

THE ROLE OF THE UNITED STATES IN ADDRESSING GLOBAL CLIMATE CHANGE: DON'T FOLLOW LEADERS, WATCH THE PARKING METERS¹

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To be able to lead others, a man must be willing to go forward alone.

~Harry Truman

I. Introduction

Climate change has been one of the most polarizing scientific and policy debates of modern history. It is also one of the most complex. The issue not only requires the gathering of paleoclimatic data back several thousands of years to a time well before man began measuring and recording temperature, but it also requires the reliable measurement of subtle differences in temperature and minute changes in carbon dioxide (CO₂) concentrations down to the parts per million.² Not to mention scientists' best estimates of solar irradiance from the sun³ which influences the Earth's atmosphere from a distance of approximately 93 million miles away.⁴ It also necessitates a thorough understanding of the absorptive capacity of carbon sinks including the Earth's vast oceans which in some ways are less understood than our solar system. Throw in the recent "climategate" scandal⁵ and some very vocal, albeit minority, opposition and it is not necessarily difficult to understand that fewer Americans now believe there is solid evidence of global warming or that it is a serious problem.⁶

However, despite waning support by the United States (U.S.) public, and these inherent uncertainties, there exists considerable international scientific consensus that the average temperature on Earth has been getting warmer over the past few decades and that it is primarily due to the emission of manmade greenhouse gases (GHG).⁷ While most agree that the extent of climate change impacts cannot be predicted with any certainty, potential impacts range from minimal to catastrophic – from a welcomed warming in some colder northern locations⁸ to radical sea level rise displacing millions of people and their homes.

In reliance on this scientific consensus, and perhaps for other less noble reasons such as political survival⁹, many law and policy makers have willingly, or maybe by force, moved beyond the science and headlong into the even more difficult challenge of how to slow, stop and ideally reverse climate change. Most international leaders agree or concede that something needs to be done. However, they cannot agree on what that “something” is. Moreover, while the science of climate change is complex, it is easily matched or surpassed by the complexity of implementing a binding GHG reduction program at the international level.

This article considers the role of the U.S. in addressing climate change at the international level. Part II discusses the characteristics of air pollution and the concept of climate change including carbon sources and sinks. Part III addresses scientific uncertainty in gathering and analyzing climate data and the potential range of impacts. Part IV reviews the scientific consensus and public opinion regarding the presence and severity of climate change. Part V discusses past domestic and international efforts to address climate change. Part VI provides recommendations for addressing the problem through the establishment of a revenue-generating market-based GHG reduction approach with common but differentiated state responsibilities, and concludes that this will require a key leadership role from the U.S. with participation by

subnational entities including nongovernmental organizations (NGO), private corporations and individual citizens.

II. The Nature of Air Pollution and the Concept of Climate Change

A. Climate, Weather and Global Warming

The term “climate change” refers to major changes in temperature, rainfall, snow or wind patterns lasting for decades or longer.¹⁰ This is in contrast to “weather” which refers to short-term variations in the atmosphere.¹¹ The term “global warming” is climate change which results in an average increase in the temperature of the atmosphere near the Earth’s surface and in the troposphere, which can contribute to changes in global climate patterns.¹² In the climate change debate, global warming often refers to the warming that results from increased emissions of GHG’s from anthropogenic sources.¹³ The terms climate change and global warming are often used interchangeably.¹⁴ However, climate change is growing in preferred use for a variety of reasons including that it helps communicate that there are many other important changes in addition to just rising temperatures.¹⁵

B. Emission Sources and the Greenhouse Effect

Global warming may result from the emission of GHG’s from both natural and anthropogenic sources. The greenhouse effect is a natural occurrence that helps regulate the temperature of the Earth.¹⁶ Shorter-wave ultraviolet radiation from the sun passes through the atmosphere and reaches the ground where much of it is absorbed and reflected back as long-wave infrared radiation. This infrared radiation is trapped in the atmosphere by clouds and

GHG's. This process is often referred to as the GHG effect because of the similar process that occurs in garden greenhouses. Without it, much of the sun's heat energy would be lost, and the Earth would become a frozen wasteland with temperatures nearing zero degrees Fahrenheit.¹⁷

GHG's are emitted from natural processes such as volcanic activity, wild fires, wetlands and marshes. Water vapor is the most abundant GHG and plays an important part of the natural greenhouse effect.¹⁸ Anthropogenic sources of GHG's include automobiles, electric power generation, and generally any other process or activity that burns fossil fuels such as coal, oil, and natural gas. The burning of biomass such as trees, vegetation and forest underbrush also re-emits GHG's into the atmosphere. However, this is sometimes considered a net sum zero increase since trees and plants are a natural sink for GHG's and their combustion merely releases the previously sequestered carbon. CO₂ is the GHG emitted in the greatest quantity by anthropogenic sources comprising approximately 82% of manmade GHG emissions.¹⁹ The goal of complete combustion has been to fully utilize the fossil fuel leaving only CO₂ and water as the byproduct. In reality, however, complete combustion is almost impossible to achieve. Nevertheless, for many years, the higher the content of CO₂ in the exhaust gas, the better. While this is still generally the case from an efficiency standpoint, CO₂ is now simultaneously seen as an unwanted byproduct with significant environmental ramifications.

Other important GHG's include methane, nitrous oxides, and fluorinated gases.²⁰ The insulating or heat trapping ability, sometimes referred to as the global warming potential, of these gases varies greatly. For example one ton of methane provides the insulating ability of approximately 21 tons of CO₂.²¹ For this reason, instead of accounting for and separately quantifying each individual GHG's contribution, scientists often refer to carbon equivalents. A

carbon equivalent means the amount of CO₂ it would take to achieve the same level of insulating capacity for the specified GHG.

C. Carbon Sinks

On the other hand, there exist various emission sinks which uptake or sequester GHG's, often for use in biological processes. Carbon sequestration is the process where agricultural and forestry practices remove CO₂ from the atmosphere.²² The term "sink" is also used to describe agricultural and forestry lands that absorb CO₂.²³ Sequestration activities can help mitigate global climate change by enhancing carbon storage in trees and soils, preserving existing tree and soil carbon, and by reducing the emission of some GHGs.²⁴ The oceans also play a vital role in naturally absorbing increased heat and removing CO₂ from the atmosphere. The ocean is thought to have an enormous capacity available to sequester CO₂ on the order of 1,000 to 10,000 gigatons in addition to the vast quantities already stored naturally.²⁵ However, accelerated or artificial sequestration can have negative impacts on the oceans including but not limited to increased acidification. In addition to the potential physical impacts, there are also a variety of legal implications associated with carbon capture and sequestration (CCS) in the ocean which must be considered prior to initiating any CCS project.²⁶

D. Regional Transport of Air Pollution

Arguably more than any other media such as soil and water, the air that surrounds us is the epitome of the global commons. In many ways it is the poster child for the transboundary movement of pollution. Unlike solids and liquids, gases know no boundaries. They are inherently apolitical and do not respect geographic or jurisdictional boundaries. Gases dissipate and continue moving at least until they seek equilibrium with the world around them, and then

long after subject to changing weather patterns. There are many examples which exemplify this characteristic such as Saharan dust from Africa contributing to algal blooms in the Florida Keys²⁷ and persistent organic pollutants (POPs) from equatorial regions which “grasshop” their way to the Arctic.²⁸ Perhaps never before has the ubiquitous phrase “what a small world” been so true as in the context of air pollution. The familiar concept of “not in my back yard” or NIMBY is rendered meaningless when that backyard is the atmosphere that we all share and breathe - which is why the atmosphere is yet another victim of the tragedy of the commons. Therefore, while in the past the “solution to pollution” might have been “dilution,” the diluent is becoming more and more concentrated.²⁹ The problem of scale is more evident as the atmosphere fills with these GHG’s and other air pollutants that the rest of the Earth can no longer quickly or easily assimilate. Science now suggests that the world may be reaching the sustainable limits of human activity.

III. Scientific Uncertainty and Data Analysis

Scientists and researchers working for both government institutions³⁰ and NGO’s around the world have been studying and gathering data related to climate change for many years now. The U.S. has taken a lead role in these efforts through organizations such as the National Aeronautics and Space Administration (NASA), National Weather Service, and the National Oceanic and Atmospheric Administration.

