarwal, *A Southern Perspective*, *supra* note 133, at 385.

272. Wirth, *supra* note 10, at 650. The GEF is "a multilateral entity whose projects are developed and implemented by the World Bank, the UN Development Programme, and the UN Environment Programme." *Id.* The United States does not provide any funding toward these or any other protocol-related activities. *Id.* at 650–51. *See* Royal C. Gardner, *Exporting American Values: Tenth Amendment Principles and International Environmental Assistance*, 22 HARV. ENVTL. L. REV. 1, 45 (1998) (explaining the United States' failure to contribute pledged money to GEF even before the Kyoto Protocol); GREEN POLITICS, *supra* note 88, at 311–42.

273. Wirth, *supra* note 10, at 651.

fects on developing countries from the implementation of climate-change policies.”²⁷⁴

V. CLIMATE CHANGE: THE VIEW FROM THE BOTTOM

While we often speak of a Third World, developing countries, or the South, the reality is that there are vast differences within the Third World, and these disparities are growing as large industrializing countries become economic powerhouses.²⁷⁵ While there are often joint negotiating positions emanating from the G77 and China, the reality is the most impoverished and the smallest nations are often marginalized in international discourse,²⁷⁶ and the debate and mechanisms regarding climate change are no different. Thus, this Part will explore climate change from the perspective of those at the very bottom of the international hierarchy. Even here, there have been a variety of approaches, with small island states taking an active role, the Inuit people bringing suit against the United States, and African nations undertaking a more modest role, choosing to focus on development. Nonetheless, the outcome has been the same for all of these fragments of the most marginalized. These nations certainly cannot control the process and are unlikely to obtain much benefit from the mechanisms in place. They also share the fate of suffering potentially disastrous consequences from a warmer planet.²⁷⁷

A. *Africa and the Clean Development Mechanism*

The CDM is the mechanism most directed toward poor countries, and it appears to be promising because it ostensibly prioritizes sustainable development and supports the develop-

274. *Id.*

275. See Anita M. Halvorssen, *Common, but Differentiated Commitments in the Future Climate Change Regime—Amending the Kyoto Protocol to Include Annex C and the Annex C Mitigation Fund*, 18 COLO. J. INT’L ENVTL. L. & POL’Y 247, 258 (2007) (discussing growth of development in China and India).

276. For example, the lowest income nations are generally on the periphery of discussions within the World Trade Organization and have been unable to successfully advance their interests, despite vociferous efforts, if those interests in any way intrude upon Western national prerogatives. See generally FATAOUMATA JAWARA & AILEEN KWA, *BEHIND THE SCENES AT THE WTO: THE REAL WORLD OF INTERNATIONAL TRADE NEGOTIATIONS* (2004); Gordon, *Brave New World*, *supra* note 6; Gordon, *Margins*, *supra* note 232.

277. See *supra* discussion in Part III.

ment of infrastructure to facilitate projects.²⁷⁸ While it may be beneficial to some segments of the developing world, there are a number of important reasons Africa may not share in its benefits.

Most impoverished nations see the CDM as far more than a mechanism for ensuring cost-efficient emission reductions; they view it as an instrument for ensuring sustainable development,²⁷⁹ meaning additional funds for development. As would be expected, African nations are focused on the development characteristics of this project.²⁸⁰ Some of these nations have suggested that the CDM could be beneficial for Africa by attracting investment and capital investment projects,²⁸¹ even as they recognize that there might be substantial problems in attracting such ventures.²⁸² Nonetheless, African scholars have put forth quite detailed suggestions on projects dealing with energy production,²⁸³ transportation,²⁸⁴ forestry,²⁸⁵ and

278. See Nelson, *supra* note 10, at 622.

279. Abeeku Brew-Hammond, *Designing Energy Projects in Africa for the Clean Development Mechanism*, in AFRICAN PERSPECTIVES ON THE CLEAN DEVELOPMENT MECHANISM, *supra* note 141.

280. Unsurprisingly, sustainability and technology transfer have been lower on the list of priorities. Executive Summary, AFRICAN PERSPECTIVES ON THE CLEAN DEVELOPMENT MECHANISM, *supra* note 141, at 7.

281. Other positive possibilities presented by the CDM included, *inter alia*, acting as a major stimulant for technology co-operation and partnership, stimulating market development and expanding existing markets, improving the overall business environment, and greatly enhancing the negotiating capacity of parties to the convention and thus enriching the climate change debate. Davidson & Sokana, AFRICAN PERSPECTIVES ON THE CLEAN DEVELOPMENT MECHANISM, *supra* note 141, at 16.

