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Climate Change “Crisis” – Struggling for Worldwide Collective Action

Lisa Schenck*

ABSTRACT

Global climate change due to increased levels of atmospheric greenhouse gases caused by human activity has the potential to threaten life on earth. International cooperation is required to effectively address this threat; however the climate crisis represents a classic collective action problem in response to overexploitation of a global commons. This article explains the global climate change issue, traces efforts to confront it, and argues that inherent difficulties plague collective responses to global commons problems. It pinpoints individual reasons for collective action failures, examines background economic and scientific problems, and analyzes how group factors such as strategy and coalition building affect cooperation. Finally, the article overviews how ambiguous international environmental law principles may further hinder global solutions to the climate crisis and suggests a series of best practices for future negotiations.

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I. INTRODUCTION

Climate change has far-reaching impacts on the human environment: on ocean currents, agriculture, animal and plant extinction rates, and the future of humans on Earth.\(^1\) Over the past twenty-five years, nations have identified, researched, and attempted to respond to the international environmental problem of climate change.\(^2\) Climate change occurs from sunlight warming the Earth’s surface and is exacerbated by the release of a group of gases—collectively known as greenhouse gases (GHG)—into the atmosphere. Typical GHGs include: carbon dioxide, methane, chlorofluorocarbons, nitrous oxide, perfluorocarbons, hydrofluorocarbons, and sulphur hexafluoride. The release of GHG emissions has resulted in an intensified natural greenhouse effect, and may be causing rising sea levels, severe windstorms, and changing rainfall patterns.\(^3\)

Scientists believe that human activities including fossil fuel combustion, deforestation resulting from agricultural burning and logging forests,\(^4\) land use or cover changes,\(^5\) and industrial use of artificial chemicals (e.g., halocarbons) are responsible for releasing


\(^2\) The IPCC defines climate change as any long-term variation in climate whether due to natural variability or as a result of human activity. The United Nations Framework Convention on Climate Change, however, defines it as an unnatural change, resulting only from human activity. Pew Center on Global Climate Change, Glossary Overview, http://www.pewclimate.org/global-warming-basics/full_glossary/ (follow links to alphabetically listed terms) (last visited Apr. 11, 2008). Global warming, in contrast, is a “progressive gradual rise of the Earth’s average surface temperature thought to be caused in part by increased concentrations of [greenhouse gas emissions] in the atmosphere.” Id.

\(^3\) J.F. RISCHARD, HIGH NOON: TWENTY GLOBAL PROBLEMS, TWENTY YEARS TO SOLVE THEM 70 (2002).

\(^4\) WHITE HOUSE OFFICE OF SCIENCE AND TECHNOLOGY POLICY, CLIMATE CHANGE: STATE OF KNOWLEDGE 3 (1997). Emission of carbon dioxide results from the burning of fossil fuels (e.g., oil, gas, and coal) and deforestation. RISCHARD, supra note 3.

significant GHG emissions into the atmosphere. Increased GHG emissions enhance the natural greenhouse effect by trapping solar heat and slowing down re-radiation into space, causing an insulating effect. Whereas the natural greenhouse effect maintains the Earth's average temperature at approximately sixty degrees Fahrenheit, the atmospheric build up of GHGs traps heat and causes the Earth to warm dramatically.

The international response to the threat of global climate change has been ineffective to date. The challenge of mobilizing the global community to reduce GHG emissions represents a classic tragedy of the commons, a problem that occurs when a shared or "open access" resource (e.g., the atmosphere) is readily and freely available for unsustainable exploitation. A concerted global response, also known as collective action, offers the opportunity to create incentives for sustainable use. This article argues that in order to address ongoing atmospheric degradation, sovereign states must overcome their divergent interests in order to cooperate and act collectively. Furthermore, it argues that the collective action to date has failed in a number of ways.

Part II of this article provides an historical overview of climate change and describes how nations have attempted to deal with this transboundary issue. Part III argues that inherent difficulties exist in taking collective action to address a global commons problem. Part IV suggests that certain international environmental law principles actually hinder global collective action. Finally, Part V offers several solutions to encourage effective collective action.

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10. Thompson, *supra* note 5.
II. AN OVERVIEW OF CLIMATE CHANGE

A. Where We Have Been: An Historical Review of Climate Change

I am far from satisfied with the results of the negotiations thus far, the goal of which is exceedingly ambitious for it is no less than to positively control man's impact on the Earth's climate. The dynamics of climate, the impact of man's influence on it, its timeframes and thresholds and danger points are still far from perfectly understood. . . . Having said that . . . I accept the proposition that the potential for serious climate disruption is real and that the global community must respond at an appropriate pace.11


As scientists uncover stronger evidence about the effects of global warming, the world increasingly recognizes the existence and magnitude of the global threat of climate change. The Kyoto Protocol (Protocol)12 has been the most notable attempt to effectuate collective action and it served to, "established emissions ceilings on 6 specified GHGs for 38 countries, with the 15 members of the European Union (EU) treated as a single unit, to be reached on average in the five-year accounting period 2008-2012."13 The Protocol, an international agreement of 150 nations, has fallen short in a variety of ways, primarily because it fails to achieve true collective action. As Table 1 below reflects, the world has made some progress towards addressing climate change.

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Table 1: Global Climate Change Responses

<table>
<thead>
<tr>
<th>Year</th>
<th>Global Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>ISSUE FIRST IDENTIFIED (First World Climate Conference)</td>
</tr>
<tr>
<td>1988</td>
<td>U.N. RESOLUTION TO PROTECT THE CLIMATE (climate change recognized and response framework sought)</td>
</tr>
<tr>
<td>1989</td>
<td>HAGUE DECLARATION ON THE ENVIRONMENT (affirms climate change requires a global solution)</td>
</tr>
<tr>
<td>1990</td>
<td>U.N. 2ND CLIMATE PROTECTION RESOLUTION (Intergovernmental Negotiating Committee to form framework convention)</td>
</tr>
<tr>
<td>1992</td>
<td>U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC) (establishing collective goals addressing climate change)</td>
</tr>
<tr>
<td>1995-Present</td>
<td>CONFERENCES OF THE PARTIES (COP) (180 signatories to the UNFCCC meet annually)</td>
</tr>
<tr>
<td>1995</td>
<td>COP 1 – BERLIN MANDATE (non-binding commitments with time frames to reduce emissions)</td>
</tr>
<tr>
<td>1997</td>
<td>KYOTO PROTOCOL (entered into force in 2005, sets limits for 8 GHG emissions for 38 countries)</td>
</tr>
</tbody>
</table>

World leaders and scientists first recognized climate change as a global, transboundary environmental issue in 1979 at the World Meteorological Organization’s (WMO) First World Climate Conference. Throughout the 1980s and 1990s, policymakers, scientists, and environmentalists met to address scientific and policy issues of climate change and the need for world-wide action. In 1989, the United

14. World Meteorological Organization, World Climate Programme (2005), http://www.wmo.ch/pages/prog/wcp/index_en.html (follow links to programmes) (last visited Apr. 28, 2008) (Essentially a scientific conference, scientists from a myriad of disciplines attended this World Climate Conference, meeting in plenary sessions as well as working groups studying climate data, identifying climate topics, reviewing impact studies, and examining research regarding climate variability and change.); UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC), CLIMATE CHANGE INFORMATION KIT: INFORMATION SHEET 17, THE INTERNATIONAL RESPONSE TO CLIMATE CHANGE, http://unfccc.int/essential_background/background_publications_htmlpdf/climate_change_information_kit/items/300.php (last visited Apr. 12, 2008). This conference led to the World Climate Programme. Id. [hereinafter INFORMATION SHEET 17].

15. INFORMATION SHEET 17, supra note 14. Specifically, the following conferences were held: Villach (1985); Toronto (1988); Ottawa (1989); Tata (1989); Hague (1989); Noordwijk Ministerial (1989); Cairo Compact (1989); Bergen (1990); and the Second
Nations issued The Hague Declaration on the Environment, which publicly affirmed the dangers of global atmospheric warming, deterioration of the ozone layer, and climate change. The report called for a solution that was “vital, urgent and global.” Most notably, the Declaration foreshadowed the problem of “equity,” stating that most emissions originated in industrialized nations where “room for change is the greatest” and “the greatest resources to deal with this problem” exist. Global concern began following a more focused path in 1990, when the United Nations General Assembly passed Resolution 45/212, entitled “Protection of Global Climate for Present and Future Generations of Mankind.” The resolution established the Intergovernmental Negotiating Committee (INC), which was tasked with creating a framework convention on climate change, appropriate commitments, and related instruments.

At the 1992 Rio “Earth Summit,” the INC announced the United Nations Framework Convention on Climate Change (UNFCCC) and thereby created a roadmap and collective goals by which to address climate change. The UNFCCC parties subsequently agreed to stabilize atmospheric GHG concentrations “to avoid ‘dangerous interference’ with the climate system” by controlling methane, nitrous oxide, and, in
particular, carbon dioxide emissions. Although the UNFCCC did not commit the parties to specific GHG emission limits, it did achieve several notable accomplishments. First, the UNFCCC set a common, long-term goal to stabilize atmospheric GHG concentrations at a level that would prevent “anthropogenic interference with the climate system.” The UNFCCC also established a GHG emissions control target for industrialized countries to reduce emissions to 1990 levels by the year 2000. Additionally, the UNFCCC set forth principles, albeit vague, to address inter and intra-generational inequities, the needs of developing countries, sustainable development, and international economic concerns. Lastly, the UNFCCC established a process to improve data collection, reduce scientific and economic uncertainties, encourage national planning, and produce more concrete international standards.

The UNFCCC entered into force as an international treaty in 1994 and has over 180 signatories. After establishing the UNFCCC the INC dissolved in 1995. Subsequently, the annual Conference of the Parties to the UNFCCC has become the “ultimate authority” for the Convention. A Conference of the Parties has taken place annually since 1995 (COP 1-12). The most notable global-scale policy emerged in 1997 from COP–3, in the form of the 1997 Kyoto Protocol. The Protocol commits

22. Bodansky, supra note 17, at 455 (quoting UNFCCC, supra note 20, art. 2).
23. Annex I parties are essentially developed countries and countries transiting to market economies, listed in Annex I to the UNFCCC. See UNFCCC, supra note 20, at Annex I.
24. UNFCCC, supra note 20, art. 3; see discussion infra Part IV (for details on sustainable development, intergenerational equity and the precautionary principle).
25. UNFCCC, supra note 20, art. 3.
27. See INFORMATION SHEET 17, supra note 14.
28. The annual meetings take place around the globe. For a list of the previous sessions and their locations of the Conference of the Parties (COP) see UNFCC, Previous Sessions, http://unfccc.int/meetings/archive/items/2749.php (last visited Sept. 5, 2008). In 1995, COP-1’s Berlin Mandate identified the UNFCCC’s non-binding commitments’ inadequacies, reinforced the developed countries as leading the efforts, and established the goal of setting “quantified limitation and reduction objectives within specified timeframes, such as 2005, 2010 and 2020, for anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol.” UNFCCC, REPORT OF THE CONFERENCE OF THE PARTIES ON ITS FIRST SESSION, HELD AT BERLIN FROM 28 MARCH TO 7 APRIL 1995, para. II.2(a), p. 5 (6 June 1995), FCC/CP/1995/7/Add. 1, available at http://unfccc.int/cop4/resource/docs/cop1/07a01.pdf.
developed countries and those transitioning to market economies—together, Annex I parties—to reduce their 1990 overall emissions levels by a minimum of five percent. The Protocol also provides for an implementation timetable to establish emissions trading opportunities, cross boundary emissions reductions, and GHG “sink” sequestration.

The Protocol requires Annex I parties to establish National GHG Inventories—including emission and sequestration data—and to verify annual compliance with emissions limitations. To assist Annex I parties in compliance, the Protocol created three interrelated mechanisms to reduce emissions. These mechanisms include an emissions trading system, a credit-sharing system for emission-reducing projects jointly implemented by Annex I parties, and a Clean Development Mechanism (CDM) meant to encourage reduction in non-Annex I countries.

The emissions trading system allows industrialized countries to increase their cap by purchasing other industrialized nations’ Kyoto allocations. The joint implementation mechanism allows industrialized nations to earn

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29. UNFCCC, supra note 20, at Annex I.

30. Churie et al., supra note 21; Kyoto Protocol, supra note 12, art. 3. Levels are to be phased in between 2008 and 2012 with individual country targets varying. For example, the European Union hopes to achieve an 8% target and Iceland a 10% reduction target. Kyoto Protocol, supra note 12, at Annex B.

31. Cooper, supra note 13, at 11484. The UNFCCC defines a “sink” as “any process, activity, or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere.” UNFCCC, supra note 20, art. 1. See also Alexander Gillespie, Sinks and the Climate Change Regime: The State of Play, 13 DUKE ENVT. L. & POL’Y F 279, 286 (2003).


34. Kyoto Protocol, supra note 12, art. 4, 6; Churie et al., supra note 21. See also, Breidenich et al., supra note 33, at 323–4.

35. The Clean Development Mechanism is designed to aid developing countries undertake “activities to prevent climate change while achieving sustainable development.” Campbell & Carpenter, supra note 33, at 749–50.