A. Characteristics of GHG’s

The heat trapping abilities of GHG’s such as CO₂ are not in dispute and were demonstrated more than a century ago.³¹ The ability of these GHG’s to affect the transfer of

infrared energy through the atmosphere is the scientific basis of many of NASA's Jet Propulsion Laboratory designed instruments.³² Scientists have concluded that increased concentrations of GHG's in the atmosphere must cause the Earth to warm in response.³³

B. Lack of Direct Measurements and Uncertainty

Science can be an inherently uncertain field, and scientists are often known for, and sometimes self-limited by, their precision. Identifying slight changes in temperature or CO₂ concentrations down the parts per million, and back thousands of years, carries with it inherent standards of error. Therefore, it is not surprising that scientists readily admit there are uncertainties associated with the climate change debate.³⁴ For example, there are no direct observations of solar output prior to the 1970s, and climate scientists admit they don't have much confidence that they understand longer-term solar changes.³⁵ There is a large body of data regarding past and present atmospheric conditions, although much of it is indirect.³⁶

Aerosols, dust, smoke and soot which originate from both natural and manmade sources have very different effects on climate which are still being understood.³⁷ Sulfate aerosols which are emitted from such sources as volcanic activity, and coal and biomass combustion, tend to cool the Earth.³⁸ These aerosols may offset some of the warming that would have otherwise taken place.³⁹ However, other kinds of particles often have the opposite effect. The tracking of global aerosols began only about a decade ago, and the measurements cannot reliably distinguish between types of particles.⁴⁰ Thus, aerosol forcing is another scientific uncertainty regarding future climate change predictions.⁴¹

Clouds also have a significant impact on the Earth's climate, reflecting back into space approximately one third of the total amount of sunlight that reaches the atmosphere.⁴² As the

atmosphere warms, cloud patterns may change, altering the amount of light absorbed by the Earth.⁴³ Because clouds play such a large part in the Earth's climate, even small changes in average cloud amounts, location and type could speed warming, slow it, or even reverse it.⁴⁴ The Intergovernmental Panel on Climate Change (IPCC) has consistently rated clouds as among one of its highest research priorities.⁴⁵

Natural processes are thought to remove about half of manmade CO₂ emissions from the atmosphere, although the amount varies.⁴⁶ It is unclear whether the ocean or land biotas absorb the majority of these emissions.⁴⁷ The surface of the earth is approximately 70.9% water and 29.1% land.⁴⁸ It is not well understood where the carbon goes and what is the Earth's capacity to absorb more CO₂ emissions.⁴⁹ Ocean circulation plays an important role in climate change. However, global ocean data only extends back to the early 1990s, so there remain large uncertainties in predictions of future ocean changes.⁵⁰ Global climate change models for precipitation show that it will generally increase, but not in all regions.⁵¹ These models show wide variations in their results which makes planning very difficult.⁵² The IPCC in its 2007 Fourth Assessment Report (FAR) used new satellite data to conclude that shrinkage of ice sheets may contribute to more sea level rise than previously predicted.⁵³ The IPCC concluded that it could not provide a best estimate or an upper bound for sea level rise due to lack of uncertainty regarding the Earth's ice.⁵⁴

C. Data Analysis

Despite all of these uncertainties, there exists a sufficient amount of reliable data for the majority of scientists to reach a consensus regarding climate change. The data shows that the Earth's climate responds to changes in solar output, the Earth's orbit, and in GHG levels.⁵⁵ The

data also shows that in the past, large changes in climate have happened very quickly, geologically-speaking, in tens of years as opposed to millions or even thousands.⁵⁶ All three major global surface temperature reconstructions show that the earth has warmed since 1880, with most of this warming occurring since the 1970s.⁵⁷ Even though the 2000s witnessed a solar output decline resulting in an unusually deep solar minimum in 2007 through 2009, surface temperatures continued to increase.⁵⁸ The oceans have absorbed much of this increased heat, with the top 700 meters of ocean showing warming of 0.302 degrees Fahrenheit since 1969.⁵⁹

Global sea level rose approximately 17 centimeters in the last century.⁶⁰ The rate over the last decade, however, is nearly double that of the last century.⁶¹ Ice sheets in Greenland and Antarctica have decreased in mass.⁶² Greenland lost 150-250 cubic kilometers of ice per year between 2002 and 2006.⁶³ Antarctica lost about 152 cubic kilometers over a similar time period.⁶⁴ Both the aerial extent and thickness of Arctic sea ice has rapidly declined over the last few decades.⁶⁵ Glaciers are retreating almost everywhere around the world.⁶⁶ The number of record high temperature events in the U.S. has been increasing since the 1950s.⁶⁷ At the same time, the number of record low temperature events has been decreasing.⁶⁸ The CO₂ concentrations of the oceans have been increasing since the mid-1700s increasing the acidity by approximately 30 percent.⁶⁹ Plant and animal ranges have shifted, migration patterns are changing, and trees are flowering sooner.⁷⁰ The evidence for rapid climate change is scientifically “compelling.”⁷¹

D. Impacts from Climate Change

The consequences of altering the natural atmospheric greenhouse are difficult to predict.⁷² However, certain effects appear likely. The Earth’s average temperature will get

warmer.⁷³ Scientists have high confidence that global temperatures will continue to rise due in large part to manmade GHG emissions.⁷⁴ The IPCC, which includes more than 1300 scientists from the U.S. and around the world, forecast a temperature rise of 2.5 to 10 degrees Fahrenheit over the next century.⁷⁵ Some regions may benefit from this warming while others may not.⁷⁶ Increasing temperatures will intensify the Earth's water cycle.⁷⁷ Warmer conditions will probably result in more evaporation and precipitation overall, but individual regions may vary, some becoming wetter and others dryer.⁷⁸ Warming the climate will alter the frequency and severity of extreme temperature events.⁷⁹ In general, scientists expect increases in heat waves, decreases in cold spells, and an increase in the intensity of hurricanes.⁸⁰ A stronger greenhouse effect will warm the oceans and partially melt glaciers and ice, increasing sea level.⁸¹ Ocean water will expand if it warms leading to further sea rise.⁸² Some agricultural crops and other vegetation may respond favorably to increased concentrations of CO₂, growing more vigorously and using water more efficiently.⁸³ Meanwhile, higher temperatures and shifting climate patterns may change the areas where crops grow best and affect the makeup of natural plant communities.⁸⁴ Many of these predicted impacts operate on the assumption that the relationship between atmospheric CO₂ concentrations and impacts are linear. However, this is another scientific unknown and therefore small linear increases in GHG concentrations could nevertheless potentially result in exponential impacts to the environment.

IV. Global Opinion

With nearly 7 billion people⁸⁵ spread across 265 countries, dependent areas, and other entities⁸⁶, on this “pale blue dot”⁸⁷, it is not difficult to predict that there might be widely differing opinions on the presence and severity of climate change or how to best address it. The

idea that we, as mere humans, have the ability to affect in any meaningful way an entire planetary system can be very hard to fathom. This is especially true when thought of in relation to the enormous and incomprehensible size of our solar system, galaxy or universe.

On the other hand the role of the media, coupled with the power and technology of such devices as the cellular camera phone and the internet, now allows us to observe what is happening on the other side of the world thereby significantly decreasing the perceived size of our planet. The term neighbor is constantly being redefined and distance across the globe is much less relevant. Every time there is a “natural” disaster somewhere in the world, we see it almost instantaneously or view live footage of the event shortly thereafter. The effects of climate change are generally always mentioned during such broadcasts as a potential cause or contributor to the disaster. Although a connection between climate change and natural catastrophes can probably never be proven (or disproven), it is nevertheless always considered.