282. Possible problems include debate over how many credits can be applied to Annex I country commitments and whether allowing such credits would ultimately meet the goals of the Convention; difficulties monitoring and counting credits nationally and internationally, considering the variety of projects permitted under the mechanism; difficulty of countries with weak private sectors participating in projects under the CDM; and concerns with the administrative costs for participating nations. *Id.*

283. Energy development is an important sector according to African scholars. See, e.g., Brew-Hammond, *supra* note 279; Randall Spalding-Fecher et al., *The Clean Development Mechanism: Energy Projects for Africa*, in AFRICAN PERSPECTIVES ON THE CLEAN DEVELOPMENT MECHANISM, *supra* note 141, at 63.

284. P.P. Zhou, *Designing Projects/Programmes/Portfolios—Approaches for CDM: The Transport Sector in Africa*, in AFRICAN PERSPECTIVES ON THE CLEAN DEVELOPMENT MECHANISM, *supra* note 141, at 81.

285. Timothy Afful-Koomson, *Cost Effectiveness and Potential Benefits of Forestry Mitigation Projects Under the Clean Development Mechanism*, in AFRICAN PERSPECTIVES ON THE CLEAN DEVELOPMENT MECHANISM, *supra* note 141, at 35.

bolstering sustainable development; they are not without excellent ideas.²⁸⁶

So, where has CDM investment clustered, and what has it meant for the poorest nations? As might be expected, the picture is not good with respect to the last question. African nations have been unable to attract such projects,²⁸⁷ and they are highly unlikely to do so in the future. The primary factors influencing CDM investment flows are the capacity for cheap emissions reductions, the institutional capacity of the host country to process joint implementation arrangements, and the general investment climate in the host country.²⁸⁸ African countries, with very limited exceptions, do not possess this combination of characteristics; indeed for the most part, they possess none of them.

As previously noted, these nations account for a very small portion of GHG emissions, and thus they present few opportunities to reduce emissions. Sizeable emissions of GHGs are a byproduct of industrial processes, power generation or transportation that relies on CO₂. Yet, the most important indicator for attracting CDM projects is the potential for absolute reductions of GHG emissions, because only absolute reductions generate Certified Emission Reduction (CER) credits.²⁸⁹ CDM projects must reduce GHG emissions below a baseline level, which creates an incentive for investors to forgo investment in the poorest countries, even though these nations are most in need of development and are at risk of developing as inexpensively as possible and thus often without regard to environmental concerns. Private investors are more likely to invest in nations

286. See, e.g., Prof. F D Yamba, *The Clean Development Mechanism as a Tool for Enhancing Sustainable Development*, in AFRICAN PERSPECTIVES ON THE CLEAN DEVELOPMENT MECHANISM, *supra* note 141, at 53.

287. There are ten CDM projects in South Africa, and one each in both Nigeria and Tanzania. Clean Development Mechanism Home Page, Registered Project Activities by Host Party, <http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html> (last visited July 10, 2007).

288. Jung, *supra* note 254, at 4. Professor Jung criticizes as too simplistic the arguments of scholars who assert that investment flows will follow the pattern of foreign investment; thus, she utilizes the other factors. *Id.* Nonetheless, investment flows have followed foreign investment, for the most part. *Id.*

289. Professor Jung argues that the entire pool of greenhouse gases should be included, rather than just CO₂, because they are all eligible under the CDM. *Id.* at 5. She also notes that as of 2005, most CDM projects actually reduce non-CO₂ gases. *Id.*

such as China or India, where there are substantial emissions problems that can be improved with readily available technology requiring only a modest investment and little or no research.²⁹⁰ Where GHG emissions are low because of lack of industrialization, there are few incentives for private companies to invest because this kind of innovation is not rewarded.²⁹¹ In sum, the CDM assumes a level of industrialization that is conspicuously absent in most of sub-Saharan Africa, a quandary that applies to most countries in Africa with the exception of South Africa.