36. Kyoto Protocol, supra note 12, art. 12; Churie et al., supra note 21. See also, Breidenich et al., supra note 33, at 325.
credits by working with other Annex I nations to implement specific emissions reduction projects. The CDM permits Annex I countries to earn credits by implementing projects within the boundaries of developing nations.\footnote{37. David G. Victor, The Collapse of the Kyoto Protocol and the Struggle to Slow Global Warming 4 (2001). In November 2005, the Kyoto Protocol entered into force when signatories accounting for 45% of world-wide carbon dioxide emissions in 1990 ratified the agreement. UNFCCC, Status of Ratification, http://unfccc.int/kyoto_protocol/background/status_of_ratification/items/2613.php (last visited Sept. 5, 2008). Since 1997, global attention focused on whether major GHG emitters, such as the United States and Russia were participating in the commitments of the Kyoto Protocol. By June 6, 2003, the UNFCCC Secretariat reported 110 nations—not including the United States and Russia—accounting for 43.9% of industrialized nations’ emissions had ratified the Kyoto Protocol. Ratification by Russia—alone accountable for 17% of the world’s greenhouse gas emissions in 1990—“would push that tally over the 55% threshold needed for the treaty to become international law.” Eric J. Lyman, Bonn Meeting Confronts Uncertainty About Russia’s Ratification of Kyoto Pact, DAILY ENVTL. REP., June 13, 2003, A–6. The failure of the United States and Russia to formally ratify the Protocol was the most problematic for nations supporting the Protocol as well as others contemplating ratifying it. In 2003, UNFCCC Director Waller-Hunter admitted that if the United States and Russia “stay[ed] on the sidelines and the [P]rotocol [did] not enter into force” some countries, most notably Japan, might waiver in their support. Eric J. Lyman, Russian Fence-Setting Could Speed up Work on Expanding Kyoto Pact, U.N. Official Says, BNA CHEMICAL REG. DAILY, Oct. 1, 2003, available at http://pubs.bna.com/ip/BNA/CRD.NSF/125731d8816a84d385256297005f336a2ad33f15cb2f50ad85256db200006073?OpenDocument. Director. Waller-Hunter further suggested that to make the agreement more attractive to powerful, skeptical remaining nations, the Kyoto framework could “shift from the current emphasis on binding, overall emission-reduction targets to a more complicated model tying greenhouse gas emission limits to economic growth or technology use[.]” Id. (quoting Waller–Hunter). However, in 2004, Russian President Vladimir Putin signed the bill confirming that country’s ratification of the Protocol, despite the warnings of his economic adviser, Andrei Illarionov who advised that the agreement would hinder Russia’s economic growth. Putin Clears Way for Kyoto Pact, BBC NEWS, Nov. 5, 2004, http://news.bbc.co.uk/2/hi/europe/2985669.stm (last visited Sept. 5, 2008). President Putin overcame his long time hesitancy to commit to the Protocol by agreeing to push Protocol support in exchange for the European Union’s support of Russia’s attempt to join the World Trade Organization. Id. See also China Welcomes Russian Approval of Kyoto Protocol, ENVTL. NEWS NETWORK, Oct. 29, 2003, http://www.enn.com/top_stories/article 256 (last visited Sept. 5, 2008).}
B. Post-Kyoto Obstacles to Progress

The Kyoto Protocol was fatally flawed in fundamental ways. But the process used to bring nations together to discuss our joint response to climate change is an important one. . . . Our country, the United States is the world’s largest emitter of manmade [GHGs]. We account for almost 20 percent of the world’s man-made [GHG] emissions. We also account for about one-quarter of the world’s economic output. We recognize the responsibility to reduce our emissions. We also recognize the other part of the story—that the rest of the world emits 80 percent of all [GHGs]. And many of those emissions come from developing countries. This is a challenge that requires a 100 percent effort; ours, and the rest of the world’s. We recognize our responsibility and will meet it—at home, in our hemisphere, and in the world. . . .

- President George W. Bush, 2001

The failure of the Protocol is often attributed to the unequal economic burdens it imposes upon signatory countries and its adverse impacts on national competitiveness. Furthermore, signatory nations criticize the protocol for its free-rider problem—its omission of major-emitters from binding GHG reduction targets. Changes in national leadership, inconsistent domestic policies, and the inability of some signatories to meet their Protocol commitments also inhibit realization of the Protocol’s goals. Finally, mutual distrust and the threat of leakage hinder an adequate global response to climate change.39

1. The United States Position

The United States maintains that the Protocol is “fatally flawed” because: 1) the extent of anthropogenic induced climate change is uncertain, 2) emissions allocation schemes that only bind Annex I countries have the potential to harm economic competitiveness, and


39. Leakage occurs when countries abate emissions causing businesses and emissions to move to other unregulated countries.

40. In June 2001, President Bush used this language to describe the Kyoto Protocol. See President Bush Discusses Climate Change, supra note 38.
3) an effective collective action response requires reciprocal GHG reduction commitments from developing nations.\textsuperscript{41}

In May 2001, President Bush asked the National Academy of Sciences\textsuperscript{42} to identify the greatest uncertainties in the science of climate change and assess "views on whether there are any substantive differences between the IPCC Reports and the IPCC summaries."\textsuperscript{43} After receiving a final report from the Committee on the Science of Climate Change in June 2001, the President directed a cabinet-level climate change working group to develop innovative approaches that stabilize GHG concentrations, ensure continued economic growth, favor market-based incentives, and spur technological innovation.\textsuperscript{44} Furthermore, he required that these approaches be flexible enough to adjust to new information or technology and be rooted in global, collective

\textsuperscript{41} The United States position varied only slightly during the Clinton Administration. Before the United Nations Framework Convention on Climate Change Conference of the Parties in Kyoto convened in December 1997, during the Clinton Administration, Senator Charles Hagel (R-NE) paired up with Senator Robert Byrd (D-WV) to sponsor Senate Resolution 98. This resolution passed the Senate 95-0 in July 1997. \textit{See} 143 \textsc{Cong. Rec.} S8139, Vote No. 205 (July 25, 1997). Resolution 98 declared that in Kyoto the United States should not be a signatory to any agreement (regarding the UNFCCC of 1992) that would: 1) mandate new commitments for Annex I Parties to limit or reduce GHGs unless such agreement would mandate commitments for developing country Parties within the same compliance period or 2) seriously harm the U.S. economy. Moreover, Senate Resolution 98 gave President Clinton a preview of the Senate's response to any request to ratify the Kyoto Protocol. \textit{See} \textsc{U.S. Const.} art. II, § 2 (granting the President the "Power, by and with the Advice and Consent of the Senate, to make Treaties, provided two thirds of the Senators present concur."). Nevertheless, Vice President Gore ceremonially signed the Protocol for the United States in December 1997. In May 1998, Senator Joe Knollenberg (R-MI) responded by introducing the American Economy Protection Act, H.R. 3807, 105th Cong. (1998) to "prevent the administration from implementing [through regulation] this dangerous treaty in the absence of Senate ratification by requiring that Federal funds cannot be used for rules, regulations, or programs designed to execute the Kyoto Protocol." 144 \textsc{Cong. Rec.} at H3494–03 (daily ed. May 20, 1998) (statement of Rep. Knollenberg).

\textsuperscript{42} \textsc{National Academy of Sciences, Committee on the Science of Climate Change, Climate Change Science: An Analysis of Some Key Questions vii} (2001) \textit{[hereinafter Academy Analysis]}.

\textsuperscript{43} \textit{Id.} app. A. (Letter from John M. Bridgeland, Deputy Assistant to the President for Domestic Policy and Director, Domestic Policy Council & Gary Edson, Deputy Assistant to the President for International Economic Affairs to Dr. Bruce Alberts, National Academy of Sciences, May 11, 2001) \textit{[hereinafter Letter from John M. Bridgeland]}.

\textsuperscript{44} \textsc{White House Climate Change Initial Report} 1 (2001), \textit{available at} www.whitehouse.gov/news/releases/2001/06/climatechange.pdf.
participation. President Bush’s directive reflects skepticism of the foundational science used as evidence of anthropogenic climate change. In lieu of participation in what was viewed as a flawed Protocol and suffering potential economic hardships, the Bush Administration has adopted a bilateral approach. In pursuing this strategy, the White House has emphasized changes in national policy and “partnerships for climate solutions” as the appropriate means of addressing climate change.

45. Id.

46. The Bush Administration’s skepticism was confirmed when President George W. Bush announced the Clear Skies and Global Climate Change Initiatives. He remarked that “[w]e must also act in a serious and responsible way, given the scientific uncertainties” and the United States will “continue to lead the world in basic climate and science research to address gaps in our knowledge that are important to decisionmakers.” President Bush’s Remarks Announcing the Clear Skies and Global Climate Change Initiatives in Silver Spring, Maryland, 1 PUB. PAPERS 226 (Feb. 14, 2002) available at http://www.whitehouse.gov/news/releases/2002/02/20020214-5.html [hereinafter President Bush’s Clear Skies Remarks].

47. WHITE HOUSE CLIMATE CHANGE INITIAL REPORT, supra note 44, at 31.

48. Specifically, in its Climate Change Initial Report, the Administration points to the Joint Declaration on sustainable development that the Secretary of State signed on June 7, 2001 with seven Central American countries. The Report states that “[t]he Declaration emphasizes ‘the need for intensified cooperative efforts to address climate change,’ citing as priority for action: [s]cientific research; [e]stimating and monitoring greenhouse gases; [i]nvesting in forestry conservation; [e]nhancing energy efficiency; [p]romoting environmental technologies; [e]nhancing capacity to adapt to climate change; and [c]ollaborating to better understand regional impacts of climate change.” WHITE HOUSE CLIMATE CHANGE INITIAL REPORT, supra note 44, at 32. As for domestic policy, in 2002, President Bush announced his Clear Skies and Global Change Initiatives, observing that, because the climate change problem “presents a different set of challenges” with complex science, less-certain answers, and less-developed technology, a flexible approach was needed to “adjust to new information and new technology.” President Bush’s Clear Skies Remarks, supra note 46. This is President Bush’s “environmental approach that will clean our skies, bring greater health to our citizens, and encourage environmentally responsible development in America and around the world.” Id. To clean the “air that Americans breathe,” the President called for clean skies legislation to reach “ambitious air quality goals through a market-based cap-and-trade approach that rewards innovation, reduces cost, and guarantees results.” Id. This flexible approach entails cutting United States greenhouse gas emissions “relative to the size of our economy” by 1% over ten years. Id. In October 2003, the U.S. General Accounting Office (GAO) reviewed the Administration’s February 2002 Climate Initiative which established an 18% reduction of “emissions intensity” by 2012, and found the Administration’s public documents did not support an 18% figure, but rather the already anticipated 14% reduction estimate. Furthermore, the Initiative lacked specific plans for interim progress monitoring. Preliminary Observations on the Administration’s February 2002 Climate Initiative, U.S. Gen. Accounting Office (GAO) Testimony on Climate Change before the S. Comm. on Commerce, Science, and Transportation, 108th Cong., GAO-04-131T, at 1, 8 (2003) (Statement of John B. Stephenson, Director, GAO Natural
2. Failure to Include Major-Emitting Nations

The United States position reflects general international concern that the Kyoto Protocol is inherently flawed because many major-emitters—notably China, India, and other developing countries—are exempt from participating in the Protocol’s commitments. As President Bush noted in 2001, India and China, both major polluters, were exempt from the Protocol’s requirements.49 GHG emissions represent a transboundary harm which requires a collective response by all emitters. However, the sheer number of nations and their conflicting agendas have the potential to impede any collective action.

The failure of the United States to ratify the Protocol remains problematic because of its impact on other “fence-sitters”—those who remain reluctant to join the Protocol (e.g., Australia prior to its 2007 elections).50 U.S. policy also impacts future decisions and actions of ratifying nations. For example, Canada might be reluctant to comply for fear that competitive advantages may accrue to fossil fuel-powered industries in the unbound United States.51 Moreover, the Protocol lacks a meaningful enforcement mechanism and signatories may be distrustful of other nations:

[Commitments] serve as the glue that helps hold a cooperative regime together. Before taking potentially costly actions to address climate change, states need to be confident that others will do their part as well. International commitments are the means by which countries bind themselves to one another to take mutual action.52

In sum, the failure to secure collective buy-in and mutual distrust significantly undermine the cooperative mentality required for the success of the Protocol.

49. See President Bush Discusses Climate Change, supra note 38.
3. Fluctuating National Leadership

To effectively implement an international agreement, the obligations of each nation must be carried out at the national level. When obligations are particularly onerous, individual nations will adhere "only insofar as those nations perceive that positive net benefit[s]... will be forthcoming." The tendency of successive administrations to alter a nation's official position and domestic policies further complicates adherence to international obligations.

Fluctuating U.S. national policy is especially harmful because of the country’s status as the largest GHG emitter. Changing political administrations and varying policies have prevented the United States from assuming a leadership role in directing collective action. Other nations have provided varying levels of support and changed domestic policies. For example, Germany’s national leadership recently exempted the coal industry from the European Union’s carbon trading program that was designed to ensure Protocol compliance. In Canada, the country’s leadership transferred funding away from Protocol implementation projects in order to support commuter tax credits. As these examples show, consistent national climate change policies may significantly increase the likelihood of a successful collective response.

4. Inability of Ratifying Nations to Meet Protocol Commitments

International concerns also arise due to the inability of ratifying nations to meet their commitments. As recently noted, “Canada, Japan,


54. For example, on April 21, 1993, President Clinton in introducing The Climate Change Action Plan stated “Today, I ... announce our nation’s commitment to reducing our emissions of greenhouse gases to their 1990 levels by the year 2000.” WHITE HOUSE, THE CLIMATE CHANGE ACTION PLAN: EXECUTIVE SUMMARY (1993), available at http://www.gcrio.org/USCCAP/execsum.html. However, his successor, President George Bush has not continued that lead.


Climate Change “Crisis” and the European Union—the most enthusiastic advocates of the Protocol—are not on track to meet their commitments.57 The failure of signatories to meet their obligations, combined with the lack of repercussions signals to Annex I and developing nations that the Protocol is likely to fail.

The lack of accurate emission baselines creates an obstacle in determining whether participating states are meeting their Protocol commitments.58 Some signatories may have an advantage when 1990 baselines are chosen to assess emission rate changes. In nations such as Russia, where the national economic output has declined since 1990, GHG emissions may also have decreased.59 This situation creates “head room” or “hot air.”60 Conversely, the Protocol’s use of 1990 emission levels as a baseline burdens some countries, like the United States, that have grown over the past ten years.61 A further obstacle to the Protocol’s effectiveness may be leakage, a phenomenon which occurs when businesses move their operations and accompanying emissions to unregulated countries to avoid the expenses of obtaining emission-reduction technology. Essentially, even if the Annex I countries reduce overall emissions, those emissions may resurface elsewhere, as non-Annex I countries enjoy the economic benefits of leakage.62

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58. See UNITED STATES GENERAL ACCOUNTING OFFICE., GLOBAL WARMING: DIFFICULTIES ASSESSING COUNTRIES’ PROGRESS STABILIZING EMISSIONS OF GREENHOUSE GASES 2 (1996) [hereinafter 1996 GAO REPORT ON DIFFICULTIES ASSESSING COUNTRIES’ STABILIZING EMISSIONS].
60. Id.
62. BARRETT, supra note 59, at 383.
III. CLIMATE CHANGE: A CLASSIC GLOBAL-SCALE COLLECTIVE ACTION PROBLEM

[States] realize that they cannot solve some transnational or global environmental problems through individual action, so they agree to collective action by means of a reciprocal exchange of promises....

- Daniel Bodansky, 1999

The difficulties associated with achieving collective action are compounded by the fact that the climate is a readily and freely available resource subject to exploitation—a phenomenon known as a tragedy of the commons. Without regulation parties may use the resource as much as desired, even though such action may result in destruction of the resource itself. To respond to climate change, equity issues and economic concerns must be addressed. This section first contemplates the equity issues that inhibit collective action. It then goes on to address background factors beyond the economic concerns that impede collective action. Finally, it describes several foundational problems that parties must understand and forestall to successfully develop and implement an adequate global collective response.