A. Scientific Consensus and the IPCC

Despite the need to rely on proxy data and the many inherent uncertainties associated with climate change research, approximately 84% of scientists believe the Earth is warming as a result of human activities.⁸⁸ Furthermore, approximately 70% of scientists regard global warming as a very serious problem.⁸⁹ In the FAR, the IPCC was abundantly clear regarding its position on the existence of climate change. The FAR states that “[w]arming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level.”⁹⁰ The FAR goes on to state that eleven of the last twelve years (1995-2006) rank among the warmest years on record, average arctic temperatures have increased at almost twice the

global average rate in the past 100 years, the average temperature of the global ocean has increased to depths of at least 3000 meters, global sea level rose at an average rate of 1.8 millimeters, and arctic sea ice has decreased by an average of 2.7% per decade.⁹¹ The FAR also finds that extreme weather events have changed in frequency and/or intensity over the last 50 years.⁹² With respect to the causes of climate change, the FAR is almost as clear. It states that “[t]here is a very high confidence that the global average net effect of human activities since 1750 has been one of warming . . .”⁹³ and “[m]ost of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic GHG concentrations.”⁹⁴ The FAR defines “very likely” as greater than 90% likelihood.⁹⁵

B. United States

U.S. President Barack Obama has made his feelings regarding climate change similarly clear. In his remarks at the United Nations Climate Change Conference in Copenhagen, Denmark (COP 15) on December 18, 2009, President Obama stated that climate change is real and that it “poses a grave and growing danger to our people.”⁹⁶ He went on to state that climate change “is not fiction, it is science.”⁹⁷ However, while the threat of climate change is not in doubt, President Obama said that the international community’s ability to take collective action is.⁹⁸

Despite scientific consensus and President Obama’s commitment to reduce emissions, there has been a decline in recent years in the percentage of Americans who say there is solid evidence that global temperatures are rising and that global warming is a serious problem.⁹⁹ According to a national survey conducted in October of 2010 by the Pew Research Center for the

People and the Press, among 2,251 adults living in the U.S. who were reached by telephone, 59% thought there was solid evidence that the average temperature on Earth has been getting warmer over the past few decades.¹⁰⁰ Just two years before, 71% said there was solid evidence of rising temperatures.¹⁰¹ Over the same period, there was also a comparable decline in the number of Americans who say global temperatures are rising as a result of human activity such as the combustion of fossil fuels.¹⁰² Just 34% believed that, as compared to 36% for the previous year, and 47% for both years 2007 and 2008.¹⁰³

The decline in the belief in solid evidence of global warming cuts across the political spectrum, but has been particularly noticeable among independents.¹⁰⁴ According to the survey, just 56% of independents saw solid evidence of global warming compared with 75% two years before.¹⁰⁵ Fewer democrats also shared this view dropping from 83% in 2008, to 75% in 2009, and back up slightly to 79% in 2010.¹⁰⁶ Republicans who were already highly skeptical of the presence of global warming have become even more so dropping from 62% in 2007, 49% in 2008, 35% in 2009 and back up slightly to 38% in 2010.¹⁰⁷ While there are dissenters in most all groups, there does not appear to be party-wide denial regarding the presence of global climate change anywhere in the world similar to that of the U.S. Republican Party.¹⁰⁸ According to some U.S. journalists, the Republican Party not only disagrees on a potential solution, but repudiates the core premise that there is even a problem that needs to be solved.¹⁰⁹ Moreover, the emergence of the Tea Party movement¹¹⁰ has had an effect on Republican beliefs. Republicans who agree with the Tea Party movement are much more likely than other Republicans to say that there is no solid evidence that the Earth's temperature has been rising.¹¹¹ Among Republican registered voters who agree with the Tea Party, approximately 70% do not think there is solid evidence of global warming.¹¹² Tea Party Republicans also overwhelmingly believe there is no

scientific consensus on global warming.¹¹³ Just 19% say that scientists agree that the Earth is getting warmer due to human activity, while 71% say that scientists do not agree.¹¹⁴

Despite this growing public skepticism, the survey found more support than opposition for a policy establishing limits on carbon emissions.¹¹⁵ Approximately half of Americans favored setting limits on carbon emissions and making companies pay for their emissions, even if this might lead to higher energy prices.¹¹⁶ A majority of Americans (about 56%) thought the U.S. should join other countries in establishing standards to address global warming while 32% said the U.S. should set its own standards.¹¹⁷ These survey results are similar to those from 1997 and 2001 when the public was asked about setting standards to improve the global environment.¹¹⁸

V. Past Efforts to Address Climate Change

A. Trail Smelter and Corfu Channel

Although climate change has taken center stage in the arena of major environmental concerns over the last decade or so, the issue of how to address air pollution is hardly a new one, dating back to well before the industrial revolution. One of the best known cases dealing with the transboundary movement of air pollution in the international law context was the 1949 Trail Smelter arbitration.¹¹⁹ The arbitration resulted from a dispute between the U.S. and Canada over sulfur dioxide fumes emitted by a smelter at Trail, British Columbia.¹²⁰ The fumes were blown by prevailing winds down the Columbia River valley into the northern part of the state of Washington, and damaged the property of apple growers.¹²¹ Canada was held responsible under international law for the actions of the smelter, and ordered to pay damages to the U.S.¹²² The

case helped establish a fundamental international law principle that a state has a duty to prevent, and may be responsible for, pollution by private parties within its jurisdiction if the pollution results in demonstrable injury to another state.¹²³

Although not dealing with air pollution or environmental degradation, the 1949 Corfu Channel Case (United Kingdom v. Albania)¹²⁴ established another core international law principle that every state has an obligation to not knowingly allow its territory to be used for acts contrary to the rights of other states, and that every state has a duty to notify states of any imminent danger that may harm another state.¹²⁵ The Corfu Channel case involved damage to British warships which ran into moored contact mines in the Straits of Corfu.¹²⁶ The International Court of Justice (ICJ) recognized that allowing extraterritorial damage from intrastate activity that is lawful in and of itself may nevertheless render a state responsible for the damage inflicted.¹²⁷ The ICJ held Albania responsible for the damages to the United Kingdom.¹²⁸

Since Trail Smelter and Corfu Channel, there have been a number of international efforts to address climate change, many of which were coordinated through the United Nations. Although most of these efforts did not result in legally binding requirements, each successive effort continued to build and expand upon the concepts established in Trail Smelter and Corfu Channel regarding liability for transboundary pollution and extraterritorial damage, respectively. This research paper will not discuss each individual effort and development but rather highlight a few of the more major or well-known efforts.¹²⁹

B. Stockholm Conference

One of the first international conferences on the environment was sponsored by the United Nations and held in 1972 in Stockholm, Sweden (Stockholm Conference). The Stockholm Conference is generally considered a major turning point that marked the culmination of efforts to place environmental protection on the official agenda of international environmental law.¹³⁰ Often considered one of the best documented and organized United Nations conferences of its time¹³¹, the Stockholm Conference was attended by 114 of its 131 members.¹³² It resulted in the creation of the United Nations Environment Program (UNEP) which was the first international organization with an exclusive environmental mandate.¹³³ The Stockholm Conference also produced a conference declaration of twenty-six principles (Stockholm Declaration) that addressed the improvement of the environment and an action plan containing recommendations for future implementation.¹³⁴ More specifically, Principle 21 of the Stockholm Declaration affirmed states' obligations not to cause damage to the environment of other states or areas beyond their jurisdiction.¹³⁵ This was followed by Principle 22 which says that states should cooperate in developing international law and policy regarding liability and compensation for this damage.¹³⁶ Principle 22 helped provide an important impetus and foundation for the future development of international environmental law.¹³⁷ While not drafted with global warming in mind, the Stockholm Declaration can be logically extended to address the impacts from climate change. Furthermore, while the Stockholm Declaration is regarded as an advisory statement or what is sometimes referred to as "soft law"¹³⁸, it was instrumental in establishing general practice standards which could be later codified into binding treaties or which may mature into binding customary obligations.¹³⁹ It was also instrumental in gaining some sort of international consensus, which would be much more difficult and unlikely if legally binding obligations were being sought.¹⁴⁰

C. Rio Conference

On the twentieth anniversary of the Stockholm Conference, the United Nations held a Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, also known as “Earth Summit.”¹⁴¹ Governmental representatives from over 170 nations attended.¹⁴² UNCED resulted in the Rio Declaration on Environment and Development (Rio Declaration), thought of as the modern equivalent to the 1972 Stockholm Declaration. The Rio Declaration comprised 27 principles which were adopted by the UNCED and endorsed by the United Nations General Assembly. It was the result of compromise between the developed and developing nations. However, one of the new concepts not originally included in the Stockholm Declaration was the precautionary approach to environmental protection.¹⁴³ As with most science, there exists inherent uncertainties. This is certainly the case when trying to determine or predict the historic and future rates of global warming and their potential impacts on the world’s ecosystems. However, according to the precautionary principle, these inherent uncertainties do not justify delay when potential impacts are believed to be severe or irreversible. Principle 15 of the Rio Declaration states:

In order 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.¹⁴⁴

There may never be scientific certainty with respect to climate change, and particularly the range of projected impacts. However, waiting on such certainty may prove to be too late. If, for example, the world waits to see how much sea level will actually rise, or temperatures will change, passing laws or adopting binding reduction targets to address already occurring impacts,

many of which could be irreversible such as species extinction, may be moot. The precautionary principle is proactive in nature with an approach designed to address anticipated future risk or harm. The principle does not specifically address how to act or what type of approach to take, other than being cost-effective, and therefore it is left to states to decide.