Moreover, CDM projects must pass through a relatively complex project cycle.²⁹² The host country must have ratified the Kyoto Protocol, which is not an issue for most African nations and especially for small island states, which are among the most vociferous proponents of addressing climate change.²⁹³ CDM projects must be submitted to the Executive Board of the CDM,²⁹⁴ and recipient nations must have a Des-

290. See Nelson, *supra* note 10, at 633.

291. *Id.*

292. UNEP FI CLIMATE CHANGE WORKING GROUP, CEO BRIEFING, FINANCE FOR CARBON SOLUTIONS, THE CLEAN DEVELOPMENT MECHANISM: THE FINANCIAL SECTOR PERSPECTIVE 3 (2005), http://www.unepfi.org/fileadmin/publications/cc/CEO_briefing_finance_for_carbon_solutions_2004.pdf (explaining additional steps required to make a project a CDM project); Nigoff, *supra* note 252, at 275–76 (concluding that the complex registration process serves the interests of neither Annex I nations nor the host country).

293. The African and small island states that have ratified the protocol include Antigua and Barbuda, Bahamas, Bahrain, Barbados, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Congo, Cook Islands, Democratic Republic of the Congo, Dominica, Dominican Republic, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Fiji, Gambia, Ghana, Grenada, Guinea, Guinea-Bissau, Haiti, Indonesia, Jamaica, Kenya, Kiribati, Lesotho, Liberia, Libya Arab Jamahiriya, Madagascar, Malawi, Maldives, Mali, Marshall Islands, Mauritania, Mauritius, Micronesia, Morocco, Mozambique, Namibia, Nauru, Niger, Nigeria, Niue, Palau, Papua New Guinea, Philippines, Rwanda, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Senegal, Seychelles, Sierra Leone, Singapore, Solomon Islands, South Africa, Sudan, Swaziland, Togo, Trinidad and Tobago, Tunisia, Tuvalu, Vanuatu, and Zambia. UNFCCC, Parties to the Kyoto Protocol, <http://maindb.unfccc.int/public/country.pl?group=kyoto> (last visited Sept. 12, 2007).

294. The CDM was set up by article 12 of the Kyoto Protocol and further defined through the Marrakesh Accords. Nigoff, *supra* note 252, at 250–51; see also *Marrakesh*, *supra* note 257. The Executive Board, which operates under the Conference of the Parties, meets at least three times a year. Nigoff, *supra* note 252, at 252. The board is made up of ten members from Kyoto parties and runs on the budget of registration and accreditation fees. *Id.* There is a backlog of approval of

ignated National Authority (DNA) that approves CDM project activity and confirms that it is complying with the national definition of sustainability.²⁹⁵ At least twenty-three African nations have designated such an authority.²⁹⁶ Nonetheless, establishing a well-functioning DNA requires expert knowledge within the government of the rules and modalities governing the CDM.²⁹⁷ This is knowledge that impoverished nations and small nations are unlikely to possess, despite the capacity-building efforts by NGOs and such entities as UNEP.²⁹⁸

The final indicator is the general investment climate, which is mediocre at best in most low-income nations. These nations have a very difficult time attracting foreign investment in general, and, as this author has argued elsewhere, this is highly unlikely to change regardless of their efforts to follow World Bank and other prescriptions to attract international capital.²⁹⁹ Africa already has the lowest FDI rate in the world, and investors are more comfortable and perceive less risk if they already have an ongoing relationship with the host country.³⁰⁰ Regardless, even African or island nations with com-

CDM projects that could be solved by increasing the Executive Board's budget and/or simplifying the method of approving projects. *Id.* at 271-73.

295. Jung, *supra* note 254, at 5.

296. See *id.* For a list of Designated National Authorities, see Clean Development Mechanism Home Page, Designated National Authorities, <http://cdm.unfccc.int/DNA/index.html> (last visited July 10, 2007).

297. Professor Jung notes that the states that participated in the "Activities Jointly Implemented" phase "and completed a National Strategy Study analyzing their CDM potential will be able to profit from the experience and knowledge gained" in this process. Jung, *supra* note 254, at 5. She believes participation in these activities is an indicator of institutional CDM capacity. *Id.*

298. The UNFCCC requires the COP and other international bodies, like UNEP, to provide research, technological assistance, and support for capacity-building in all nations, especially those still in the process of modernization. See UNFCCC, *supra* note 14, art. 9, ¶ 2. This is also echoed in the Kyoto Protocol. Kyoto Protocol, *supra* note 9, art. 10, ¶ c. However, developing nations still have a hard time paying for the necessary technology. Nelson, *supra* note 10, at 621-22.