A. Global Commons Issues Delay International Collective Action

[Mancur] Olson's [(The Logic of Collective Action (1965))] examination presents a rational choice basis for collective action...

The success of international collective action depends on the extent to which the interests of the parties coincide.

- Joseph R. Bial & Gary D. Libecap, 1999

A tragedy of the commons is a social trap wherein an unregulated, finite resource is over-consumed by a society, ultimately to the public's


64. See Hardin, supra note 9; MANCUR OLSON, THE LOGIC OF COLLECTIVE ACTION: PUBLIC GOODS AND THE THEORY OF GROUPS (1965); TODD SANDELL, GLOBAL COLLECTIVE ACTION 11 (2004). See also Thompson, supra note 5, at 242.

overall detriment. Garrett Hardin first described this theory in 1968.\textsuperscript{66} Essentially, where:

\begin{quote}
[r]uin is the destination toward which all men rush, each pursuing his own best interest in a society which believes in the freedom of the commons. Freedom in a commons brings ruin to all .... The challenge is how to legislate temperance using the only means at our disposal, international law.\textsuperscript{67}
\end{quote}

The atmosphere is the ultimate example of a commons at risk of being destroyed by global society. In order to combat overuse, nations must internally regulate at-risk public resources that make up the commons and all nations must act collectively to ensure such regulation. When acting collectively to avert a tragedy of the commons, parties face two core equity issues: free-riding and the inequitable distribution of costs and benefits of collective action.

Overcoming the tragedy of the commons by collective action requires a legal framework capable of securing cooperation among all necessary parties whose interests are not fully aligned. To construct this legal framework, sovereign states with divergent interests must cooperate in the allocation of global resources. To secure cooperation, parties must determine that incentives exist to participate in collective action. Furthermore, before agreeing to take collective action, the parties must foresee gains and demonstrable net benefits and perceive an equitable apportionment of the burden.\textsuperscript{68}

\textbf{I. Free-Rider Concerns}

Free-riding occurs when some parties bear the costs of an action, while others, the free-riders, bear no burden, but still enjoy the benefits.

\textsuperscript{66} See Hardin, \textit{supra} note 9 (describing how pastures open to all for cattle grazing (a commons) may result in a tragic overuse of the land (suboptimal resource depletion) because each "rational herdsman" has an incentive to maximize his individual profits and will continually add animals to the pasture, despite the destructive impact--no self-sustaining grasses will remain--that occurs if all herdsmen act similarly. The behavior is essentially a race to the bottom. With global commons problems, a resource, like the pasture, is readily and freely available to all, and incentives exist for all parties to obtain as much of the global resource as they desire, even though collectively this may cause the resource to be destroyed. Thompson, \textit{supra} note 5, at 242.


Generally, nations participating in global climate change negotiations are driven by “economic self-interest and the search for strategic advantage in an international economy in which trade and capital mobility play an increasingly important role.” If a nation can accrue benefits from a particular course of action without sharing in the burdens, a self-interested nation will naturally pursue this course of action. For example, China ratified the Kyoto Protocol, but as a developing, non-Annex I country has no formal obligations to act to reduce emissions. This is particularly disconcerting given that China is the world’s biggest coal producer and second largest world-wide carbon dioxide emitter. Despite signing the Protocol, China continues to maintain its current energy use practices; the country plans to establish 562 new coal-fired power stations. Without formal obligations, China bears no costs under the Protocol, but receives benefits in the form of a cleaner atmosphere since others are required to reduce their emissions.

Such conduct may cause those who do bear the costs to refrain from participating collectively because of the perceived unfairness of such a situation. Parties are unlikely to join in collective action unless they are assured that others will be similarly bound or believe that failing to do so would result in excessive costs to themselves. For example, one of the reasons the United States has not ratified the Protocol is because of the lack of obligations imposed on developing nations that are large emitters of carbon dioxide. President Bush pointed out the potential for free-riding in China and India when he stated:

The world’s second-largest emitter of [GHGs] is China. Yet, China was entirely exempted from the requirements of the Kyoto Protocol. India . . . among the top emitters . . . was also exempt . . . . These and other developing countries that are experiencing rapid growth face challenges in reducing their emissions without harming their economies.

2. Inequitably Allocated Costs and Benefits

Collective action may also be inhibited because participants or potential participants believe the costs and benefits of collective action

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72. President Bush Discusses Climate Change, supra note 38.
will be allocated inequitably. This circumstance may arise where a large emitter reduces its emissions and incurs huge costs to the benefit of all other nations that will enjoy cleaner air. Reducing countries may rightly perceive that collective action results in inequitable or unfairly distributed benefits. Parties often choose not to participate in collective actions if they perceive themselves unduly burdened. This result may be mitigated by the provision of individual feedback from other nations regarding the effects and benefits of their actions. When solving a tragedy of the commons problem, "resource users are more likely to restrict their consumption when they receive prompt feedback on the impact of their extractions, when their behavior is visible to others, when they can communicate with their fellow resource users and when the users share a group identity." Thus, clear feedback can serve as an incentive to parties to participate even where benefits accrue inequitably.

B. Background Factors

Certain social conditions known as background factors influence the decisions of individual nations to participate in collective action. These factors include uncertainty and complexity of the underlying climate change science, economics, and the impact of technology. Proper understanding and manipulation of these factors has the potential to create a negotiating environment that is conducive to global collective action on climate change threats.

1. Science

Climate change science involves the evaluation of interactions of air, land, water, sunlight, ecosystems, and atmospheric gases. Such evaluation requires complex data collection methods and computer climate models that are very sophisticated and difficult to explain. Due to this complexity, modeling results, underlying data, and climate change theories cannot be easily conveyed for the general public's understanding. Consequently, the public may fail to fully realize the urgency of the climate threat. Until examples of climate change impacts are obvious and commonplace, it is unlikely that the public, absent governmental education or intervention, will act as necessary to effectuate change. Further, even if the public were able to understand the issue on a global level, it is difficult for governments to predict or explain to their citizens any particular impacts their nation is likely to face. In sum, these difficulties frustrate the public's ability to understand

73. Thompson, supra note 5, at 242-43.
and a government's ability to explain the climate change problem. These obstacles could ultimately hinder a nation's public support of global collective action and the political will of emitting countries.

a. Complexity

The science of climate change relies on many complex factors. As commentators have noted, agreement on science remains an essential factor in the collective action debate. As discussed supra, a multitude of climate change phenomena are attributed to an intensified, global "greenhouse effect." The greenhouse effect occurs when carbon dioxide and other trace gases, like methane or nitrous oxide, react with water vapor to trap solar rays and prevent normal reflection or re-radiation into space. Evidence of the greenhouse effect is seen in the form of retreating glaciers, fracturing ice shelves, rising sea levels, and melting permafrost. The timing, distribution, and impacts of climate change depend on a myriad of complex, correlated environmental interactions. Temperature changes have a great effect on other climate determinants. For example, increased temperatures usually increase the amount of water vapor carried in the air, but the magnitude of this effect is difficult to quantify, because it varies with other factors such as atmospheric pressure. One measured impact of increased water vapor is that it often creates more re-radiation, which essentially augments the greenhouse effect. Cloud-cover also influences the interaction of air, water, land, atmospheric gases, and sunlight. These variables, in turn, impact the amount of cloud cover, sunlight, ocean currents and vegetation feedback. In sum, all of these variables are impacted by complex interdependencies.

74. ANDREW E. DESSLER & EDWARD A. PARSON, THE SCIENCE AND POLITICS OF GLOBAL CLIMATE CHANGE: A GUIDE TO THE DEBATE 16-17 (2006) (science, policy options, and political positioning are regarded as the three major factors surrounding the collective action debate).

75. RISCHARD, supra note 3, at 70.

76. Id.

77. WHITE HOUSE OFFICE OF SCIENCE AND TECHNOLOGY POLICY, supra note 4, at 2.


b. Uncertainty

Along with complexity, the inherent uncertainty of existing scientific data contributes to parties' skepticism about the actual impacts of climate change. There are three central aspects to the uncertainty issue: the measurement problem, the self-healing capability of the Earth, and the actual impact of human activity on climate change.

First, the measurement problem arises from the large number of climate variables necessary for accurate climate modeling. Small errors in measuring or assessing any one of the variables could result in incorrect climate theory conclusions. In addition to measurement problems, debate surrounds the question of whether nature will correct the climate change process on its own. Many scientists emphasize that natural processes exist to stabilize or counter the potential impacts of GHGs on the Earth’s atmosphere without intervening human action. Not all believers in the Earth’s ability to eventually self-heal promote a hands-off approach. Rather, some advocate enhancing or augmenting the Earth’s natural, known GHG mitigation capabilities. For example, humans have the ability to create or expand natural “carbon sinks”—processes, activities, or mechanisms which remove GHGs from the atmosphere and trap carbon and other GHGs in permanent reservoirs.

Despite disagreement within the scientific community on the role of human GHG emission and its impact on climate change, the Intergovernmental Panel on Climate Change (IPCC) conclusively determined that human activities such as fossil fuel burning, industrial emissions, agricultural activities, and deforestation result in significant GHG emissions. The IPCC further found that these emissions contribute to climate change and if not addressed, will increase the risk of rising sea levels and flooding, increase the average global temperature, damage ecosystem stability, adversely impact human health, and cause food shortages because of changed precipitation patterns.

In 2001 the Bush Administration expressed doubt about the IPCC findings and requested the National Academy of Sciences to identify “the greatest certainties and uncertainties” of climate change science and to

80. See UNFCCC, supra note 20, art. 1. See also Gillespie, supra note 31, at 279.
81. 1996 GAO REPORT ON DIFFICULTIES ASSESSING COUNTRIES' STABILIZING EMISSIONS, supra note 58, at 3.
82. IPCC SECOND ASSESSMENT, supra note 1, at 25–41. Other potential future impacts may include water shortages in some regions, decreased in agriculture production in some areas, and mortalities due to insect and/or water-borne diseases. RISCHARD, supra note 3, at 72–73. Increased global temperature may also result in severe weather events. Glick, supra note 78, at 22.
83. IPCC SECOND ASSESSMENT, supra note 1, at 25–41.
assess the IPCC’s reports. Although the Academy’s study did not resolve the underlying debate on the import of uncertainty in climate change science, it did find that GHG emissions “are accumulating in Earth’s atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise.” However, the report also noted that some temperature change may reflect natural variability and stated that global climate change impacts depend primarily on the magnitude and rate of the Earth’s warming.

Political entities have reacted differently to the inherent scientific uncertainty and the IPCC findings. The combination of complex science and unperceived impacts has also led individuals citizen to believe that the threat of climate change as, at best, uncertain. This belief is compounded by the fact that climate change parties and government decision-makers continue to question the impacts of the threat and the implications of inaction.

Hesitation to ratify the Kyoto Protocol and the Bush Administration’s continued doubt about human causation of climate change exemplify a negative reaction to this uncertainty. Perceptions of uncertainty raise concerns regarding hypotheses about the timing, rate, distribution, and magnitude of climate change impacts. The Bush Administration, for instance, has stressed the fact that “we do not know how much effect natural fluctuations in climate may have had on warming” and “[w]e do not know how much our climate could, or will change in the future” or “how fast change will occur, or even how some of our actions could impact it.”

c. Impacts - Timing, Regularity, Magnitude

In addition to the uncertainty associated with climate change science, there are also many uncertainties regarding the magnitude, rate, and timing of climate change impacts. Parties responding to the climate

84. Letter from John M. Bridgeland, supra note 43.
85. ACADEMY ANALYSIS, supra note 42, at 1. Furthermore, the National Academy of Sciences reported results of this global change in temperature will include sea level rises, rainfall rate increases, and “increased susceptibility of semi-arid regions to drought.” Id.
86. Id.
87. See President Bush Discusses Climate Change, supra note 38.
88. Even some basic scientific observations regarding human activities leading to global climate change are subject to criticism. In November of 2004, the Pew Center on Global Climate Change and the Arctic Council published reports that concluded global warming was occurring in part because of human activity. CAMILLE PARMESAN & HECTOR GALBRAITH, PEW CENTER ON GLOBAL CLIMATE CHANGE, OBSERVED IMPACTS OF GLOBAL CLIMATE CHANGE IN THE U.S. (2004), available at http://www.pewclimate.org/global-warming-in-depth/all_reports/observedimpacts;
Climate Change “Crisis”

change collective action problem are faced with scientific complexities and uncertainties concerning the extent to which human activities exacerbate the greenhouse effect and in turn cause climate change. The uncertainty regarding the extent of the impact of climate change is also exacerbated by natural phenomena. Questions surround how air, land, and water interact with GHGs, other atmospheric gases, various ecosystems, and the oceans. The Earth’s inherent adaptability to global warming and self-healing capabilities are poorly understood. For example, increased atmospheric water vapor levels and evaporation rates often accompany increased atmospheric temperatures. Assuming increased vapor does not act as an additional GHG, but instead forms clouds that reflect sunlight, a cooling effect could occur. The impacts of ocean current and vegetation feedback on climate change also remain unresolved, although evidence suggests that ocean currents may delay global warming by distributing atmospheric heat. Certain clouds also impact the timing and magnitude of climate change by cooling the Earth’s surface.

Without accurate predictions of what clouds will be prevalent with a GHG build up, data for accurate climate models remains incomplete. Given the uncertainty of the extent of climate change impact, the threat is not frightening enough to compel action. For example, reports assert that


89. 1996 GAO REPORT ON DIFFICULTIES ASSESSING COUNTRIES’ STABILIZING EMISSIONS, supra note 58, at 2 (reporting that the status of the United Nations Framework Convention on Climate Change’s goal to reduce greenhouse gas emissions could “not be fully assessed” due to incomplete, unreliable, and inconsistent emissions data).

90. Sinclair, supra note 79, at 557.

91. Id.

92. Id.

the "Earth's climate has warmed by about [one] degree since 1900. In the
Arctic, where the warming effects of carbon dioxide are amplified, most
regions have experienced a rise of [four] to [seven] degrees in the last 50
years." 94 Those areas that have not experienced such drastic increases in
temperature are less likely to perceive a significant threat, and
consequently, will be less likely to take collective action.