Several other key concepts that directly or indirectly relate to transboundary pollution were also memorialized in the Rio Declaration including but not limited to liability and compensation for pollution victims (Principle 13), obligation to undertake environmental impact assessments of proposed activities (Principle 17), notification of environmental emergencies or disasters (Principle 18), and notification and consultation with states regarding transboundary pollution (Principle 19).¹⁴⁵

In addition, an 800-page comprehensive program of action for sustainable development and environmental preservation was drafted entitled “Agenda 21.”¹⁴⁶ It included a set of priority actions including achieving sustainable growth and protecting global and regional resources such as the atmosphere, oceans and seas.¹⁴⁷ Whereas the Stockholm Conference helped for the first time draw large-scale attention to global environmental issues and establish a foundation upon which future international environmental laws might be built¹⁴⁸, the Rio Conference tried to further develop and shape them through a coordinated a global response. Although the emergence of the right to development may have resulted in the watering down of some of the Rio Principles, the Rio Conference nevertheless continued to build upon the foundation established in Stockholm, and helped heighten awareness of the need for international environmental protection.¹⁴⁹

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted at the 1992 Rio Earth Summit.¹⁵⁰ The UNFCCC emphasized concern over changes in the Earth's climate, calling for the stabilization of GHG concentrations in the atmosphere at a level that would prevent serious anthropogenic interference with the climate system.¹⁵¹ The U.S. became a party to the UNFCCC in 1992 under President George H.W. Bush.¹⁵² The U.S. was the fourth country to ratify the UNFCCC which became effective in 1994 and now has 189 parties.¹⁵³ In 2001, President George W. Bush reaffirmed the U.S. commitment to the UNFCCC.¹⁵⁴ The UNFCCC creates an international structure to address climate change, including provisions for the reporting of climate change, scientific research, and annual meetings of the COP.¹⁵⁵ Under the UNFCCC, developed countries agreed to try and reduce their emissions to 1990 levels by 2000.¹⁵⁶ Once again there were no binding emissions reductions.¹⁵⁷ In recognition of the amount of GHG's emitted by their countries, the developed countries agreed to take the lead in addressing climate change.¹⁵⁸ However, the UNFCCC requires all parties, both the developed and developing, to establish and implement programs to mitigate climate change.¹⁵⁹

D. Kyoto Protocol

The Earth Summit in Rio was yet another stepping stone which led to future international law developments such as the well-known Kyoto Protocol. In 1995, the IPCC formally reported a consensus among scientists that the balance of evidence suggested that there was a “discernible human influence” on the global climate system.¹⁶⁰ The IPCC Report provided governmental leaders with the necessary scientific support for adopting a timetable and reduction targets, and provided an important foundation leading up to the negotiation of the Kyoto Protocol.¹⁶¹ In part because of the findings of the 1995 IPCC Report, and because of growing public and

international pressure, the U.S. surprised climate negotiators by announcing for the first time that it would support binding targets and timetables for GHG reductions.¹⁶² However, the U.S. was noticeably silent on what specific reduction targets it would actually support and remained so for the next year.¹⁶³ In June 1997 at the Rio+5 session of the United Nations, U.S. President Clinton announced that he would spend the six months prior to the Kyoto COP educating the American people about the need for GHG reductions.¹⁶⁴ This announcement energized both sides of the climate change debate to rally their troops and build political and public support.¹⁶⁵

In July 1997, prior to the adoption of the Kyoto Protocol, the U.S. Senate by a unanimous vote of 95-0, passed a resolution sponsored by Senators Byrd (D-W.Va.) and Chuck Hagel (R-Neb.) expressing the position of the Senate that the U.S. should not sign on to any protocol to the climate convention unless certain key conditions were met.¹⁶⁶ Amidst overwhelming pressure from both sides of the debate, the Clinton Administration announced its long-awaited policy on October 22, 1997.¹⁶⁷ The Administration proposed a binding target of stabilizing emissions at 1990 levels by the year 2008-2012, along with additional unspecified reductions by 2017.¹⁶⁸ Not surprisingly, this position drew immediate criticism.¹⁶⁹ Industry groups thought the reductions were too stringent while environmental groups and others around the world believed that the U.S. should demonstrate much stronger leadership.¹⁷⁰ However, at least with the position of the U.S. finally known, the major proposals for targets and timetables leading up to Kyoto could now be identified.¹⁷¹

A tremendous amount of interest and attention was now being directed towards Kyoto.¹⁷² While there was some hope and cautious optimism, there was also skepticism on how the protocol would be developed, or if one could be agreed on at all.¹⁷³ At Kyoto, amid the presence of then U.S. Vice President Al Gore, the U.S. announced that it would consider flexible targets

and timetables, meaning that all industrialized states did not necessarily have to agree to the same emission reductions or the same baseline year.¹⁷⁴ This was an important turning point in the negotiations.¹⁷⁵ After much discussion, and with only two days left in the conference, the U.S. agreed to a three percent reduction in emissions from 1990 levels, and with that agreement deals were starting to be made.¹⁷⁶ The main thrust of the Kyoto Protocol was GHG emissions targets and timetables for the industrialized (Annex I) parties.¹⁷⁷ Most of the European countries agreed to reduce their emissions by eight percent below 1990 levels, while the U.S. agreed to a seven percent reduction.¹⁷⁸ All of the reduction targets had to be met over a five-year commitment period from 2008 to 2012, which was to then be followed by a subsequent commitment period and presumably more aggressive emission targets.¹⁷⁹ In addition, the Kyoto Protocol set forth general guidance for different flexibility mechanisms such as joint implementation, the European Union's "bubble" approach, and a clean development mechanism which allowed Annex I countries to fund activities in other countries and use those emissions reductions towards meeting their own compliance requirements.¹⁸⁰ Another important feature of the Kyoto Protocol, which the U.S. aggressively sought, was the use of market-based trading mechanisms to reduce emissions.¹⁸¹ However, many of these various provisions raised as many issues and questions as they answered, setting the stage for additional negotiations after Kyoto.¹⁸²

E. Kyoto to Copenhagen

Soon after Kyoto, it became clear that there were significant ambiguities in the text of the protocol that could potentially lead to widely different reduction requirements for the U.S. and other Annex I countries.¹⁸³ In February 2001, with newly elected President George W. Bush, the U.S. changed its position and announced that it would no longer support the Kyoto Protocol.¹⁸⁴

The Bush Administration also referring to the Byrd-Hagel Resolution, stated that Kyoto would exempt 80% of the world including major population centers such as China and India, and would cause serious harm to the U.S. economy.¹⁸⁵ No alternatives to Kyoto were offered by the U.S. other than a further commitment to researching the causes and impacts of climate change.¹⁸⁶ Though it was originally a signatory, the Kyoto Protocol was never sent to the U.S. Senate for ratification.¹⁸⁷ Led largely by the European Union, and without the support of the U.S., Kyoto was ratified and entered into force in 2005.¹⁸⁸ The U.S. instead headed down an alternative path of relying on voluntary actions, technology cooperation, and expanded research into climate science and green technologies.¹⁸⁹