299. See generally Gordon, *Brave New World*, *supra* note 6; Gordon, *Margins*, *supra* note 232. There are a multitude of problems entailed in investing in very low-income nations, including location, poor infrastructure, poor capital and consumer markets, high risk, and other difficulties. Moreover, investment tends to cluster, and thus private investors tend to invest where or near where they have already invested, making it even more difficult to attract new investment. While there is a surplus of very low-cost labor in low-income nations, low-cost labor can be found in abundance in nations such as China and India that present fewer obstacles to investment and generate far more profits. See generally *id.*

300. See Nelson, *supra* note 10, at 634.

paratively favorable investment climates may not have enough emissions to generate CDM projects.

Indeed, just as investment seems to take place in clusters,³⁰¹ it seems the necessary requisites for CDM projects also exist in clusters. Nations with higher GHG emissions tend to have better institutional CDM capacity, a favorable investment climate tends to correlate with better CDM capacity, and both relate to superior emission reduction potential.³⁰² In short, industrialization requires a certain level of administrative capacity and generates a certain level of emissions. Thus, it is predictable that these particular factors cluster and that impoverished unindustrialized nations, or small island nations, would be unlikely candidates for CDM projects. It is also predictable that most projects are located in industrializing giants such as China, India, and Brazil,³⁰³ a configuration that is expected to continue,³⁰⁴ even as the Marrakech Accords³⁰⁵ emphasize the importance of “equitable geographical distribution of [CDM] project activities at regional and sub-regional levels.”³⁰⁶

African nations have realized that they are at a disadvantage in attracting projects requiring emissions reductions given that they account for such a small portion of world emissions. They have argued that CDM projects should be geared towards projects that promote socio-economic development using clean technologies. Another possibility is to grant credits for emis-

301. Gordon, *Margins*, *supra* note 232, at 99–100 (explaining that investment only occurs in poor countries where the conditions are right, which normally entails exploitation of cheap labor and natural resources). *See also* Nelson, *supra* note 10, at 633.

302. Jung, *supra* note 254, at 6.

303. *See* CDM: Registration, *supra* note 9, for the percentage of CDM projects for which each country is registered.

304. Professor Jung groups potential beneficiaries of CDM projects into clusters that represent the likelihood of future investment. African nations, except South Africa, are in the group least likely to attract investment, as are most island states. Jung, *supra* note 254, at 6. These states have low institutional CDM capacity, low mitigation potential, and relatively difficult investment climates. *Id.* They are labeled as very unattractive for CDM projects, and most are located in Africa. *Id.*

305. The seventh meeting of the COP in November 2001 worked out the final details of the Kyoto Protocol, so it was ready for ratification. Vespa, *supra* note 130, at 417–18. The agreements reached seemed to favor the United States, making its later refusal to ratify particularly ironic. *Id.* at 416–17.

306. Jung, *supra* note 254, at 3 (citing Decision 17/CP.7 of the Marrakech Accords adopted at the 7th Conference of the parties).

sions avoided rather than emissions reduced, which might be the only way Africa can be drawn into the CDM.³⁰⁷ This could present incentives for investors to entirely omit fossil fuels, producing a “leapfrog effect” where countries would adopt clean energy technologies at the outset of their industrialization. Another strategy is to create CDM investment quotas, such as regional quotas, that would better equalize investment among developing countries. The problem with these approaches is that if the overall investment climate is unattractive, investors will invest elsewhere, ignoring the CDM.³⁰⁸ African nations realize that a “purely market-driven approach will bypass Africa.”³⁰⁹

B. Influencing the Process: Powerlessness and Marginalization

The UN Secretary General’s list of obstacles to African development is overwhelming even without considering the possible effects of global warming. It includes “external debt problems; declining external resources flows; declining terms of trade; barriers to market access for their products; high population growth; inadequate social development; lack of infrastructure; and environmental constraints, including water shortages,” all of which are exacerbated by AIDS, poverty, and a low standard of living.³¹⁰ Given these pressing issues, and Africa’s minimum contribution to rising emissions, it makes sense that reducing GHG emissions does not rank high on Africa’s development agenda.³¹¹ If it is not high within the development paradigm, it is not a priority.³¹²

Thus, while Africa has participated in climate change talks, it has not staked out a unique position pertaining to Af-

307. Agarwal, *A Southern Perspective*, *supra* note 133, at 375. For example, “[a] project promoting infrastructure development in [Africa’s] energy sector would not only meet Africa’s sustainable development needs, but also avoid emissions.” *Id.* at 386.