Inconsistencies in computer modeling predictions add to the climate
change science puzzle. Computerized, general circulation models
provide scientists with the capability to analyze possible future climate
change. 95 However, different models reflect inconsistent results
regarding regional climate changes and timeframes for changes. 96 As the
National Academy of Sciences points out, extensive uncertainty is
inherent in model predictions and requires "major advances in
understanding and modeling of both (1) the factors that determine
atmospheric concentrations of GHGs and aerosols, and (2) the so-called
'feedbacks' that determine the sensitivity of the climate system to a
prescribed increase in [GHGs]." 97

The inconsistent predictions resulting from diverse computer
models is exacerbated that by the fact that many agencies involved in
climate change use different computer models. For example, the U.S.
Government Accounting Office reported that seven federal agencies
funded or operated such divergent models. 98 Those that oppose climate
change action point to the differences in these models to raise doubts
regarding climate change predictions, thereby undermining efforts to
engage in collective action. 99

The use of divergent computer models by so many federal agencies,
and the ensuing inconsistent predictions, also leaves room for

94. Crenson, 2 Reports: Global Warming Real, Already Altering Climate, supra
note 88.
95. 1990 GAO REPORT, supra note 8, at 2.
96. Id. at 4. As GAO points out the National Oceanic and Atmospheric
Administration model predicted that the southeastern United States would experience
abnormally drier summers, while the National Aeronautics and Space Administration
using its model predicted the opposite. Id.
97. ACADEMY ANALYSIS, supra note 42, at 1.
98. These agencies include: Department of Energy, National Aeronautics and Space
Administration, National Oceanic and Atmospheric Administration, National Science
Foundation, U.S. Department of Agriculture, the Environmental Protection Agency, and
99. See STATE OF FEAR, supra note 78 (responding to issues, including model
variation of uncertainty, raised by Michael Crichton's book STATE OF FEAR. However,
various model validation, comparison, and evaluation projects are currently ongoing such
as the Program for Climate Model Diagnosis and Intercomparison at Laurence Livermore
National Laboratory. Id.).
accusations that the government is distributing misinformation to the public. For instance, Representative Henry A. Waxman, chairman of the Committee on House Oversight and Government Reform examining the government’s response to climate change, accused the Bush Administration of “misleading” the public regarding climate change and “injecting doubt into the science of global warming and minimize[ing] the potential danger.”

d. Distribution of Effects and Rewards for Action

A collective response to address climate change is problematic because it requires many participants to incur immediate costs to prevent climate change with only a possibility of delayed global rewards. Parties may delay incurring the costs because, if they receive individual benefits at all, it will be in the distant future. Some parties even consider benefits such as energy efficiency gains and the spirit of cooperation to be insufficient. The uncertain science regarding distribution and timing of climate change effects causes parties to hesitate to act collectively. Scientific predictions regarding climate change are unclear as to where, when, and how climate change will strike.

In some areas, climate change will have positive effects. In such circumstances, parties who perceive benefits from climate change will be less likely to participate in collective action. Russia, for instance, might enjoy a longer growing season, which likely translates to economic benefits. In such a circumstance, Russia will be less likely to participate in collective action. Additionally, while global climate change may adversely impact United States coastlines, other areas may experience reduced heating costs or improved farming conditions.


101. Scenarios involving the effects and their locations are uncertain. For example, some predict that many coastlines will migrate miles inland, displacing millions, and areas such as Siberia and northern Canada may face warmer, wetter climate. Glick, supra note 78, at 22. Others assert global warming may provide beneficial gains for Americans by improving health, lowering death rates, easing transportation issues, reducing heating costs, and satisfying their taste for warm weather. THOMAS GALE MOORE. CLIMATE OF FEAR: WHY WE SHOULDN’T WORRY ABOUT GLOBAL WARMING 129 (1998). Locations at higher sea levels could suffer the major costs from mitigating the effects of the increase in smog caused by rising temperatures. Id. As one critic stated, “From an American point of view, spending anything to reduce the emissions of greenhouse gases is unwarranted. . . . Not everyone will agree that warming would be largely beneficial. Certainly parts of the world and even parts of the United States would be harmed from climate changes.” Id. See also Christy, supra note 93.

102. Id.
Regardless of the ultimate distribution, the disparity of positive and negative climate change impacts contribute to the inequity associated with the costs of collective action.

Similar to the inconsistencies in computer modeling predictions on the extent of climate change effects, uncertainty regarding distribution of negative and positive climate change impacts allows policy partisans who oppose action to manipulate scientific information to support their respective positions. Nevertheless, parties must commit to accept a delayed reward for acting collectively based on uncertain science and possible beneficial impacts.

e. Data Verification and Accuracy

Parties collectively responding to the threat of climate change encounter difficulties with data management, verification, and collection—both baseline and subsequent compliance data. Data issues are especially relevant since the Kyoto Protocol requires National Greenhouse Gas Inventories (emissions and sink removal data inventories), which involves methodological detailed data collection and reporting requirements for emissions and sink removal. Emissions data verification requires establishing an accurate baseline and subsequently assessing mitigation compliance. This process requires parties to measure various gases, and accurately, though perhaps reluctantly, self-report data, despite the fact that an overwhelming number of parties lack sophisticated measurement technologies.

The difficulty in achieving a sufficient collective response is exacerbated by the fact that the data available to the parties may be inaccurate or incomplete. The Protocol only places the burden of National Greenhouse Gas Inventories and detailed annual reporting on Annex I parties. Non-Annex I countries are merely required to submit national communications describing aspects of their implementation and to provide any relevant information regarding their emissions and sink removal data inventories. However, in practice, most non-Annex I parties claim difficulties in meeting these minimal requirements and “indicated that their technical and institutional capacities were inadequate to meet

104. National Reports, supra note 32.
105. Over 180 parties of the United Nations Framework Convention on Climate Change are involved in responding to climate change. However, the Kyoto Protocol established ceilings on six specific greenhouse gases (e.g., carbon dioxide, methane, nitrous oxide, perfluorocarbons, hydrofluorocarbons, and sulphur hexafluoride) for thirty-eight countries, with the 15 European Union members treated as a single unit. See Kyoto Protocol, supra note 12.
National Greenhouse Gas Inventories remain an ongoing responsibility of Annex I countries. Non-Annex I countries do not have this responsibility. The data upon which collective action relies for support is limited because emissions figures for large emitting non-Annex I parties such as China and India are missing. Some parties may lack confidence in a collective action agreement based on an incomplete picture of baseline data. A complete baseline would require information from all major-emitters.

Additionally, the integrity of the data itself is difficult to ascertain. As the U.S. General Accounting Office (GAO) reported in 1996, GHG “emissions data was incomplete, unreliable, and inconsistent.” Additionally, it often can be difficult to quantify emissions of some of the six GHGs regulated by the Kyoto Protocol. For example, carbon dioxide data has greater reliability than methane and nitrous oxide, for which emissions have not been assessed.

Since the 1996 GAO report, assessing and monitoring emissions data has notably improved and parties consistently self-report emissions data. However, the failure to include national inventories of some major-emitters, regardless of their non-Annex I status, results in an incomplete baseline which may cause inaccurate climate change impact predictions and a misguided response. Also, as a result of the economic restructuring of European Union states, most notably former Warsaw Pact members, emissions have been significantly reduced. Consequently, the 1990 baseline level may be inflated and provide European economies a competitive advantage over the United States.


107. 1996 GAO REPORT ON DIFFICULTIES ASSESSING COUNTRIES' STABILIZING EMISSIONS, supra note 58, at 2. Problems in appraising progress resulted from the Convention’s lack of reporting requirements and the limited ability to quantify certain greenhouse gas emissions. Id. Problems associated with data reporting in determining whether emissions goals are met for the Convention are also transferable to assessing the impact human activities have on global climate change. In example, reliability regarding carbon dioxide emissions data is higher than that of methane and nitrous oxide because the latter gases are nontoxic, originate from a myriad of sources, and little effort has been made to assess their emissions. Id. This limited reporting data results in a failure to quantify methane and nitrous oxide emissions with certainty. Id. at 6.

108. Id.

109. Id.

2. Intergenerational Threat and Technology

The intergenerational aspect of climate change serves as another reason some parties decline to take action, preferring to just “wait and see.” Despite the “intergenerational equity” principle of “doing all that can be done to preserve the quality of the atmosphere,” some participants do not view the possibility of delayed global rewards as an adequate justification to take action and incur immediate costs. Current climate change impacts can be virtually invisible and future effects are even less conceivable. Although public awareness regarding climate change is increasing through the dissemination of magazines and movies on the subject, climate change may not represent the risk of immediate loss of human life and devastation which would likely spur more immediate action. Moreover, some believe that we should wait for technological developments to address our informational gaps and inefficient energy production. As a result, these parties believe that the cautious choice is to delay action, until the world is better equipped with the technology and knowledge to assess and respond to the issue of climate change.

Climate change commentators highlight the importance of research and development of new technologies to decrease emission control costs and design alternatives to fossil fuel sources. Future generations’ scientists may develop methods to stabilize the potential impacts of GHGs on the Earth’s atmosphere. Technology may also enable new abatement or mitigation methods and provide better means of obtaining information regarding these methods and their effectiveness.

The promise that future technology and scientific knowledge may more effectively resolve climate change encourages parties to delay collective action. President George W. Bush’s response after receiving the Committee on the Science of Climate Change’s reply in June 2001 reflects this attitude. The President requested “innovative approaches . . . measured, as we learn more from science[,] . . . flexible to adjust to new information and [that] take advantage of new technology[,] and . . . market-based incentives [that] spur technological innovation.” Climate change parties tend not to invest in an insurance policy or response—to

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111. The Hague Declaration, supra note 18, at 1309.
113. WHITE HOUSE CLIMATE CHANGE INITIAL REPORT, supra note 44, at Introduction.
avoid future risks and potential intergenerational impacts because these risks likely are only to be felt by future generations—unless they act based upon a duty to society and their children.  

3. Economics

In addition to background issues of the threat, economics plays a major role in whether parties will act collectively to address climate change. The economics of this global threat involves questions of perceived implementation costs, the role of particular industries in the emissions problem, and computer modeling in estimating the costs. Estimating possible environmental and socioeconomic harms or costs resulting from climate change is encumbered by uncertainty as well. Nevertheless, the economic impact of climate change is a key variable in generating global action. Parties may be discouraged from acting collectively to address climate change if mitigation and abatement costs exceed the perceived benefits of action. Furthermore, where a party perceives benefits from climate change itself, that party will also be deterred from participating in collective action. Both the economic impact and the costs of collectives play major roles in determining who will act and what world-wide action should be taken.

a. Cost Issues

Corporations and individual citizens who must commit to global emissions reductions will be the immediate cost bearers of collective action. Climate change agreements commit not only governments, but also the public to take certain actions. Many participants worry that

114. Interview with Matt Petersen, President and Chief Executive Officer, Global Green (Jan. 24, 2007) [hereinafter Petersen interview]. Global Green is the U.S. affiliate of Green Cross International, Mikhail S. Gorbachev, Chairman. This national environmental organization addresses global climate change, eliminating weapons of mass destruction, and providing safe drinking water. Global Green, About Global Green, http://www.globalgreen.org/about/index.html (last visited Apr. 11, 2008).

115. This article will not address the possible economic damage caused by global climate change itself. A 2002 report by Innovest Strategic Value Advisors on behalf of the United Nations Environment Program’s Finance Initiatives’ Climate Change Working Group indicates climate change impacts such as devastating storms would cost $150 billion a year within ten years. Climate Change Costs $150 Bln a Year: Report, London (Reuters) (October 8, 2002). Furthermore, although this article will not fully discuss the extensive costs involved in researching climate change and its impacts, by 1998 “[t]he United States [had] already been averaging a $1 billion annual investment . . . on global change research.” Alex G. Hanaﬁ, Note, Joint Implementation: Legal and Institutional Issues for an Effective International Program to Combat Climate Change, 22 HARV. ENVTL. L. REV. 441, 451 (1998).

116. Richard N. Cooper, Toward a Real Global Warming Treaty, FOREIGN AFFAIRS
supporting climate change response programs could, by diverting resources, stifle economic development and industrial competitiveness in their respective countries.

Cost bearers may not be willing to accept current economic losses to avoid future risks and may instead prefer to accept future adverse impacts of climate change. Moreover, economic interests of the participants play a major role in determining whether the parties can reach a viable agreement, especially since all emitting nations have an underlying goal of industrialization and economic profit.

Once parties agree to collectively address climate change, they must translate any of the agreement’s obligations into domestic policy. The implementation of international treaties within a country may be frustrated by existing domestic policies that might conflict with the goals of the treaty. Worldwide efforts to combat climate change likely require countries to initiate policies that reduce reliance on fossil fuels, the leading source of the world’s energy.117 To fulfill national treaty obligations, governments must influence and incentivize their citizens and corporations to act in prescribed ways. It is foreseeable that politically influential corporations that perceive the costs to be unbearable will attempt to undermine government endeavors by trying to influence the public with rhetorical attacks on the underlying science.

Costs associated with mitigating or abating climate change also cause major fault lines in international environmental politics between the developed North and the developing South and will be discussed in Part III.C. Those emerging conflicts related to international environmental lawmaking should be evaluated as economic-issue conflicts rather than purely as environmental issues.118 International environmental law is tied to economic development as well as the geopolitics of global wealth distribution.119 Economically-advanced parties may be more willing to support action to address transboundary environmental degradation because they are more financially stable, feel greater responsibility for the problem, or have a greater ability to address the issue because they are not overwhelmed by basic national issues such as poverty. In any case, the affluent, developed countries of the North and the poorer, developing nations of the South disagree over how to best address climate change in the context of the global economy.