In 2009, newly elected President Barack Obama promised to work with the United Nations to develop a new international treaty on climate change to replace the Kyoto Protocol which is set to expire in 2012.¹⁹⁰ The U.S. proposal for the treaty showed that it was “committed to reaching a strong international agreement in Copenhagen based on both the robust targets and ambitious actions that will be embodied in U.S. domestic law”¹⁹¹ Under the terms and conditions, the U.S. would face more GHG emissions reductions than most countries and would also provide financial and technological assistance to developing countries.¹⁹² President Obama renewed this commitment at Copenhagen vowing that the U.S. would continue to fight climate change.¹⁹³

More specifically, the President outlined a three pronged approach consisting of mitigation, transparency and financing.¹⁹⁴ First, all major economies must take national action to reduce emissions including legitimate and ambitious targets.¹⁹⁵ The U.S. committed to reducing emissions in the range of 17 percent by 2020 and more than 80 percent by 2050.¹⁹⁶ Second, there must be a mechanism to review whether commitments are being met, and exchange this

information in a transparent manner.¹⁹⁷ These measures will ensure accountability and demonstrate whether parties are meeting their obligations.¹⁹⁸ Third, financing must be available to assist developing countries to adapt, especially the least developed and those most vulnerable to climate change.¹⁹⁹ The President also stated that the U.S. will be part of fast-start funding that will increase to \$10 billion by 2012, and a global effort to mobilize \$100 billion in financing by 2020.²⁰⁰ However, the President caveated this commitment by saying that only if it is part of a broader accord.²⁰¹

In January 2010, in association with the Copenhagen Accord, the U.S. committed to a reduction of GHG emissions from base year 2005 by 2020 in the range of 17% consistent with anticipated U.S. energy and climate legislation.²⁰² This GHG reduction commitment was evidenced in President Obama's January 27, 2010, State of the Union address, and has been consistently reaffirmed since that time.²⁰³ As such, from what may be considered initial resistance to the Kyoto Protocol, the U.S. appears to be moving toward a strong leadership role in international efforts to address climate change.²⁰⁴

VI. Future Recommendations – Cancun, South Africa and Beyond

Effective address of climate change and its anticipated impacts will require a multifaceted approach by the U.S. It will require simultaneous political action at the international, domestic, and local government levels including public-private cooperation. It must include concurrent measures not only to mitigate climate change but also to begin preparation and planning in order to adapt to its potential consequences. Research, development and technology enhancement will be pivotal, with a critical focus on financial assistance and technology transfer to developing

countries. Fortunately, many of these efforts have already been initiated. On the other hand, if past action is any indication of future performance, reaching consensus on meaningful and binding GHG reductions at the international level will prove to be a herculean task.

A. International Cooperation

President Obama has clearly and repeatedly indicated his interest in establishing the U.S. as a leader in international climate change.²⁰⁵ He will have another opportunity to demonstrate this desire on November 29 – December 10, 2010, when representatives from nearly all the world's governments will convene in Cancun, Mexico for the sixteenth Conference of Parties to the UNFCCC (COP 16), and again the following year in South Africa for COP 17.²⁰⁶ The main purpose of COP 16 is to sign a new global agreement to address climate change.²⁰⁷ The U.S. should recognize that international negotiations at COP 16 will continue to be among the world's most complex, and additional meetings and further constructive discussions will be necessary leading up to South Africa's COP 17 in order to build upon any success in Cancun.²⁰⁸ It will require a grand bargain, with binding and enforceable requirements and contributions from both developed and developing countries.²⁰⁹ Such binding reductions should come in the form of a carbon tax, cap and trade program, or some hybrid combination of both. Alternatively, a target reduction goal could be established for each state with the flexibility to achieve it as they see best fit. Although essentially imposing restrictions on states' rights to emit GHG emissions, and thereby indirectly influencing future development, this approach may help minimize encroachment on state sovereignty if they are the ones making the decision on how to reach the goal. Nevertheless, the U.S. with cooperation and leadership from other developed countries must show the way and be prepared to commit to greater GHG reductions than perhaps other developed or developing countries. This idea of common but differentiated responsibilities is

based on the concept that all states have shared responsibilities in environmental protection.²¹⁰ It also concurrently takes into consideration the difference in states' contribution to the problem, and their respective economic and technical capacities to address it.²¹¹ Therefore, the U.S. and other developed countries must also help provide developing countries with the technological and financial assistance to achieve a faster transition to a lower carbon economy during their own growth phase.²¹² The Obama Administration will also need to convince world leaders that any binding international agreement can be successfully adopted and implemented in the U.S. which will prove much more difficult with a newly elected Republican controlled U.S. House of Representatives.²¹³ If President Obama cannot succeed in passing the requisite legislation, he may need to assure that global community that it can be similarly accomplished through regulation by the U.S. EPA. The rest of the world is waiting to see if the Obama Administration will deliver on its commitment to demonstrate climate change leadership at COP 16 in Cancun, and thereafter at COP 17 in South Africa.

B. U.S. Domestic Policy

In addition to providing leadership at the international level, the U.S. must lead by example through, among other things, the implementation of binding GHG emissions domestically. To date, the U.S. has not been able to enact climate change legislation. However, this is not necessarily for lack of trying on the part of many. While legislation has not been successfully enacted, the courts and executive agencies are addressing climate change in a number of ways including, but not limited to, through the Clean Air Act and the National Environmental Policy Act which apply, often indirectly, to climate change.²¹⁴

In 2007, the U.S. Supreme Court decision in *Massachusetts v. U.S. Environmental Protection Agency* paved the way for direct federal regulation of GHG's under the Clean Air Act.²¹⁵ The Court confirmed the U.S. Environmental Protection Agency's (EPA) authority to regulate CO₂ emissions under the Clean Air Act.²¹⁶ In April 2009, the EPA responded to the decision by proposing GHG endangerment and cause-or-contribute findings.²¹⁷ The EPA, in December 2009, after carefully considering the full weight of the scientific evidence finalized those findings effective January 14, 2010.²¹⁸ Furthermore, the EPA adopted the GHG reporting rule which requires reporting for about 10,000 facilities accounting for approximately 85% of the total U.S. GHG emissions.²¹⁹ Data collection began on January 1, 2010, with the first annual reports due to the EPA in 2011.²²⁰ While this mandatory GHG reporting rule does not impose actual reductions, it does call additional political and public attention to the issue, and more importantly provides important baseline information that will be needed for any potential future regulation.²²¹

The U.S. is also addressing climate change at the national level through the Energy Independence and Security Act of 2007 (EISA) and the Energy Policy and Conservation Act (EPCA).²²² EISA imposes efficiency standards for consumer appliances, heating and air conditioning equipment, and lighting.²²³ EPCA charges the U.S. Department of Transportation with promulgating requirements for fuel efficiency.²²⁴ In addition, the Energy Policy Act of 2005 promoted the use of renewable fuels.²²⁵

However, despite the progress to date, without a legally binding GHG reduction program being developed and implemented at the national level, the U.S. will be unable to live up to its goal of being an international leader in addressing climate change. Such a program could come in the form of a traditional command and control approach such as numerical limit on emissions

or a best available control technology requirement. It could also be accomplished through market-based programs such as carbon taxation or cap and trade which embrace the polluter pays principle. The command and control approach is generally considered much more rigid and therefore does not seem to be a part of the potential approaches being discussed at this time. As such, a market-based system is more likely.