308. See Nelson, *supra* note 10, at 635.

309. Agarwal, *A Southern Perspective*, *supra* note 133, at 386.

310. See Nelson, *supra* note 10, at 635 (citing *Report of the Secretary-General on the Work of the Organization*, U.N. GAOR, 56th Sess. Supp. No. 1, Para. 140, U.N. Doc. A/56/1 (2001)).

311. See Nelson, *supra* note 10, at 625.

312. As previously noted, the response this author received in bringing the issue of climate change to the attention of African scholars was polite disinterest.

rican interests.³¹³ While Africa will be uniquely affected by climate change and the structure and mechanisms of the CDM, as discussed above, its position has been simply in accordance with that of the G77 and China.³¹⁴ For example, Uganda submitted a position paper on behalf of Africa to the 4th Session of the Conference of the Parties, but it did not deviate from the position taken by the G77 and thus did not address the issues of most importance to Africa.³¹⁵

This failure to articulate a distinct African position is due to a number of causes that are mirrored in other international forums.³¹⁶ Besides climate change being viewed as a distant and comparatively unimportant issue, African nations lack the resources to negotiate effectively. Their delegations are small, while those of the industrialized and industrializing nations that control the process are substantial, enabling nations with large delegations to be extraordinarily active participants on all fronts.³¹⁷ Moreover, similar perspectives expressed by the private business sector and non-governmental organizations augment industrialized nation views.³¹⁸

313. See Mumma, *supra* note 8, at 198–99.

314. See *id.* at 199. In the WTO, some African countries have articulated and maintained a divergent opinion on U.S. cotton subsidies. They have been largely unsuccessful in changing U.S. policy, however. See Gordon, *Brave New World*, *supra* note 6, at 112–15.

315. Mumma, *supra* note 8, at 201. The paper was entitled “African Common Position on the Clean Development Mechanism.”

316. Putting aside the emerging industrializing nations of China and India, Third World nations generally have a very small market share in the global economy and consequently lack the bargaining power industrialized nations enjoy. The number of Third World nations, combined with the variety of income levels and individual goals, makes it difficult for these nations to develop a common goal. Moreover, any country may leave a coalition if presented with the opportunity to realize its own particular goals. See Gordon, *Brave New World*, *supra* note 6, at 117. Interests between countries at different levels of industrialization, as well as competition among Third World countries, may also prevent the formation of coalitions. Gordon, *Margins*, *supra* note 232, at 104. See generally JAWARA & KWA, *supra* note 276; Gordon, *Brave New World*, *supra* note 6; Gordon, *Margins*, *supra* note 232.

317. For example, at the fourth COP, the American delegation consisted of 83 people. The average Africa delegation, on the other hand, consisted of two to four individuals. Mumma, *supra* note 8, at 202.

318. *Id.* Industrialized nations and their corporations also worried that the lack of specific caps on developing nations would allow them to eventually surpass industrialized nations in emissions and thus undo the reduction efforts of industrialized countries. GREEN POLITICS, *supra* note 88, at 51–52. Such an argument, however, fails to account for the difference between the population of the United States and of the developing world. Agarwal, *A Southern Perspective*, *supra* note

Yet not all members of the smallest or lowest-income states have taken such a passive stance. Acting through the Alliance of Small Island States (AOSIS), another group that is particularly vulnerable and in need has maintained its membership in the G77 but established a discrete position that demands large and immediate reductions in GHG emissions.³¹⁹ Despite their small size and limited resources, island states have persistently been able to at least influence a range of issues (political, economic, trade and environmental) through collaboration.³²⁰ One commentator credits AOSIS with carving out “a distinct AOSIS position” throughout many years of negotiating while still maintaining its membership in the G77, and suggests that African States should do the same.³²¹

Yet what have small island states actually achieved? It is true that their vulnerability to the ravages of climate change has been recognized,³²² and they were accorded special recognition in the United Nations Framework Convention on Climate Change (UNFCCC),³²³ where they were also granted advanced speaking rights.³²⁴ In addition, they are given priority in re-

133, at 381. Some developed countries have asked that developing countries sign an agreement to commit themselves to emission reduction obligations. Nelson, *supra* note 10, at 651.