66 Mar/Apr. 1998 (arguing that we must inform the public to gain support for climate change agreements).

117. Unless carbon sequestration can be worked out.


119. Id.
No adequate agreement may be obtained until governments, industry, and individual citizens are willing to accept present costs to address the risk of future harms. Collective action could ultimately stall because the significant costs of mitigation and abatement methods may seem too high for many cost bearers and the benefits from emitting may outweigh the risks of climate change impacts.

b. Industry Impacts and Input

The economic interests of corporations exerted through lobbyists plays a major role in whether and what type of action will be taken to address climate change. Collective action to combat climate change involves reducing fossil fuels upon which many corporations rely. Essentially, to decrease GHG emissions, developed and developing nations must commit to replace fossil fuels, which would negatively impact corporations that are involved in the production of these fuels or have made investments in fossil fuel dependent means of production. Any impact to these corporations would likewise affect national economies. The costs of transition to an economy based on alternate fuel sources are significant even without mitigation costs. During a transition period, corporations would incur extensive costs in converting their existing infrastructure to support alternate fuel use. Some economic analysts, however, contend that reducing GHG emissions will not be as costly as anticipated, even in industrialized economies.121

120. As the U.S. General Accounting Office warned in 1990, “[d]eveloping a worldwide strategy to slow global warming will be economically and politically contentious because it will involve a decreased reliance on fossil fuels, which currently provide over 75% of the world’s energy.” 1990 GAO REPORT, supra note 8, at 5. In the past, some observers asserted fossil fuel interests, primarily the “carbon club” of “coal, oil, and other fossil fuel-related industry umbrella groups,” will go so far as to engage in “manipulation, distortion, sabotage or lying at the climate negotiations” attempting “to derail the climate convention” (1990-2005) by “watering down” scientific climate change reports among other activities. Posting of Jeremy Leggett, Carbon Wars, April 25, 2006, http://www.guardian.co.uk/commentisfree/2006/apr/25/exxonmobilslonglivedemulatio (last visited Sept. 5, 2008). asserting Exxon-Mobil is one of the remaining “climate-treaty wreckers.” See also JEREMY LEGGETT, THE CARBON WAR (1999). Some even predicted that industry-funded lobby groups intended to “undermine” the IPCC report, published in February 2007. David Adam, Scientists Fear New Attempts to Undermine Climate Action, THEGUARDIAN.CO.UK, April 21, 2006, available at http://www.guardian.co.uk/climatechange/story/0,,1758233,00.html.

121. For example a 1992 macro-economic study of the Federal Republic of Germany argues:

policies to improve energy efficiency and to shift the energy mix to advanced technologies and less carbon-intensive fuels will generate four important kinds of benefits for the national economy. Such policies will 1) spur overall economic growth, 2) quickly generate a large number of jobs within the
Absent explicit industry pressure, nations may still decline to support collective action to address climate change because they fear that their economic growth, productivity, corporate competitiveness, and wealth would suffer unnecessarily by diversions of resources to support global climate change programs. Some analysts contend that replacing fossil fuels or reducing their use as directed in the Protocol regardless of United States participation could impact the global demand for oil and natural gas, and in turn reduce oil demand and producer prices. Furthermore, the implications for natural gas use remain unclear because reducing fossil fuel consumption “will lead to substitution of carbon-intensive coal with natural gas in electricity markets.” Most economic models indicate that a two percent loss of the world Gross Domestic Product would result if carbon emissions are reduced by fifty percent from baseline levels by the middle of the twenty-first century.

c. Inconsistencies in Economic Computer Modeling

Economic models used in assessing potential costs incurred from GHG emission abatement differ depending on assumptions. Similar to the scientific proof and computer modeling problems discussed previously, the differing results that competing economic models provide may be used as rationalization for some nations to act and others to resist action. Similar to computer modeling used for climate predictions, the

country (including the sort of entrepreneurial jobs which encourage a resourceful, self-sufficient, and satisfied work force), 3) increase exports of high technology products, and 4) reduce environmental and social costs of energy use that were previously uncounted in the market transactions for fuel.


124. Id.

125. WILLIAM R. CLINE, THE ECONOMICS OF GLOBAL WARMING 7 (1992). However, carbon-abatement cost studies use different approaches (e.g., focusing on alternative energy technologies or reinforcing the use of international trading). Additionally, cutback costs rise when the baseline percentage is reduced, but over time decline due to the widening range of technological alternatives from technical change. Id. However, a decrease of abatement costs may result from afforestation or reduction in deforestation. Id.

126. Even government agencies may engage in using economic modeling to sway public opinion, and in some cases political action. In 2003, Senator Hollings (Committee on Commerce, Science and Transportation) and Senator Kerry (Subcommittee on
use of varying assumptions in economic cost modeling also causes a wide disparity in economic impact predictions attendant to GHG emissions abatement.

Economic models that assume no actions to control emissions are taken are called the “base case” or “business-as-usual” case.\textsuperscript{127} In these scenarios, as emissions rise over time with increased economic output, it will be more difficult to meet specific reduction targets and necessarily higher control costs will result.\textsuperscript{128} The higher the base case climate impacts are, the greater the benefits of controlling emissions results.\textsuperscript{129} Other assumptions controlling the “no action” alternative, are: 1) whether new, low-cost, low-GHG-emitting technologies will be available; 2) the extent to which consumers and producers can meet their needs through substituting these technologies (substitution); 3) what government policies will be put in place to control GHG emissions; and, 4) whether environmental benefits due to reducing GHGs are included in the quantitative analysis of control costs.\textsuperscript{130}

Similarly, a World Resources Institute study indicates that predictions of costs for reducing GHG emissions differ depending on certain economic model assumptions.\textsuperscript{131} Variances in the following assumptions account for eighty percent of the differences in projected costs: 1) whether competitively-priced non-fossil energy alternatives will be available, 2) whether firms and consumers will efficiently reallocate

\begin{quote}
Oceans, Fisheries and Coast Guard, Committee on Commerce, Science and Transportation) requested that the U.S. General Accounting Office (GAO) review the difference in reports from the Council of Economic Advisors (CEA) and the Energy Information Administration (EIA) providing cost estimates if the United States implemented the Kyoto Protocol. U.S. GOV’T ACCT. OFF., ESTIMATED COSTS OF THE KYOTO PROTOCOL, GAO-04-144R (2004). The CEA estimated the cost at $7 to $12 billion while the EIA estimated a cost of $397. \textit{Id.} The different estimates, according to GAO, resulted due to two assumptions. First, if the model assumed that the United States could not purchase emissions reductions from other nations (international emissions trading), the estimated costs would be higher. \textit{Id.} Second, when the economic model assumed a slower-growing economy (GDP growth), less energy use would occur, resulting in fewer emissions, and in turn, a smaller emissions reduction requirement. \textit{Id.} at 9.
\end{quote}

\textsuperscript{128} \textit{Id.}
\textsuperscript{129} \textit{Id.}
\textsuperscript{130} \textit{Id.} at 193–94.
expenditures as energy prices increase, 3) whether nations will take advantage of joint implementation, 4) whether revenues from energy taxes or auctioned-off carbon dioxide permits will be used to reduce taxes on capital and labor, 5) whether fossil fuel consumption reductions will decrease air pollution damages, 6) whether fossil fuel consumption reductions will avert environmental damages resulting from climate change, and 7) how much the model assumes energy sources, technologies, products, and production substitution are possible.

Not only do different economic model assumptions impact predictions of mitigation and abatement costs, but various response actions or policies also lead to differing predictions of economic impacts. For example, proposals for stabilizing and allowing no emissions growth, such as the Kyoto Protocol framework and the United States' internationally tradable emissions permits proposal, as opposed...
to reducing emissions growth, could also entail a more drastic economic impact.\footnote{135}{See McKibbin & Peter J. Wilcoxen, \textit{supra} note 134, at 4 ("[S]tudies to date suggest that the costs [to stabilize or hold emissions] exceed the benefits . . . Estimates of the cost of holding emissions constant range from -0.5\% (an increase in GDP) to 2\% of GDP annually; most fall in the range of 1 to 2\%. . . the benefit of stabilization is simply the sum of the avoided costs of damages that higher temperatures would cause.").}

Disputes between parties involved in collective action to address climate change inevitably arise because money is involved. Whether the background factor of economic incentive promotes action depends on who the winners and losers are in a particular reduction plan. In any case, as long as mitigation and abatement cost data remains in dispute, parties are likely to lean upon these uncertainties as an excuse to delay participation in collective action. Regardless of the assumptions that cause inconsistent results in economic modeling and in assessing costs incurred for abatement, uncertainty is a significant obstacle to collective action.

\section*{C. Group Elements at the Climate Change Negotiating Table}

\textit{[S]ince the success of international collective action generally requires broad participation, some countries that place low net values on the agreement may adopt hold-out strategies in order to extort payments from others.}\footnote{136}{Bial & Libecap, \textit{supra} note 65, at 6 (footnote omitted).}

- Joseph R. Bial & Gary D. Libecap, 1999

At the negotiating table, parties addressing a transboundary harm or a global commons dilemma encounter other representatives with predetermined judgments regarding what response, if any, is appropriate. Global collective bargaining participants will also find that group factors such as the size of the parties, composition of the negotiating body, negotiation or interaction rules, and party strategies influence the consensus process. Additional complications exist as parties encounter a myriad of policy positions expressed by NGOs, global agencies and coalitions. Furthermore, the tendency of developed nations of the North and the developing nations of the South to disagree on a variety non-climate issues further complicates negotiations. While preexisting judgments and entrenched alliances can hinder the negotiation process, coalition building has the potential to simplify the process.
1. Players

The sheer number of participants in global bargaining complicate negotiations. Past international collective negotiations that addressed transboundary environmental problems have involved many participants: states, global or international agencies, and non-state participants such as NGOs corporations and the media. For example, the 1992 Rio Earth Summit involved over 100 heads of state, 8,000 delegates, 3,000 NGO representatives, and 9,000 representatives from the press.

State participants at the global negotiating table have also increased. The number of recognized sovereign states has risen from thirty-four at the start of the twentieth century, to fifty-one in 1945 at the establishment of the United Nations, and 188 United Nations member states at the start of the twenty-first century, not including several other non-United Nations states. The regime charged with addressing the transboundary issue of climate change includes 186 individual governments and the European Community and meets at the annual Conference of the Parties to discuss the UNFCCC negotiating process.

137. As a result, some observers call for an authoritative international institution to compel compliance. For example, as Daniel Bodansky noted, seventeen heads of state that endorsed The Hague Declaration “called for ‘new institutional authority’ that involves non-unanimous decision making, . . . to combat global climate change. It is hard to imagine how problems such as global climate change will be successfully addressed, without the eventual establishment of more authoritative international institutions to set standards and oversee compliance.” Bodansky, supra note 63, at 599 (footnote omitted). The United Nations Charter itself does not address specific environmental concerns. See Palmer, supra note 67, at 259 contending that “the United Nations lacks any coherent institutional mechanism for dealing effectively with environmental issues,” the “Charter itself provides no environmental organ” and “[a]side from a reference to ‘good neighborliness,’ it contains nothing” regarding the environment. Id. at 260.


140. See UNFCCC, supra note 20; United Nations Framework Convention on Climate Change, “Guide to the Climate Change Negotiation Process,” available at http://unfccc.int/not_assigned/b/items/2555.php. Prior to coming to the global negotiating table, membership in certain organizations may also provide a preview of where a party may stand on specific issues. Additionally, such organizations may disseminate information regarding issues and assist in focusing agendas. For example, the United Nations Environment Programme, which evolved from the 1972 Stockholm Conference, is devoted to promoting universal and regional environmental law and plays a leading role in promoting regional conventions. Pierre-Marie Dupuy, Soft Law and the International Law of the Environment, 12 MICH. J. INT’L L. 420, 423 (1991). Outside the United Nations system, the World Bank and other international organizations also formed the Committee of International Development Institutions on the Environment in 1980,
Although state delegations continue to be the primary actors in global negotiations, corporations and NGOs have also assumed many of the complex tasks that states previously performed.\textsuperscript{141} Individuals from NGOs may be included in a government delegation, a national delegation, or a formal advisory group.\textsuperscript{142} NGOs may send delegates to international conferences, be included as members of international organizations, may participate in policy development or preparatory committees, or give presentations at international organizations’ special sessions.\textsuperscript{143} NGOs broaden the base of an organization’s decision-making structure by providing specific subject matter expertise and representing divergent societal views.\textsuperscript{144}

NGOs in today’s international environmental law arena have come to perform a myriad of functions. Primarily, NGOs exert their influence by participating in the international decisionmaking process by focusing on codifying and developing international law, developing new convention proposals, drafting treaty language, and participating in negotiations.\textsuperscript{145} In particular, the value of NGOs has been evidenced by correcting treaty mistakes, pointing out inconsistencies in proposals, and serving as official state delegation members.\textsuperscript{146} Other NGO activities center on enforcing international law and promoting the public interest by informal strategies such as mobilizing public opinion pressures on governments, making personal appeals to decision-makers, and providing expert support for international lawmakers.\textsuperscript{147}
In global negotiations on climate change, two kinds of NGOs—each with highly divergent objectives—are prominent when addressing climate change: 1) environmental NGOs which focus on reducing gas emissions that may cause climate change, and 2) business NGOs which represent industry interests as their operations impact climate change. However, a broad controversy exists regarding whether to exclude for-profit business entities from NGO status.

2. The Psychology of Strategy and Coalition Building

Once all the players arrive at the table, fundamental issues evolve based on strategies and coalition building inherent in any collective, multi-party negotiation process. When parties attempt to resolve global commons problems, some opinions at the bargaining table may reflect holdout strategies and predictable positions based on psychological phenomena.

Other challenges based on party strategies may appear when multiple states sit down to negotiate a collective action. Global negotiations often involve the analytical framework that game theorists

at the mercy of international organizations and foreign domestic rules on access and participation” but simultaneously are allowed “to define their role unconstrained by law . . . to develop more creative effective approaches to environmental protection than those offered through litigation.” Id., at 64.


149. Jeffrey J. Rachlinski, Innovations in Environmental Policy: The Psychology of Global Climate Change, 2000 U. ILL. L. REV. 299, 304–05. Parties will have different attitudes toward risk. For example, some skeptics may use evidence supporting the belief that the degree and impact of the threat are minimal (biased assimilation). Id. at 307. Representatives at the table may also include individuals attached to the status quo who may be unwilling to sacrifice benefits “in hand” to obtain other benefits (loss aversion) or who will tolerate climate change and its risks but are reluctant to pay for reducing the risk (status quo bias). Id. Still others may take positions reflecting “risk seeking preferences in the face of loss” and may refuse to accept economic loss associated with mitigating the impacts of the threat, choosing instead to incur the greater risk of the adverse impacts. Id. at 309.
identify as the Prisoner's Dilemma, of which the tragedy of the commons is a poignant example.

In a global commons scenario, the Prisoner's Dilemma may occur when parties “pursue their individual self-interest [and] behave in a way contrary to their shared collective interest,” and which results in “the power of self-interest in defeating any sense of moral obligation to advance the common good, [and] the ability of free-riders to undermine or even destroy the benefits of communally conscious actions.” Moreover, when a commons is unregulated, the competitive fear that others will be the first to cheat has a tendency to override any intuitive sense to restrain from polluting, and free-riding strategy becomes more justified. In a Prisoner’s Dilemma situation restraint does not occur “for fear that others will benefit by maximizing their own self-interest.