Both the carbon tax and cap and trade approaches have their advantages and disadvantages, and both have their vocal supporters and opponents.²²⁶ Supporters of the cap and trade system argue that it is the only approach that will guarantee results, has been shown to work effectively, and is politically more attractive.²²⁷ Those in favor of a carbon tax argue that it is a better approach because it is transparent, minimizes the involvement of government, and avoids the creation of new markets which are subject to potential manipulation.²²⁸ Both attempt to correct a market failure through internalizing externalities, placing a price on carbon, and creating an incentive to invest in lower carbon technologies.²²⁹ This should also help spur development of alternative fuels and renewables, and provide some much needed elasticity to fossil fuels. Assuming the auction of allowances under the cap and trade program, both approaches can raise much needed revenues which can be used for mitigation and adaptation both here and abroad.²³⁰ This funding could also be used to help address UNEP's inadequate and unpredictable funding, along with providing it some additional enforcement authority. However, the free allocation of allowances, or at least a portion of them, has also been discussed and remains a possibility. The main drawback to a cap and trade system is that the cost to affected sources and the consumer is unknown. While the amount of GHG's emitted is capped at a known number, the cost of reaching the goal is determined by market forces.²³¹ In addition, under a cap and trade program, establishing an accurate cap on emissions from a market

perspective is paramount. Setting it too high or too low will undermine the objective of the program. Furthermore, this assumes that scientists and climatologists have actually determined what is a safe or acceptable level of GHG's in the atmosphere and back calculated what the corresponding annual anthropogenic emissions would equate to. Additionally, it is more challenging to capture all sources of GHG emissions under a cap and trade program which in the U.S. has so far only been applied to the electric power generation sector under the Acid Rain Program.²³²

On the other hand, under a carbon tax program the cost is known, but the environmental benefit is not. This pigouvian tax²³³ attempts to most efficiently internalize externalities by creating a disincentive to use products or services with high fossil fuel contents or carbon intensities. While it is nearly impossible to predict with any certainty the amount of GHG reductions that will result from an increased price on fuels due to a carbon tax, such a tax could more easily be adjusted up or down to meet the targeted emissions reduction. However, there is also the concern of tax exemptions being written into the law by those industries with the greatest lobbying resources. Whereas the main drawback for the cap and trade program is the unknown costs, for a carbon tax, it is most likely the political infeasibility. Taxes are a political hot potato and few politicians looking to get elected or re-elected would propose such a new tax. However, in reality a cap and trade program could increase the cost of fossil fuel usage similar to a carbon tax strategy – but “cap and trade” is much more aurally palatable at this time than “tax.”

When selecting a strategy, it is also important to consider how a U.S. GHG reduction program might dovetail with other international approaches. If more countries utilize a carbon tax system for example, then it may be administratively easier for the U.S. to integrate into that type of a system, or vice versa for a cap and trade approach. Additionally, any market based

GHG reduction approach will have direct or indirect impacts on multiple sectors of the economy such as electric power generation, transportation, manufacturing, agriculture and the investment sectors, and therefore World Trade Organization (WTO) implications must be considered.²³⁴ Although there is generally an underlying tension between environmental regulations and international trade, the greater the number of countries that utilize a specific GHG reduction approach, the more likely WTO issues or prohibitions on tariffs might be avoided. The climate change issue, particularly in the context of a proposed carbon tax system, would also be a prime opportunity to further develop and clarify the WTO “shrimp-turtle” case²³⁵ holding. A detailed analysis of the legal issues associated with a national or international tax regime are well beyond the scope of this article. Briefly, however, the WTO Appellate Body in shrimp-turtle suggests that countries can defend unilateral import bans as permissible environmental measures under the General Agreement on Tariffs and Trade (GATT 1947) as long as they avoid arbitrary or unjustifiable discrimination, and thereby may satisfy the requirements of GATT Article XX.²³⁶ Therefore, the possibility that Article XX may support a carbon tax does exist, and may be ripe for consideration by the WTO. In reality, no program is perfect and both approaches have their flaws. Although this author believes a carbon tax might be simpler, the approach of cap and trade is also attractive, or perhaps some combination of both.

While mitigation is one of the essential components of any climate change program, adaptation is another. Most of the focus on climate change at the national level in the U.S. has been towards mitigation.²³⁷ However, adaptation is an important defense mechanism which will be required if mitigation efforts fall below required levels which scientists tell us is likely because of GHG’s long term persistence in the atmosphere.²³⁸

The U.S. Government Accountability Office (GAO) in October 2009 published a study of adaptation based on information provided by agencies that participate in the U.S. Climate Change Research Project.²³⁹ The GAO reported that U.S. policy makers view adaptation as a risk management strategy that is designed to reduce vulnerability to unavoidable climate change.²⁴⁰ The GAO also noted that adaptation to climate change poses a number of challenges for government officials and that there currently is no coordinated national approach to adaptation.²⁴¹ The GAO recommended development of a national strategic plan for adaptation.

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C. Local Governments and Subnational Entities

Efforts to address climate change and adapt to its effects will require new types of partnerships, policies and instruments.²⁴³ Successfully addressing the climate change challenge can only be achieved and maintained through involvement and commitment at all levels of decision-making.²⁴⁴ Subnational entities (regional, state and local) are playing an important role in addressing climate change.²⁴⁵ This role has been discussed and addressed in various COP meetings and texts.²⁴⁶ For example, at a side event to the recent Copenhagen Round, U.S. Governors Arnold Schwarzenegger (California), Christine Gregoire (Washington) and Jim Doyle (Wisconsin) spoke out regarding the important role of subnational action.²⁴⁷ Governor Schwarzenegger announced an agreement among the leaders of a number of subnational governments to launch a club of 20 regions (R20) to develop and implement climate change reduction programs.²⁴⁸ Other groups working at the subnational level during Copenhagen included but were not limited to the International Council for Local Environmental Initiatives

(ICLEI), United Cities and Local Governments, Metropolis, the C40 Climate Leadership Group, and the World Mayors Council on Climate Change.²⁴⁹

Subnational action in the U.S., and internationally, is critical to the success of a global solution.²⁵⁰ Subnational entities can and often do move forward with addressing climate change without regard to the presence of national or international action and consensus. In addition, local governments can more easily track vehicle miles traveled, address land use practices, and monitor and verify energy consumption at individual buildings and facilities.²⁵¹ They can also launch effective sustainability programs including ground level public outreach and education campaigns. Moreover, state and local governments in the U.S. often have the most experience in identifying individual sources of GHG emissions and developing carbon footprint inventories.²⁵² Subnational entities in the U.S. have also taken steps to implement binding GHG reductions on a regional scale such as the Western Climate Initiative and the Regional Greenhouse Gas Initiative (RGGI).²⁵³ RGGI is the first mandatory, market-based GHG reduction program in the U.S. and includes ten states in the northeast and mid-Atlantic.²⁵⁴ This bottom-up effort provides much of the needed action towards addressing climate change and will serve to compliment, or supplement, any future federal action.

VII. Conclusions

There exists a consensus among scientists that the Earth's temperature is in fact rising and it is in large part due to the emission of man-made GHG's. These colorless odorless gases, that linger in the atmosphere for years or decades, have already begun to alter our natural environment. Scientists tell us that if nothing is done, these emissions will at some time in the

near future produce significant adverse impacts to human health and the environment. Despite a vocal minority, and with a giant leap of faith, the majority of the public agrees, or perhaps acquiesces, with this scientific consensus. While the impacts from climate change remain uncertain, the range of possibilities is broad and often grim. Different impacts may occur in different regions and with varying severities. Both local warming and cooling, flooding and drought, may occur at separate locations all which may be linked back to climate change caused by anthropogenic GHG sources. As we are learning, pollution often does not abide by political or geographic boundaries. This is especially true of GHG's and air pollution. The idea of not in my backyard is much less relevant today since we all share the same atmosphere – our “global backyard.”

Transboundary issues are often most effectively resolved through transboundary agreements.²⁵⁵ If the world fails to act promptly and in a unified fashion, political and scientific leaders tell us, the damages could be significant or catastrophic. It will take a coordinated and sustained effort of all nations, developed and developing, rich and poor, small and large, to begin addressing the problem. It must come in the form of a binding and enforceable agreement. The idea of reversing or stopping climate change seems improbable. The world is now hoping to just slow it down. It will take a multifaceted, multidimensional, everything-and-the-kitchen-sink approach that includes the core elements of mitigation and adaptation, with simultaneous action at the international, national and local levels. Public and private partnerships will be key with forward thinking and creative solutions such as a climate change impact labeling system for consumer products. A concurrent effort by NGO's, and particularly umbrella networks such as the Climate Action Network, will be equally important as they often have the ability to broker deals that government officials do not always possess. It will require public outreach and

education, and technology enhancement and transfer. It demands immense patience and foresight on behalf of politicians and the public since noticeable improvements in climate change may take decades or longer.