319. Mumma, *supra* note 8, at 199.

320. Slade, *supra* note 7, at 533. The Alliance of Small Island States (AOSIS) is an example of this collaboration. AOSIS “is a coalition of small-island and low-lying coastal countries that share similar development challenges and concerns about the environment, especially their vulnerability to the adverse effects of global climate change.” Alliance of Small Island States, <http://www.sidsnet.org/aosis/> (last visited Jan. 21, 2007). The group negotiates for small island developing states (SIDS) in the United Nations and includes fifty-one SIDS from Africa, Latin America and the Caribbean, and Asia and the Pacific. *Id.* Small island states are also at the head of the line to receive financial assistance for both development and climate change. Gillespie, *supra* note 7, at 121. Japan, Italy, Norway, and Germany have also helped to fund SIDSnet, which runs the AOSIS website and facilitates communications between SIDS and other agencies. Small Island Developing States Network, About SIDSnet, <http://www.sidsnet.org/5.html> (last visited Sept. 12, 2007). The AOSIS has achieved some success in at least having its positions included in international agreements. See Gillespie, *supra* note 7, at 119–20; Slade, *supra* note 7, at 540–41; Bodansky, *Commentary*, *supra* note 93, at 481.

321. Mumma, *supra* note 8, at 199.

322. The vulnerabilities of SIDS were recognized at the 2002 World Summit on Sustainable Development. Report of the World Summit on Sustainable Development, Aug. 26–Sept. 4, 2002, ¶ 58–61, U.N. Doc A/CONF.199/20 (2002). See Gillespie, *supra* note 7, at 107.

323. UNFCCC, *supra* note 14, art. 4, ¶ 8.

324. See Gillespie, *supra* note 7, at 120.

ceiving financial assistance because of their unique need.³²⁵ Sustainable development, which would be the presumable objective of African nations, has also been mentioned; however, no nation has been accorded the right to development, including SIDS, only the right to pursue development.³²⁶ These concessions are concrete achievements that African nations could also achieve if they took a more proactive posture.

Indeed, it seems we have a distinct contrast. African countries seemed to have no, or a weak, position and stance and have received few concessions. Small island states, on the other hand, had a distinct position and lobbied extraordinarily hard. Yet they too received little that will achieve their real goal: controls on GHG emissions at a level that will halt a warming climate and avoid the total destruction of their habitats. Thus, the hard reality is that in a very real sense, they have achieved little more than African states, and it is because of the profound inequality that characterizes the international system.³²⁷

One way in which inequality manifests itself is in dominance of the South by the North. This has been documented in the international trade arena where southern nations are bullied and ignored.³²⁸ Within international financial institutions, the South is at the mercy of entities that dictate policy and control the funds.³²⁹ Why would it be any different when it comes to a problem with huge economic consequences for industrialized states that have been hesitant to undertake measures potentially damaging to their economies and at variance with

325. See *id.* at 121.

326. UNFCCC, *supra* note 14, art. 3, ¶ 4. See Gordon & Sylvester, *supra* note 6. While many Third World nations have demanded a recognized right to develop, industrialized countries have not supported their demands. *Id.* at 61–62.

327. Gordon, *Brave New World*, *supra* note 6, at 116–17 (noting inequality in international trade). See also Gordon & Sylvester, *supra* note 6; Ruth Gordon, Forward to Symposium, *Critical Race Theory and International Law: Convergence and Divergence*, 45 VILL. L. REV. 827 (2000).

328. See generally JAWARA & KWA, *supra* note 276; Gordon, *Brave New World*, *supra* note 6; Gordon, *Margins*, *supra* note 232.

329. Gordon, *Brave New World*, *supra* note 6, at 97 (explaining investment controls used by the WTO on Third World nations); Gordon, *Margins*, *supra* note 232, at 100 n.18; Gordon & Sylvester, *supra* note 6, at 22–29 (explaining the relationship between the World Bank, the International Monetary Fund, and Third World nations).

powerful domestic interests?³³⁰ This inequality is reflected in climate change negotiations where the United States has dominated and refused to negotiate. Indeed, some representatives from Third World nations characterize the “negotiations” as rich nations telling the South what is and is not going to happen.³³¹ When the United States refused to ratify the Kyoto Protocol, it allowed another group of industrialized nations to hold the agreement hostage, and they were able to wring all manner of concessions from the other parties. The European Union somehow always caves at the end and has often negotiated with the United States; both parties then present their joint position, on a more or less take-it-or-leave-it basis, to the rest of the world. All told, these actions have resulted in a weak agreement that does little to mitigate emissions of GHG.³³² It has instead become symbolic of taking joint action that will be a precursor to truly meaningful measures.³³³

The Inuit people of Canada, Greenland, Alaska and Russia have gone in a different direction, suing the United States before the Inter-American Commission on Human Rights for damages caused by their failure to lessen their emissions of GHG. They are attempting to vindicate their human right to inhabit their lands.³³⁴ They realized from the outset that it would be a symbolic act, and they have been correct—the U.S. has ignored it. This is simply another example of a level of global inequality, where the powerful do not even have to answer the weak, much less speak to their concerns.