150. The Prisoner’s Dilemma as described above is presented in extensive game theory literature. See ROBERT AXELROD, THE EVOLUTION OF COOPERATION (1984). Game theorists often contend that in the fundamental public goods/collective action paradox (i.e., a tragedy of the commons situation like global climate change) consists of “individuals acting rationally in pursuit of their own interests will produce an undesired collective outcome” resulting in a Prisoner’s Dilemma decisional game. David B. Spence, Paradox Lost: Logic, Morality, and the Foundations of Environmental Law in the 21st Century, 20 COLUM. J. ENVTL. L. 145, 147 (1995). The Prisoner’s Dilemma game occurs when two co-defendants face the quandary of whether to confess and incriminate each other. Both prisoners are better off if they both refuse to confess (mutual cooperation with each other) because the authorities will have less evidence, and they both will receive a lesser sentence for a less egregious offense (optimum consequence). However, if one prisoner confesses and the other does not, the prosecution can use the confessor’s admission against the co-defendant (who will receive the maximum sentence) and the confessor will obtain a lesser sentence, if the co-defendant does not confess. If both co-defendants confess (mutual defection), they will receive severe, but not maximum sentences. Both prisoners will use the same reasoning. They want “the lighter sentence, but logic seems to condemn [them] to serving twice as long in prison.” Wayne Eastman, How Coasean Bargaining Entails a Prisoners’ Dilemma, 72 NOTRE DAME L. REV. 89, 92 (1996). Rational choice theorists have applied game theory to many fields such as economics and international relations. See DREW FUNDENERG & JEAN TIROLE, GAME THEORY (1991) (applying game theory to economic problems).


152. Id. at 203.

This creates a suboptimal ('Nash') equilibrium: a strategy that none find ideal but that each fears another will choose. Notably, multi-player Prisoner’s Dilemma models rarely lead to improved outcomes over two-player models. Rather, game theorists contend that the choice to defect still dominates strategy. Even though the universal multi-player payoff for cooperation proves to be the superior choice over defection, it is hard to achieve. Additionally, non-universal multi-party defection and cooperation payoffs increase with the number of players. In a multi-player Prisoner’s Dilemma game, achieving mutual cooperation from a critical number of major GHG emitters—players—may be frustrated by the problems of conflicting science and economic models and inability to identify the required number of players. Even if the number is identified, reaching that number requires “advertent coordination or coalition building.”

Aside from strategy issues in multilateral negotiations, coalition building often involves several types of key participants. Multilateral negotiations addressing trade, arms control, and environmental agreements all involve a coalition building process among states, non-state players, and international organizations. Ordinarily, coalition building participants include: 1) experts defining pre-negotiation possibilities and a negotiating agenda, 2) smaller, less powerful state coalitions sustaining negotiation momentum and contributing to devising bridging solutions when more powerful states deadlock, and

154. When there are two or more players, a “Nash equilibrium requires that each player’s strategy be a payoff-maximizing response to the strategies that he forecasts that his opponents will use, and further that each player’s forecast be correct.” Drew Fundenerg & Jean Tirole, Game Theory XIX (1995) (citing John F. Nash, Equilibrium Points in N-Person Games, 36 Proceedings of the National Academy of Sciences 48-9 (1950)).

155. Id., supra note 153, at 170.


157. Id.

158. Id.

159. Id.

160. Id. at 814–15.

161. Id. at 814–15. “It is important that the game permits enforceable agreements to cooperate to ensure the payoff from defection is not likely to be so tempting as to preclude even a critical mass of players to cooperate in the one-shot game.” Id. at 815.

3) international agency officials forming strategic alliances with national bureaucratic counterparts to move negotiations forward.\textsuperscript{163}

3. North-South Division

During negotiations, coalitions typical in multi-party discussions evolve. Pre-existing issues and party conflicts beyond the subject matter of negotiations often resurface and encumber the process when formulating an international environmental agreement. In practice, the engrained relationships between the North’s developed nations and the South’s developing nations have historically thwarted the negotiation process when addressing global, transboundary problems. Differences in economic and environmental priorities and views regarding responsibility for environmental harm have often impeded consensus. For example, North–South relations raise bitter disputes about environmental issues, “with rich and poor countries divided over how to address these issues in the context of the global economy, and over how to apportion responsibility for reversing the planet’s ecological decline.”\textsuperscript{164}

Developed nations, more than developing nations, tend to actively propose multilateral environmental agreements because, as noted above, the latter are usually preoccupied with immediate economic concerns such as alleviating domestic poverty.\textsuperscript{165} Generally speaking, Northern nations place a high priority on protecting natural resources and the global environment, while those from the South seek to address near-term concerns such as malnutrition, disease, contaminated water, and polluted air.\textsuperscript{166}

Day-to-day critical issues, including population growth, income disparities, and unreasonable exchange rates, frequently burden the attention of developing countries and limit their action in the environmental arena.\textsuperscript{167} When less-developed nations do focus on environmental issues, they tend to be such issues as providing safe drinking water, arable land, indoor air, and accommodations for rapidly growing populations.\textsuperscript{168} Nations in the South focus on short-term, basic

\textsuperscript{163} Id.

\textsuperscript{164} HILARY FRENCH, VANISHING BORDERS: PROTECTING THE PLANET IN THE AGE OF GLOBALIZATION 10 (2000).

\textsuperscript{165} Drumbl, supra note 118, at 847.


\textsuperscript{167} Id. (citing the UNITED NATIONS DEVELOPMENT PROGRAMME, HUMAN DEVELOPMENT REPORT (1996)).

\textsuperscript{168} Drumbl, supra note 118, at 847.
needs of their citizens and may be unable to participate in reducing global, transboundary environmental harms whose effects are not always readily apparent and are often only experienced in the mid to long-term. Consequently, countries from the North and South have different perceptions regarding the benefits from, and the costs of acting collectively. Developing nations may not place a high value on the benefits of curbing environmental degradation and maintaining standards set forth in multilateral agreements. Similarly, Southern nations may perceive the benefits of collective action as too far in the future and be unwilling to incur the costs of acting for delayed rewards. The South seeks to have the North assume a greater responsibility for the problems of the developing nations and wants the North to “acknowledge that there must be a change in Northern lifestyles” to achieve greater fairness in the allocation of global resources.

Developing nations also view costs differently than developed countries. Direct costs (e.g., disbursements required to enact, implement, and enforce requirements on a national level) and indirect costs (e.g., perceived adverse impact on industrial growth from environmental regulation) combine to discourage developing nations from collective action. Some developing nations are not inclined to incur the direct costs of enacting, implementing, and enforcing national requirements to curb a global threat like climate change, or the indirect costs of potential adverse impact on industrialization, especially when they perceive gains as only a distant possibility. Because they have higher short-term opportunity costs, they value future gains less. Consequently, developing nations sometimes choose not to participate in a collective action response.

The North–South dichotomy also includes debate over whether monetary funding to implement international environmental agreements “will be added to the developmental assistance that is already provided to the South (‘additionality’), and what, if any, strings the North will attach

169. Id. at 852–53.
170. See GARDNER supra note 138. In negotiations during the 1992 United Nations Conference on Environment and Development (Rio Earth Summit), a group of developing countries initially blamed the industrialized nations for poverty and environmental degradation and wanted part of the North’s wealth and technology without assuming any commitments. Id. The industrialized nations saw global benefits exceeding the costs to act collectively at the Earth Summit. Id.
171. See LAWRENCE E. SUSSKIND, ENVIRONMENTAL DIPLOMACY: NEGOTIATING MORE EFFECTIVE GLOBAL AGREEMENTS 121 (1994).
172. Drumbl, supra note 118, at 848.
173. See SUSSKIND, supra note 171.
to these funds (‘conditionality’).” Disagreement arises regarding the meaning and direction of economic development, with the North asserting that environmental responses can be achieved within the present economic development framework and the South contending that its current environmental and national problems result from the dominant paradigm of economic development that the North has long benefited from.

Developed nations perceive the benefits and costs of acting differently than developing countries. Collective action addressing a transboundary harm includes bearable costs for a greater, global good. As reflected at the Rio Earth Summit negotiations in 1992, industrialized nations view acting collectively as raising the South’s environmental standards. Raising those standards in the long-run can resolve global, transboundary problems, level the international trade playing field for developed nations’ firms already subject to strict environmental regulation, and create a developing world market for “clean technologies and environmental goods and services.” Furthermore, the North generally refuses to agree to the South’s demand that the North assume a greater responsibility for the problems of developing nations or to force changes to the standard of living of Northern citizens to achieve a greater fairness in allocating global resources.

Group factors such as the North–South division impede agreement in multi-party negotiations. However, parties may employ specific tools to overcome this potential obstacle to consensus. Parties at the Montreal Protocol negotiating table overcame the North–South division by including the common but differentiated responsibility principle—that is, all parties are required to act (common), but developed nations incur more obligations (differentiated). While this principle may create

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174. Id. at 18.
175. Id. at 19 (citing THIJS DE LA COURT, BEYOND BRUNDTLAND (1990) (describing the Third World’s response to the BRUNDTLAND REPORT, THE REPORT OF THE UNITED NATIONS WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT.))
177. Id.
178. SUSSKIND, supra note 171, at 21.
179. For example, in negotiating the 1987 Montreal Protocol on Substances That Deplete the Ozone Layer, developing nation participation was vital because increased use of chlorofluorocarbons (CFC) in the South (especially China and India) could have negated the participating nations’ emissions reductions. Bryner, supra note 166, at 5.
levels followed by a fifty percent reduction in ten years for industrialized countries. 1987
[hereinafter Montreal Protocol]; Bruce Ledewitz & Robert D. Taylor, Law and the

181. See discussion infra Part IV (describing how this international environmental
law principle, without a clear definition, may adversely impact collective action).

182. Thoms, supra note 180, at 811–12. These equity-based provisions ensured
developing nation participation (especially for major CFC users such as China, India, and
Brazil) in the agreement. Id. at 812. As Thoms points out, the common but differentiated
responsibility principle also exists in the climate change regime, but those provisions
have not convinced the United States and developing nations to participate in the climate
change collective action. Id. at 822. Following the Montreal Protocol, the 1992 Rio Earth
Summit was predicted to be “the ‘great shout-out in the eco-corral[,]’ a North-South
confrontation that would rival in intensity the East-West confrontation of the Cold War
era.” GARDNER supra note 138, at 7. This prediction proved partially correct, but the lines
drawn were more complicated than a clear North-South boundary. Id. The Group of 77
(developing countries), (see Lavanya Rajamani, Re-negotiating Kyoto: A Review of the
Sixth Conference of Parties to the Framework Convention on Climate Change, 2000
COLO. J' INT’L ENVTL. L. & POL’Y 201, n.71) initially sought to blame the North’s
industrialized nations for poverty and environmental degradation and wanted only to
share in the North’s wealth and technology without assuming responsibility for future
commitments. GARDNER supra note 139, at 7. The industrialized nations saw global
benefits exceeding the costs to act collectively at the Earth Summit. In part, developing
countries compromised and established the Rio Declaration on Environment and
Development, Agenda 21 (comprehensive sustainable development action plan for
governments) and statement of forest management principles, due to the lack of support
from the Soviet-communist bloc which previously assisted them in negotiations. Id. See
[hereinafter Rio Declaration].
each other are more likely to be sympathetic with each other and ultimately be more likely to compromise to reach consensus.

IV. PRINCIPLES AFFECTING COLLECTIVE ACTION

Even if all parties transcended self-interest to overcome the global commons problems, disagreements involving distribution of responsibilities in responding to climate change would hinder achieving consensus. Several well-established principles of international environmental law which establish some guidelines regarding responsibilities may influence, and in some cases, hinder progress toward achieving collective action addressing climate change. Specifically, as discussed and defined below, the sustainable development, the precautionary, intergenerational equity, common but differentiated responsibilities, and the polluter pays principles all impact progress. Due to their broad, unclear definitions, commitments to these general principles may be interpreted differently by various parties and ambiguous meanings may lead to further disputes among the parties as to when a particular action is required. This ambiguity impedes collective action because no agreement exists regarding what these terms actually mean, and parties might consider these to be commitments of legal consequence.

General principles are guidelines that may represent unspecific obligations and fail to delineate precisely which actions parties are committed to take or when particular actions must occur. Nevertheless, as will be discussed, some parties argue these statements represent promises or implied commitments. Others may contend that these principles are purely hortatory statements carrying no obligations. Regardless, parties that fail to fulfill these collective action promises or commitments do not face formalized, legally binding consequences because of the lack of corresponding enforceable compliance provisions.

A. Sustainable Development and the Precautionary Principle

Parties responding to climate change may find the sustainable development principle a complication in reaching a consensus on climate change action. For example, in 1987, the World Commission on Environment and Development ("Brundtland Commission") urged nations to support sustainable development by meeting "the needs of the present without compromising the ability of future generations to meet
their own needs." Those using this term initially sought to tie economic progress with environmental stewardship and integrate the two in policy choices and business dealings. Nonetheless, critics argue that the term has become "devoid of content," and the public has no concept as to what the promise of "sustainable development" entails.

By 1992, the UNFCC incorporated sustainable development in Articles 3 and 4. Article 3 states, "[t]he [p]arties have a right to, and should, promote sustainable development." Article 4 further requires the parties to:

[p]romote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all GHGs not controlled by the Montreal Protocol [on Substances That Deplete the Ozone Layer], including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems.

Despite the parties' initial hopefulness in establishing sustainable development as a standard, today the concept has morphed into a "soft" goal without a specific definition. Parties have merely created a term which initially reflected a commendable focus, but has evolved into lofty rhetoric. Use of the term sustainable development allows developing countries to argue that developed nations have impliedly promised not to compromise their future generations from the ability to meet their future resource requirements. With such an existing commitment, some nations assert that parties must participate in a global climate change response regardless of potential adverse impacts to their own country. However, under the generally accepted current meaning of the term, parties agreeing to sustainable development are committing to a broad goal rather than crafting a concrete, focused objective which will translate into specific actions to curb the threat of global warming, sea level rise, more severe storms, or other clear, adverse environmental impacts.


185. *Id.*

186. UNFCCC, supra note 20, at 854.

187. *Id.* at 855.