Whether the U.S. likes it or not, all eyes are upon it. The global climate action community is waiting with baited breath to see if the U.S. will take the lead in climate change and lead by example. The U.S. has served as an international role model for many years and in many different contexts from space exploration to humanitarian aid. The U.S. is needed once again to serve in this very important leadership capacity. The U.S. must learn from, but also be cautious of following, previous U.S. Administration positions and other political leaders. It must participate actively and constructively in COP 16 in Cancun, COP 17 in South Africa (2011), and in all COP's thereafter. It must remain flexible and open, and be prepared to commit to more reductions than perhaps many other countries. The U.S. must enter COP 16 with the understanding that this is yet another stepping stone to an important goal, and that many more COPs, Meeting of Parties, and other international and subnational meetings and negotiations will be required.

The U.S. must work to correct the disconnect between reality and perception as it relates to public opinion and legislative action so that any international agreement, if reached, can be successfully ratified. This may include promoting and educating the public on the collateral benefits of reducing GHG emissions such as the economic savings associated with using less fuel, reduction in other air pollutants which directly impact human health such as particulate matter and sulfur dioxide, energy independence, and preserving the world's supply of fossil fuels which is a finite resource. Also, it should be communicated that climate change is one of those issues that can be addressed at all levels regardless of governmental support or involvement.

Simple measures by individuals such as driving automobile less, carpooling, insulating homes, and purchasing energy efficient appliances help reduce the emission of GHG's and positively impact the international issue of climate change.

Similarly, the information must also flow in the opposite direction. There must be greater opportunity by the public in sharing information and ideas with decision makers. This must be accomplished not only at the local and subnational level, but also at the international level. For example, although there is a point where too much in-person participation may slow a process down, there must at least be an opportunity for individual citizens or groups to submit written comments on pending agreements to the COP's. It is not always necessary or appropriate for citizens of a particular nation to agree with their government's official position on an issue and they should always have an opportunity to peacefully dissent, contribute to the discussion, and be heard. They don't always need to follow their leaders, particularly if those leaders' views are divergent from theirs. As stated in Rio Principle 10, environmental issues are best handled when there is participation at all levels.

The U.S. must continue to work domestically and without regard to international consensus. It must lead by example and be willing to move forward alone if needed. It must provide funding for research and development, and assistance to state and local governments. The U.S. must pass domestic legislation to develop and implement a market-based GHG reduction program with legally binding goals while minimizing economic impacts. If it were not so politically infeasible, a carbon tax might be the preferred approach since it could be quickly and easily implemented, would capture the most emissions sources, and could generate revenue to fund necessary climate change projects. However, a cap and trade system might also be effective and at this time is perceived by law and policy makers as the lesser of the two evils.

However, revenue generation appears essential, and thus for a cap and trade approach to be successful, the auction of the majority of allowances will be important.

In many ways it feels like climate change policy is moving at a snail's pace. A lot of talk about trying to reach aspirational goals, but no real action – bark but no bite. However, the overall field of environmental law has really moved at light speed compared to some other areas of the law. Especially when you consider that the EPA was created in 1970. Nearly every major environmental law was enacted within the last four decades. Climate change negotiations really began in earnest in the 1990s. Considering that it will impact nearly 7 billion people across more than 200 jurisdictions, it has come a long way. If it weren't for the urgency associated with climate change impacts, an outside observer might be impressed with the progress to date. However, with the threat of flooding, cyclones, and extinction looming, a solution is needed now. We are running out of coins to put in the atmospheric parking meter. Our ability to mitigate climate change decreases, and our need to prepare for adaptation increases, with each tick of the clock. The task at hand is complex and challenging to say the least, but not necessarily insurmountable – especially for a species that mapped the human genome and put a man on the moon.

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¹ Bob Dylan, *Subterranean Homesick Blues*, on Bringing it All Back Home (Columbia Records 1965).

² Zane Satterfield, *What Does PPM or PPB Mean?*, On Tap, National Environmental Services Center (2004), at 38, available at <http://www.nesc.wvu.edu/ndwc/articles/ot/fa04/q&a.pdf> (noting that one ppm is equivalent to: one inch in 16 miles, one second in 11.5 days, one minute in two years, or one car in bumper-to-bumper traffic from Cleveland to San Francisco).

³ National Aeronautics and Space Administration (NASA), Global Climate Change, NASA's Eye on Earth, Uncertainties, *Unresolved Questions about Earth's Climate*, at 1, available at <http://climate.nasa.gov/uncertainties/> (last visited Nov. 2, 2010).

⁴ NASA Near Earth Object Program, at 1, available at <http://neo.jpl.nasa.gov/glossary/au.html> (last visited Nov. 1, 2010).

⁵ See *Recent Developments in Environmental Law*, 23 Tul. Envtl. L.J. 561 1,1 (Summer 2010). (In late November 2009, thousands of private emails between prominent climatologists were hacked from the Climate Research Unit. Information contained in the emails led to several criticisms including that climatologists concealed data, misrepresented conclusions, and tried to prevent publication of the papers by climate change skeptics. The scandal was dubbed "climategate" – a reference to the Watergate scandal of the Nixon Administration. Although scientists maintain that the science behind climate change was still sound and supported by independent studies of NASA and NOAA, the controversy undermined public confidence in many of the basic assumptions regarding climate change.)

⁶ Press Release, Pew Research Center for the People and the Press (Pew Center), *Wide Partisan Divide Over Global Warming, Few Tea Party Republicans See Evidence*, Oct. 27, 2010, at 1, available at <http://pewresearch.org/pubs/1780/poll-global-warming-scientists-energy-policies-offshore-drilling-tea-party>; Press Release, Pew Center, *Fewer Americans See Solid Evidence of Global Warming, Modest*

Support for Cap and Trade Policy, Oct. 22, 2009, at 1, available at <http://people-press.org/report/556/global-warming>.

⁷ Press Release, Pew Center, *Scientific Achievements Less Prominent than a Decade Ago: Public Praises Science; Scientists Fault Public, Media*, July 9, 2009, at 5, available at <http://people-press.org/reports/pdf/528.pdf>.

⁸ Russian President Vladimir Putin (2003) (noting that “[a]n increase of two or three degrees wouldn’t be so bad for a northern country like Russia. We could spend less on fur coats, and the grain harvest would go up.”). See <http://www.newscientist.com/article/dn4232-global-warming-will-hurt-russia.html>. (Oct. 2003).

⁹ *But see* Kathleen Parker, *The GOP’s Suicide Pact*, *The Washington Post* (Nov. 29, 2009), at 1, available at <http://www.washingtonpost.com/wp-dyn/content/article/2009/11/27/AR2009112702325.html> (one political party’s survival could be another party’s suicide.).

¹⁰ U.S. Environmental Protection Agency (EPA) Office of Air and Radiation, *Climate Change Science Facts*, 430-F-10-002 (April 2010), at 1, available at http://www.epa.gov/climatechange/downloads/Climate_Change_Science_Facts.pdf.

¹¹ NASA, *What’s the Difference Between Weather and Climate?* (February 2005), at 1, available at http://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html.

¹² U.S. EPA, Climate Change, *Basic Information*, at 1, available at <http://www.epa.gov/climatechange/basicinfo.html> (last visited Nov. 1, 2010).

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *Id.*

¹⁶ U.S. EPA, Climate Change, *Frequent Questions*, *Science*, at 1, available at <http://www.epa.gov/climatechange/fq/science.html> (last visited Nov. 1, 2010).