330. See Thoms, *supra* note 8, at 833; Felicity Barringer & William Yardley, *Bush Splits on Greenhouse Gases With Congress and State Officials*, N.Y. TIMES, Apr. 4, 2007, at A1 (explaining that the coal industry, the oil industry, and the auto industry all have interests in blocking emission regulations).

331. Agarwal, *A Southern Perspective*, *supra* note 133, at 378–79.

332. See, e.g., *id.* at 382–84; Gillespie, *supra* note 7, at 119, 128; Rowland, *supra* note 17, at 1291.

333. The Kyoto Protocol is ultimately a weak agreement, but it does direct the North’s attention to develop and spread technologies and take other steps toward long-term emission reductions. Agarwal, *A Southern Perspective*, *supra* note 133, at 382–84. “If Kyoto hastens a global transition to renewable energy, it will have served an important function for North and South.” *Id.* at 384.

334. Petition to the Inter American Commission on Human Rights Seeking Relief from Violations Resulting from Global Warming Caused by Acts and Omissions of the United States of America (Dec. 7, 2005), available at www.inuitcircumpolar.com/files/uploads/icc-files/FINALpetitionCC.pdf.

CONCLUSION

Sadly, this paper ends where it began. The world is rapidly growing warmer; divergent interests in the international community fiddle while Rome burns. One commentator has noted that any solution to the problem of global warming must encompass economic trepidation, equity concerns and ecological effectiveness, representing the three major interests in the climate change debate.³³⁵ The industrialized West is willing to continue to destroy the climate in the interest of protecting its economies; the U.S. is the worst, but not at all the only, offender. Industrializing nations, as well as impoverished countries that desperately desire industrialization, are prepared to increase their emissions so they can become more affluent. They view climate change as an equity issue and believe the industrialized North should reduce its opulent emissions in the interest of the South's necessary development emissions. This paradigm has some merit and perhaps might be a useful framework at some point. Without an ecologically sound solution, however, it is all for naught.³³⁶

This author believes economic interests, represented by the most powerful parts of the international community, will prevail until the consequences become intolerable. This is apparent in most industrialized nations, where economic forces and interests continue to shape the debate, even if it is to varying degrees in different countries.³³⁷ Large industrializing nations are unlikely to relent in any meaningful way, insisting on economic development, which is, after all, the paradigm advocated by the West for the last sixty years. They are simply following in western footsteps³³⁸ and, indeed, have become the North's factories, making reductions difficult. The result will be a warmer planet, as ecological considerations are obviously secondary at best.

The peoples of small island nations, the lowest-income nations, and the inhabitants of rapidly deteriorating habitats

335. Agarwal, *A Southern Perspective*, *supra* note 133, at 386.

336. *Id.* at 377.

337. The United States has been the most recalcitrant and the EU the least, with other industrialized countries somewhere in between. GREEN POLITICS, *supra* note 88, at 50–56.

338. Gordon & Sylvester, *supra* note 6, at 29–49 (detailing history of development imposed upon the Third World).

such as the Arctic region have no voice in this scenario and will suffer until it is in the interests of the powerful to take a different path. Unfortunately, their distress is unlikely to influence this decision—it never has done so and it never will.³³⁹ The last factor, the climate, will eventually compel the revolution that must take place if we are to save our world, but by then the peoples at the bottom will be suffering the most horrific effects of what will be a much warmer world.

339. The consequences include not only changes to the physical environments of northern nations but the prospect of environmental refugees and profound instability in the South. Indeed, Elizabeth Kolbert has chronicled the destruction of civilizations because of drastic environmental events. KOLBERT, *FIELD NOTES*, *supra* note 17, at 91–97 (attributing decline of the Akkadian civilization and the Classic Mayan civilization to natural climate change); Kolbert, *Climate of Man—III*, *supra* note 29, at 64.