188. See Esty, supra note 184, at 74–75 (stating that, "for all its laudable goals and initial fanfare, sustainable development has become a buzzword largely devoid of content.")
In addition to sustainable development, in some agreements, parties have included another broad, difficult to define concept—the precautionary principle.\footnote{As some authors note, many versions of the precautionary principle exist and “often with cognate phrasing, as to belie the pretensions of the definite article.” Christopher D. Stone, \textit{Is there a Precautionary Principle?}, 31 ELR 10790 (2001) (internal footnote omitted). \textit{See also}, Cass R. Sunstein, \textit{Preferences and Rational Choice: New Perspectives and Legal Implications: Beyond the Precautionary Principle}, 151 U. PA. L. REV. 1003 (2003); Jonathan B. Weiner, \textit{Whose Precaution After All?: A Comment on the Comparison and Evolution of Risk Regulatory Systems}, 13 DUKE J. COMP. & INT'L L. 207 (2003).} This principle as set forth in the Rio Declaration (Principle 15) and UNFCCC (Article 3) can frustrate consensus.\footnote{In Rio, the parties agreed that, “to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.” Rio Declaration, \textit{supra} note 182, at 879.} The UNFCCC states, “[t]he [p]arties should take precautionary measures to anticipate, prevent or minimize the cause of climate change and mitigate its adverse effects.”\footnote{UNFCCC, \textit{supra} note 20, at 854 (emphasis added).} Essentially, when dealing with the climate change issue, nations are encouraged to act “to ensure that the loading capacity of the environment is not exhausted, and . . . action even if risks are not yet certain.”\footnote{Gregory D. Fullem, Comment, \textit{The Precautionary Principle: Environmental Protection in the Face of Scientific Uncertainty}, 31 WILLIAMETTE L. REV. 495, 498 (1995).}

The precautionary principle encourages action without waiting for firm climate change science regarding causes and abatement effects. However, various parties have different visions as to what action is required and when. In the climate change arena, without solid scientific evidence that a problem actually exists, the precautionary principle seems to highlight the notion that action is premature.\footnote{Some commentators criticize the precautionary rule as an “uncertain decision rule.” \textit{See} Frank B. Cross, \textit{Paradoxical Perils of the Precautionary Principle}, 53 WASH. & LEE L. REV. 851, 859 (1996).}

The underlying agreement that nations “should” take anticipatory preventive or precautionary measures to mitigate climate change effects reflects an undefined principle subject to controversy. The precautionary principle allows parties to argue that nations have impliedly committed to act regardless of the scientific basis or estimated costs. Some emitters, however, may oppose action because it entails imposing costs for safeguards without clear evidence of negative environmental impacts. Those opposing action assert that uncertain science does not demand this
“artificial decision rule,” but rather “policymakers should confront the scientific uncertainty and act prudently in accord with the best possible scientific understanding”—acting with precaution, but considering and compensating for the attendant risks.\textsuperscript{194} This is not to say that nations will require \textit{complete} scientific evidence prior to action, but controversy exists regarding how much action, if any, should be taken in light of the current knowledge and all there is to learn about the costs and the science.\textsuperscript{195}

\textbf{B. Intergenerational Equity}

The theory of \textit{intergenerational equity} and the ensuing obligation also raises issues when seeking a global consensus. The Hague parties, in their 1989 Declaration, agreed that problems of “planet-wide” scope require global-level solutions and remedies that involve “the fundamental duty to preserve the ecosystem... and the consequent duty of the community of nations vis-a-vis present and future generations to do all that can be done to preserve the quality of the atmosphere.”\textsuperscript{196} In the 1993 Rio Declaration, the parties also agreed that “[t]he right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.”\textsuperscript{197}

It is not surprising to see nations and policymakers generally commit to protect the environment and agree to limit development to benefit future generations. However, despite the general notion of intergenerational equity, when deciding how to actually implement solutions to address climate change, parties often find excuses based on the uncertainties discussed supra, in Part III.B. Most often the excuse for inaction relies upon the uncertainty of science.\textsuperscript{198} A lack of universal definition of intergenerational equity provides little guidance on how to meet general obligations.

The undefined theory of intergenerational equity results in a lack of agreement on burden sharing. Developing nations assert that the phrase “equitably meet developmental and environmental needs of \textit{present} and future generations”\textsuperscript{199} reflects a commitment that developed nations bear the costs of collective action because equity to present generations calls

\textsuperscript{194} \textit{Id.} at 862.
\textsuperscript{195} Stone, \textit{supra} note 189 (footnote omitted).
\textsuperscript{196} The Hague Declaration, \textit{supra} note 17, at 1309.
\textsuperscript{197} Rio Declaration, \textit{supra} note 182, at 877.
\textsuperscript{198} See discussion \textit{supra} Part III.B (discussing scientific uncertainty and the intergenerational threat).
\textsuperscript{199} Rio Declaration, \textit{supra} note 182, at 877 (emphasis added).
for them to bear the burden. Developing nations also contend that when responding to climate change, industrialized nations have committed to intergenerational equity, and thereby have agreed that they owe future generations and must consider responding as part of their duty derived from their commitments in the Hague and Rio Declarations. Again, this international environmental law principle causes controversy regarding when a “fundamental duty” to act is triggered and what the Hague Declaration meant by “all that can be done.”

C. Common But Differentiated Responsibilities and Polluter Pays

Another ambiguous equity principle that may hinder consensus among the climate change parties is the principle of common but differentiated responsibilities. The Rio Declaration, Principle 7,200 and UNFCCC, Article 3, state: “[i]n view of the different contributions to global environmental degradation, States have common but differentiated responsibilities.”201 The UNFCCC further encourages the parties to:

protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities . . . . the developed [nations] should take the lead in combating climate change and the adverse effects thereof.202

The common but differentiated commitment implies that everyone should act (common) but developed nations should incur more obligations (differentiated). Questions arise regarding whether differentiated responsibility merely entails a greater, more rapid response, or rather different financial obligations for developed nations. Moreover, developing nations may assert that all major GHG-emitting nations have a duty to protect against climate change and a greater responsibility to take preventative or corrective action because they caused more environmental degradation and benefited from past pollution, yet currently possess technological and financial advantages to address the problem.

While agreeing that developing and developed nations should have different responsibilities, some nations, such as the United States, assert

200. Principle 7 seems to place more responsibility on developed nations by further stating that, “developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.” Rio Declaration, supra note 182, at 877.
201. Id.
that major-emitters, despite their status as developing nations, must be required to commit to reductions and that without their formal commitment, a global response cannot succeed. The United States argues that a global response like the Kyoto Protocol, which exempts countries such as China and India (major GHG emitters causing environmental degradation), will be inadequate. This argument is consistent with the polluter pays principle, a prevailing theme of domestic environmental laws. This principle suggests that polluters should bear the proportionate economic costs of polluting, regardless of their overall state of development.

Common but differentiated responsibilities coupled with the theory that polluters should pay results in varying goals when crafting a global response to climate change. All of the parties have a common duty to respond, but should bear different responsibilities in responding to pollution. Additionally, under these theories, developed nations should take responsibility for past pollution, while developing nations should not be held responsible for past environmental degradation. In the climate change context, however, the difficulty arises where many emitters may not feel compelled to respond at all. Common but differentiated responsibilities can imply that developed nations should commit to abatement and mitigation actions and pay for pollution even if unaddressed climate change may positively impact their economies. As discussed earlier, some parties will actually benefit from the effects of their GHG emissions and global climate change. For example, countries, “such as Canada and Russia, might experience no benefits from emissions control, since they actually stand to gain from global climate change (due to the effects of increased temperatures and precipitation on agricultural production).”

In summary, preexisting international environmental law principles help explain the source of failure in achieving global agreement and are lauded as justifications for differing views regarding when responsibilities are triggered and what actions are included in those undefined responsibilities. Rather than providing workable guidelines, they interject uncertainty and contention as some parties may argue these general principles represent duties to act and that commitments arising

203. See President Bush Discusses Climate Change, supra note 38.

204. This principle has also been written into many international environmental agreements. For example, the Rio Declaration states that, “[n]ational authorities should endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.” Rio Declaration, supra note 182, at 879.

205. Stavins, supra note 53, at 298.
from these principles should have legal consequence. Without understanding the full ramifications of ambiguity or demanding clarity, parties have agreed to abide by these general principles of international environmental law by signing agreements such as the Rio Declaration and the UNFCCC. Ultimately, successful global action will depend upon nations’ successes in reaching definitional agreement rather than in crafting theoretical justifications for continued inaction.

V. POSSIBLE SOLUTIONS

The world should directly address the weaknesses and problems involved in a collective response to climate change to better respond to the threat. As this article has discussed, economic interests of industry and individual citizens interfere with achieving an adequate collective response to climate change. Additionally, climate change parties must deal with perceived or actual uncertainties in climate change science and economic impacts. Threat assessments may or may not be accurate and parties hesitate to act due to a perception that the climate change threat assessment is inadequate. Distribution, timing, and magnitude of climate change impacts are uncertain, and states may not experience the benefits of their emission reductions until some time in the distant future, if at all. Further complicating public support for agreement, climate change impacts are not readily apparent. Despite sporadic, catastrophic weather incidents such as Hurricane Katrina, climate change impacts remain virtually invisible to the public. In the climate change context, the hope of better technology gives parties a reason to delay collective action because it provides the promise of a more accurate threat assessment, possible solutions, and the opportunity to adapt to the threat. It is clear that some uncertainties and discrepancies will remain inherent in the global climate change debate. Regardless, their status as obstacles must be understood and overcome if agreement is to be achieved.

A. Parties Must Agree Urgency Requires Collective Action

The public is victim to special interests who highlight uncertainties and difficult-to-understand science in order to delay collective action. Disagreement regarding how and when to respond to the threat of global climate change permeates the writings on this global issue. Critics

assert that appropriate emissions levels necessary to stabilize atmospheric concentrations of GHGs and avert adverse impacts to economies and ecosystems are unknown. Some parties, such as the United States, argue that emissions abatement without a commitment from all major-emitters is an inadequate response. Industry and some business NGOs contend that a response is not yet necessary because parties do not agree on climate change effects, timing, or magnitude and that future technological improvements represent a reason to delay action.

To overcome these obstacles, world political leaders should admit an urgent response is required and move to respond. As a first step, the United States, the world’s leading emitting nation, could admit that climate change is a global, transboundary issue requiring an urgent response. The President could send this message with an executive order describing the issue as urgent rather than fraught with uncertainties. With a definitive role model, other major-emitting nations that are not currently obligated under the Protocol—namely, China and India—may be enticed to follow the United States’ lead. Collective action that includes the pivotal parties could result.

B. Improve Information by Requiring Data from Major-Emitting Nations

Parties should also obtain additional and more accurate information to encourage the consensus process. As previously discussed, China and India are not subject to the Protocol’s provisions requiring National Greenhouse Gas Inventories. Therefore, they need not submit data concerning annual emissions and sink removal. Instead, non-Annex I countries are merely required to provide national communications describing how they are complying with the Convention and Protocol goals. This lack of data leaves significant gaps in the overall understanding of the climate problem. Without this data the assessment of the threat is incomplete and concerned parties may be unable to make a vivid enough case for action. This global, transboundary issue requires as much accurate data as possible. As a result, all parties should be required to provide this much-needed information so that the group may better assess emissions limitations. Parties will be better equipped to collectively develop an appropriate mitigation or abatement response with appropriate data, and the act of providing such data alone may cause

207. Jacoby et al., supra note 112, at 3.
reflection and an opportunity for major-emitters to reexamine their domestic policies.

**C. Changing Incentives to Play**

Climate change involves a long-term problem for individuals and their governments, while action involves individuals who must commit and possibly sacrifice potential gains. Any global climate change response requires specific individuals to change their behaviors.\(^{208}\) To induce changed behavior, individual actors must be provided with incentives to play—to take part in emissions reduction efforts. Incurring individual costs now for future benefit involves choosing to relinquish individual gains for the greater societal good. Individuals must be willing to invest in an insurance policy—in the form of a response—that hedges uncertain risks and impacts that may occur sometime in the future\(^{209}\) and may not affect them at all. An impetus for action may arise where people feel a responsibility or “owe it their children” to act now for the benefit of future generations.\(^{210}\) Individuals should realize their power as consumers and constituents and their corresponding ability to influence industry and governments to act and initiate change. Individuals must act to respond to climate change at the micro level in addition to any macro efforts by national governments. To promote micro, grassroots level change, individual actors must be provided with incentives to take part in emissions reduction efforts. Providing economic incentives to individual consumers is vital. One possibility is subsidizing or granting tax credits for the use or development of green energy. It is well established that if green energy options become cheaper than “dirty energy derived from fossil fuels,” worldwide reductions in emissions are more likely to occur.\(^{211}\)

By giving end consumers direct incentives to play, governments can influence fossil fuel burning corporations to act. Opposition from businesses remains a major obstacle to climate change collective action. Under proposed emissions reduction schemes, corporations fear a loss of economic competitiveness and may have the perception that confronting and combating climate change may adversely impact industry growth and profits. To achieve a consensus among industry, gain the support of developing countries, and end the use of science and economic computer

\(^{208}\) Cooper, *supra* note 116, at 66.

\(^{209}\) Petersen interview, *supra* note 114.

\(^{210}\) *Id.*

modeling problems as excuses for inaction, the collective power of individual constituents may be tapped to move markets, industry, and nations. If individual consumers are motivated to demand corporate action and vote with their feet or otherwise boycott polluters, corporations may have no choice but to take measures to reduce emissions.\textsuperscript{212}

If consumers choose less expensive or cost-effective “green” alternatives (e.g., hybrid cars), then industry will be encouraged to increase technological advancements and produce new items for consumers to meet changed market demands.\textsuperscript{213} An impediment to green alternatives may be the perceived inconvenience for both industry and individuals because adapting to reduced emissions may represent a significant change in lifestyle or business practices. Industry will likely incur capital costs to develop new low-emissions products, vary production methods, or convert infrastructure to meet changed consumer demand. Industry hesitates to act because growth, productivity, competitiveness, and shareholder assets may be adversely impacted if companies modify how they do business in advance of changing consumer demands. It remains uncertain whether consumers will broadly choose to incur an increased price for green products. Only a critical mass of consumers choosing green companies will nudge the business sector to change and in doing so, reduce emissions. In theory, it is clear that the micro level can move the macro level with consumer pressure.\textsuperscript{214}

Conversely, the macro level can also move the micro level. Strong political leadership can generate grassroots interest and support for cultural change. Persuasive, popular politicians supporting action can lead by example and convince the public that they have a moral obligation to sacrifice now for future generations. In any event, a response to climate change requires the leading emitter, the United States, to set an example in responding. Foreign citizens may be persuaded to support collective action and incur individual costs if a powerful, persuasive global power leads the charge to combat climate change. Public sentiment is malleable and subject to suggestion and direction by global leaders. History supports this notion and strong American presidents have successfully persuaded Congress and the public to resolve other global, transboundary issues.\textsuperscript{215}


\textsuperscript{213} Topping, supra note 211.

\textsuperscript{214} See DORNBUSCH, supra note 212.

\textsuperscript{215} For example, the parties working to resolve the problem of nuclear arms had the benefit of individual political leaders in the forefront driving global consensus. They
D. Focus Objectives and Limit the Scope of the Threat

A global, collective response may best be accomplished in stages by limiting the number of parties at the table and limiting the parameters of the negotiations by addressing workable issues or pieces of the threat. Rather than developing a response which addresses overall emissions allocation, the parties should address smaller issues. As John Topping, President of the Climate Institute suggests, climate change parties may want to address different industry sectors that produce significant emissions. For example, key players could first seek agreements limited to the transportation sector and vehicle emissions, while other players could negotiate agreements regarding the energy sector.216 These eclectic party discussions could provide an opportunity to focus on segmented issues and create a forum where the necessary expertise of the parties most at risk could address individual emission sources and custom tailor solutions. This approach is likely to be more successful in reaching agreement because smaller groups, addressing a limited threat, generally have a more focused agenda with fewer individual priorities.

E. Addressing Background Factors

To overcome the uncertainties of climate change science and the economics involved, the world, and perhaps most notably the United States, must first admit a response cannot wait. Uncertainty causes a failure to achieve a universal, coherent public policy agenda. As Richard Benedick pointed out when assessing the Montreal Protocol, the world must take “internationally coordinated actions based on realistic and responsible assessments of risk.”217 A collaboration of scientists and government officials is essential, as well as the public dissemination of scientific findings in understandable terms.218 Simply stated, international parties must accept the fact that climate change is a problem for all of humanity and will remain so for the foreseeable future.

had the advantage and influence of presidential leaders at the helm of the negotiations. See GEORGE BUNN, ARMS CONTROL BY COMMITTEE: MANAGING NEGOTIATIONS WITH THE RUSSIANS 7 (1992). With nuclear arms control, powerful leaders guided global action which culminated in the Reykjavik Summit in 1986, “the true watershed of modern arms control” when the Soviet Union General Secretary Mikhail Gorbachev and U.S. President Reagan essentially negotiated to end the Cold War. THOMAS GRAHAM, JR. DISARMAMENT SKETCHES: THREE DECADES OF ARMS CONTROL AND INTERNATIONAL LAW 124 (2002).

216. Topping, supra note 211.
217. BENEDICK, supra note 180, at 2.
218. Id.
The parties can overcome an incomplete threat assessment by dividing the threat, or scoping it, into manageable sub-issues. Major-emitting nations, both developed and developing, must take the lead to generate an adequate response. Without the major players willing to commit to emissions limitations, the response will not adequately address the transboundary threat of climate change. If the most powerful major-emitting nations—the United States, Russia, and China—lead the way in admitting an urgent response is necessary, other countries are likely to follow. If major-emitter leadership emerges, countries such as Canada and Australia will no longer worry about economic advantages that non-participants enjoy as a result of uncapped domestic emissions.

**F. Use Dynamic Obligations to Overcome Uncertainty**

With fewer nations participating and more major-emitting parties at the negotiating table addressing focused objectives and limited sub-issues to the overall threat, the world can better attack the bigger threat of climate change. Additionally, climate change parties should develop agreements that include flexible obligations. For example, nuclear arms control agreements—another global, transboundary issue requiring collective action—including dynamic international obligations or evolving commitments that adapted to uncertain or unpredictable circumstances, such as scientific, economic, or technological changes.  

Climate change agreements should be similarly flexible. Parties could structure obligation provisions that authorize consensual changes. To overcome party fears of being locked into unattainable obligations, agreements could require parties to reassess emissions limitations or other obligations after IPCC scientific assessments are published. Specific provisions could allow parties to request a review of their obligations based on a scientific or economic climate change report.

Dynamic provisions could also ease a party’s perception and concerns regarding economic or scientific uncertainty. Parties could commit to an agreement, but maintain an opportunity to subsequently revisit their obligations, commitments, or limitations based upon changing information or conditions. As science develops to modify previous predictions of climate change impacts, establish a better threat assessment, provide a clearer understanding of complex environmental interactions, or enable innovative technologically solutions, parties could revisit the obligation provisions. As a result of a flexible mechanism,

parties may better perceive gains from cooperation and collective action if agreements account for emerging knowledge on threat magnitudes, risk levels, and appropriate strategies.\footnote{220} Additionally, developing country status should be reviewed annually to determine whether emissions have reached a threshold and require a nation to be within the obligatory provisions of the agreement.

\textit{G. Pivotal Parties, Piecemeal Responses}

Climate change collective action depends on bilateral and multilateral international negotiation and agreement. International cooperation depends on: 1) voluntary cooperation between parties to freely join or withdraw from cooperative arrangements, 2) specification of a common goal or compatible goals on which to focus joint efforts, and 3) commitment by states to engage with each other on a long-term basis.\footnote{221}

Instead of seeking global agreement, parties could develop limited responses—in some cases regional agreements—to address the most polluting industry sectors or build on earlier party discussions. Parties could then establish legally-binding consequences for noncompliance. Since global negotiation efforts, with over 180 participants, have so far failed to reduce global emissions, a new approach is warranted. First, several pivotal emitters must be identified and included, since “[f]or the purpose of fashioning a response to global environmental issues, certain countries are unequivocally more important than others.”\footnote{222} Specifically:

\begin{quote}
no solution to the problem of climate change can be achieved . . . without the cooperation of China and India. Because the growth in emissions rather than the current level of [GHGs] will likely spur climatic changes, the policy challenge can be viewed as a matter of controlling emissions from the developing world where most of the growth is occurring.\footnote{223}
\end{quote}

\footnote{220. See id. at 1557.}
\footnote{221. Peter Van Ham, Managing Non-Proliferation Regimes in the 1990s: Power, Politics and Policies 34 (1994).}
\footnote{223. Id. The status of “pivotal” or necessary depends on demographic heft, special resource endowments, or rogue behavior adversely affecting the environment. Id. at 306. One example of a special resource endowment is the Brazilian rain forests either because it acts as a sink for carbon dioxide or source of emissions due to deforestation. Id.}
Secondly, to overcome the drawbacks of divergent national views and agendas, climate change parties should decrease the negotiating group size. The overwhelming amount of players should be pared to pivotal nations to reduce free-rider and other equity issues. The parties must understand that just because emissions cross national borders and have global, transboundary effects, not all nations need to be at the negotiating table. By transitioning from near universal participation to include only major-emitters and those with special resource issues—for example Brazil and its massive Amazonian carbon sink—the world may eliminate numerous national agendas and many of the free-rider complaints. As part of the new paradigm, major-emitters should participate regardless of whether they are developing nations. Pivotal players should be limited to the top seven emitters—the United States, China, Russia, India, Japan, Germany, and the United Kingdom.

Negotiating groups should also include the leaders of corporate and financial sectors that contribute to or will be significantly affected by the climate change threat. To resolve sub-issues, the initial discussions of the smaller groups should strive to include diverse experts with various skill sets and varying levels of influence. For example, major-emitting nations, nations leading the car industry, and corporate and financial leaders could meet to address the "transportation sector" of the climate change threat. Therefore, any sub-issue group would be limited to pivotal states plus pivotal non-governmental stakeholders. Once sub-issues are resolved, the major-emitters could develop formal agreements setting forth legally-binding obligations.

H. Piecemeal Responses, Linear Approach

Once the parties develop negotiation parameters and identify manageable climate change sub-issues, they should also respond using agreements that build on the provisions of previous agreements. Discussions often lead to sequential or linear agreements, with earlier treaties including provisions to address and enable subsequent agreements along the same vein. With ongoing dialogue, piecemeal goals, and focused objectives, sequential agreements may establish guidelines and groundwork for future agreements.

Sequential agreements also allow parties to augment and strengthen established regimes, commitments, and overall goals over time. Although the Convention and Kyoto Protocol did fall in sequence, the

224. Topping, supra note 211.
225. Id.
overall regime is comprised of broad principles and emissions capping, rather than addressing smaller issues or sectors as a means of chipping away at the climate change problem. As a general rule, if a threat proves too overwhelming and involves too many controversial issues for global action, parties should consider using several related agreements to fulfill goals. Each discussion should build on the previous ones, and the consensus process will improve the likelihood of success for agreements that follow.  

I. Develop Regional Agreements

The sequential agreement approach to a global threat may prove successful because bilateral agreements can lead to comprehensive achievements. As discussed, limiting participants and focusing on specific, smaller objectives at the negotiation table encourages cooperation. Regional agreements with climate change parties can address more limited goals and sub-issues of the threat. The parties at the climate change negotiating table could develop greater incentives to cooperate by responding to limited issues with regional agreements. They could better use trade and economic bargaining approaches, especially with the transportation sector, and better promote the effectiveness of treaties, while simultaneously addressing the sub-issues of climate change.

In the area of global climate change, the Kyoto Protocol reflects large-scale global action and participation. This methodology supports the assertion that climate change is a “second generation” environmental problem that the international community recognized in the 1980s, and would best be resolved by concentrated, international action with multilateral treaties. Similarly, the United States supports a “bilateral

226. Nuclear arms control agreements such as the SALT and Treaty on the Reduction and Limitation of Strategic Offensive Arms (START) reflect a “linear” approach, containing “look-ahead” provisions addressing the parties’ future iterations or future forms of the same agreement. John K. Setear, An Iterative Perspective on Treaties: A Synthesis of International Relations Theory and International Law, 37 HARV. INT’L L.J. 139, 224 (1996). For example, the Interim Agreement on Offensive Arms (SALT I), Article VII, states that the obligations “shall not prejudice the scope or terms of the limitations on strategic offensive arms which may be worked out in the course of further negotiations.” Id. at 225.

227. Andronico O. Adede, Statement, The ‘Rio’ Environmental Treaties Colloquium: The Treaty System from Stockholm (1972) to Rio de Janeiro (1992), 13 PACE ENVTL. L. REV. 33, 34 (1995). In this statement, the Deputy Director, Codification Division, Office of Legal Affairs, United Nations, indicates that since the Stockholm Conference a “new breed” of treaties (dealing with “second generation” environmental problems) has developed that “is strongly influenced by sustainable development.” Id. at
response" as the better framework and strategy.  

To maximize the chances of reducing global GHG levels, climate change parties should develop regional agreements regarding the building of major-emitting industrial plants. Under this scheme, regional parties could provide input and be put on notice about projected emissions due to industry growth. Nations in a region would be in a strategic position to encourage their neighbors to limit their emissions. Countries in the same geographic region or along a common coastal zone will tend to face similar risks and impacts and could encourage each other to reduce or limit emissions. In some cases, unratified agreements may even be successful in promoting change. For example, in 2005, the "coal pact" countries, including the United States, China, Australia, Japan, India, and South Korea, through the Asia Pacific Partnership on Clean Development and Climate, agreed to promote technologies to reduce carbon dioxide emissions in coal and implement cleaner burning.

VI. CONCLUSION

Although agreements to address global commons dilemmas seem to call for "global" party participation and demand multilateral agreements, "pivotal" state agreements may suffice to resolve some global

38 (footnote omitted) (citing to the Framework Convention on Climate Change, calling for sustainable development, as an example). Id. at 38–39. See also discussion supra Part IV (discussing these international environmental collective action principles).

228. The Bush Administration supports a strategy of developing "partnerships for climate solutions," reflecting a piecemeal, bilateral response to global climate change. WHITE HOUSE CLIMATE CHANGE INITIAL REPORT, supra note 44, at Tab 5.

229. For example with nuclear arms global collective action agreements, when the parties did not formally establish agreements, participants used those agreements to guide behavior. Nuclear arms control parties fulfilled the requirements of unratified agreements such as Strategic Arms Limitation Talks (SALT) II. Despite the 1980 Soviet invasion of Afghanistan, the Senate's suspension of considering the SALT II agreements, and the successor Reagan Administration modernizing nuclear defenses, President Reagan still ensured the United States did not deploy troops exceeding SALT II limits, as long as the Soviets did so as well. Congressional Subcommittee on Arms Control, International Security & Science of the Committee on Foreign Affairs, Fundamentals of Nuclear Arms Control. Part I: Nuclear Arms Control: A Brief Historical Survey. XXIII (May 20, 1985); UNITED STATES ARMS CONTROL AND DISARMAMENT AGENCY. ARMS CONTROL AND DISARMAMENT AGREEMENTS: TEXTS AND HISTORIES OF THE NEGOTIATIONS 29 (1996).

230. WHITE HOUSE CLIMATE CHANGE INITIAL REPORT, supra note 44, at Tab 5.

231. See Esty, supra note 222, at 290–314, 304–06 (asserting that in creating global environmental issue responses certain countries or "pivotal" states "are unequivocally more important than others" depending on demographic heft, resource endowments, or
problems. Key participants may prove more important than global inclusion to achieve a successful international environmental agreement due to their unique demographics, resources, or past rogue behaviors.\(^2\)

Moreover, all global emitters are unnecessary in order for a multilateral agreement to adequately respond to climate change. Fewer negotiating parties mean fewer individual party agendas and a less tumultuous consensus process. If necessary parties participate and commit to obligations, fewer free-rider concerns are likely to arise and prevent agreement. Fewer participants involved in agreements also lead to greater incentives to cooperate because of fewer tangential disagreements. Bilateral and/or regional agreements have been shown to lead to comprehensive achievements. Parties may use regional agreements to address a global commons problem and in doing so may successfully achieve limited goals and resolve sub-issues of a global threat. Although it may initially appear that global problems require global participation, this approach may not be the most efficient and productive choice. Too many players often lead to too many agendas, interests, and priorities. Going forward, parties should consider limiting the agreement structure to multilateral agreements with pivotal states.

Matters affecting global commons problems such as background factors, group elements, and ambiguous international environmental principles should be anticipated and addressed. Parties should attempt to resolve these issues in drafting a global collective action response to climate change that includes pivotal states. In crafting such a response, it would be useful to: 1) establish agreement among all major-emitting countries that global climate change, despite some scientific uncertainties, requires an urgent response, 2) obtain complete data by requiring information from all major-emitting parties, 3) develop incentives for consumers and constituents to adhere to national commitments, 4) craft responses for climate change sub-issues for sectors like energy and transportation 5) limit the number of parties at the bargaining table to include only necessary or pivotal parties, and 6) develop piecemeal responses to resolve climate change sub-issues in sequential agreements. Adherence to these recommendations may ultimately assist parties in bringing the necessary participants, including the largest GHG emitter—the United States—to the table. If citizens and governments of major-emitting countries agree that an urgent response is needed, maybe the rest of the world will follow.

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\(^2\) Id.