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- ²² U.S. EPA, Climate Change, *Carbon Sequestration in Agriculture and Forestry*, at 1, available at <http://www.epa.gov/sequestration/index.html> (last visited Nov. 2, 2010).
- ²³ *Id.*
- ²⁴ *Id.*
- ²⁵ Jason Heinrich, *Legal Implications of CO₂ Ocean Storage*, Working Paper, Laboratory for Energy and the Environment, Massachusetts Institute of Technology (July 2002), at 1, available at http://sequestration.mit.edu/pdf/Legal_Implications_Ocean_Storage.pdf.
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- ²⁷ NASA, Earth Science Enterprise, *African Dust Leads to Large Toxic Algal Bloom*, at 2, available at http://eosps0.gsfc.nasa.gov/ftp_docs/African_Dust.pdf (last visited Nov. 2, 2010).
- ²⁸ Jack Weinberg, International POPs Elimination Network, *An NGO Guide to Persistent Organic Pollutants*, Final Text (Nov. 7, 2008), at 11, available at

<http://www.ipen.org/ipenweb/documents/book/saicm%20introduction%20english.pdf> (The “grasshopper effect” occurs when POPs suspended in the atmosphere fall back to the Earth due to colder temperatures or rain. The POPs remain on the Earth’s surface for a while and later evaporate back into the air, skipping again and again between the air and the surface in what has been described as the grasshopper effect. In general POPs evaporate more easily in warmer locations and fall out more easily in colder locations which often results in gradual migration towards, and higher concentrations collecting in, colder regions such as the Arctic.).

²⁹ See Clean Ocean Foundation, *The Solution, What is Required?*, at 1, available at http://www.cleanocean.org/index_general.asp?menuid=240.010 (last visited Nov. 1, 2010). (“The solution to pollution is dilution” is the principle which describes some traditional approaches to pollution management whereby sufficiently diluted pollution is considered less or not harmful. However, it assumes that the diluent is available in nearly unlimited supply.).

³⁰ See generally U.S. Global Change Research Program (USGCRP), available at <http://www.globalchange.gov/> (last visited Nov. 1, 2010) (The USGCRP, which consists of 13 agencies and departments, coordinates and integrates federal research on changes in the global environment and their implications for society. Note that other agencies like the U.S. Military’s Defense Advanced Research Project Agency (DARPA) are also heavily engaged in climate change research, but in this case from a military perspective.).

³¹ NASA, Global Climate Change, NASA’s Eye on Earth, Evidence, *Climate Change: How Do We Know?*, at 1, available at <http://climate.nasa.gov/evidence/> (last visited Nov. 1, 2010).

³² *Id.*

³³ *Id.*

³⁴ See generally NASA’s Eye on Earth, Uncertainties, *supra* note 3, at 1.

³⁵ *Id.* (noting that satellite instruments have been measuring the output of the sun since 1978 and comparing it to atmospheric temperatures.) .

³⁶ *Id.* (noting that longer-term estimates of solar irradiance have been made using sunspot records and other proxy indicators such as the amount of CO₂ in tree rings.)

³⁷ *Id.*

³⁸ *Id.* See also Marcel De Armas and Maria Vanko, *Mitigating Black Carbon as a Mechanism to Protect the Arctic and Prevent Abrupt Climate Change*, 8 SUSTAINABLE DEV. L. & POL'Y 41, 42 (2008).

³⁹ Jonathan B. Wiener, *Radiative Forcing: Climate Policy to Break the Logjam in Environmental Law*, N.Y.U. ENVTL. L.J. 210, 226 (2008).

⁴⁰ NASA's Eye on Earth, Uncertainties, *supra* note 3, at 1.

⁴¹ *Id.*

⁴² *Id.*

⁴³ *Id.*

⁴⁴ *Id.*

⁴⁵ *Id.* See also Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Chapter 8, *Climate Models and Their Evaluation*, (2007), available at http://www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html.

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ U.S. Central Intelligence Agency (CIA), World Fact Book (2010), at 1, available at <https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html> (last visited Nov. 1, 2010).

⁴⁹ NASA, Global Climate Change, NASA's Eye on Earth, Causes, *The Greenhouse Effect*, at 1, available at <http://climate.nasa.gov/causes/> (last visited Nov. 1, 2010).

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² NASA's Eye on Earth, Uncertainties, *supra* note 3, at 1.

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ NASA's Eye on Earth, Evidence, *supra* note 31, at 1.

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ *Id.* See also I. Allison et.al., *The Copenhagen Diagnosis: Updating the World on the Latest Climate Science*, UNSW Climate Change Research Center, Sydney, Australia, 2009, available at <http://www.copenhagendiagnosis.org/>.

⁵⁹ *Id.* See also Levitus, et al, *Global Ocean Heat Content 1955–2008 in Light of Recently Revealed Instrumentation Problems*, *Geophys. Res. Lett.* 36, L07608 (2009), available at <ftp://ftp.nodc.noaa.gov/pub/data.nodc/woa/PUBLICATIONS/grlheat08.pdf>.

⁶⁰ *Id.*

⁶¹ *Id.*

⁶² *Id.*

⁶³ *Id.* See also *Giant Ice Island Breaks Away from Greenland*, Reuters (Aug. 8, 2010), at 1, available at <http://www.abc.net.au/news/stories/2010/08/07/2976597.htm> (noting that “[a]n ice island measuring 260 square kilometres broke off from one of Greenland's two main glaciers, scientists say, the biggest such event in the Arctic in nearly 50 years.”)

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ National Snow and Ice Data Center, State of the Cryosphere, *Is the Cryosphere Sending Signals about Climate Change?* (2008), at 1, available at http://nsidc.org/sotc/glacier_balance.html.

⁶⁷ NASA's Eye on Earth, Evidence, *supra* note 31, at 1.

⁶⁸ *Id.*

⁶⁹ *Id.*

⁷⁰ U.S. EPA, *Frequently Asked Questions about Global Warming and Climate Change: Back to Basics*, (2009), at 7, available at http://www.epa.gov/climatechange/downloads/Climate_Basics.pdf.

⁷¹ NASA's Eye on Earth, Evidence, *supra* note 31, at 1.

⁷² NASA's Eye on Earth, Causes, *supra* note 49, at 1.

⁷³ *Id.*

⁷⁴ NASA, Global Climate Change, NASA's Eye on Earth, Effects, *The Current and Future Consequences of Global Change*, at 1, available at <http://climate.nasa.gov/effects/> (last visited Nov. 1, 2010).

⁷⁵ *Id.*

⁷⁶ NASA's Eye on Earth, Causes, *supra* note 49, at 1.

⁷⁷ U.S. EPA, *Frequently Asked Questions about Global Warming*, *supra* note 68, at 1.

⁷⁸ NASA's Eye on Earth, Causes, *supra* note 49, at 1.

⁷⁹ U.S. EPA, *Frequently Asked Questions about Global Warming*, *supra* note 70, at 1.

⁸⁰ *Id.*

⁸¹ NASA's Eye on Earth, Causes, *supra* note 49, at 1.

⁸² *Id.*

⁸³ *Id.*

⁸⁴ *Id.*

⁸⁵ U.S. Census Bureau, World Population Clock, <http://www.census.gov/ipc/www/popclockworld.html> (as of Nov. 1, 2010 at 15:13 UTC there was a projected world population of 6,878,789,076).

⁸⁶ U.S. CIA World Fact Book, *supra* note 48, at 1.

⁸⁷ Carl Sagan, *Pale Blue Dot: A Vision of the Human Future in Space* (1st edition ed.). New York: Random House, (1994) (noting that the Earth looked like a “pale blue dot” in the photograph taken by Voyager 1 on February 14, 1990, as it left Earth’s atmosphere.).

⁸⁸ Pew Center, Public Praises Science, *supra* note 7, at 5.

⁸⁹ *Id.*

⁹⁰ IPCC, *Fourth Assessment Report, Climate Change 2007: Synthesis Report, Summary for Policy Makers* (2007), at 30, available at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf.

⁹¹ *Id.*

⁹² *Id.*

⁹³ *Id.* at 37.

⁹⁴ *Id.* at 39.

⁹⁵ *Id.* (also compare to traditional burdens of proof in U.S. cases and whether “very likely” would be able to carry the requisite causation requirement.).

⁹⁶ Remarks by the President at the Morning Plenary Session of the United Nations Climate Change Conference in Copenhagen, Denmark on December 18, 2009, at 1, available at <http://www.whitehouse.gov/the-press-office/remarks-president-morning-plenary-session-united-nations-climate-change-conference>.

⁹⁷ *Id.*

⁹⁸ *Id.*

⁹⁹ Pew Center, Wide Partisan Divide Over Global Warming, *supra* note 6, at 1. *But see* Climate Confidence Monitor 2010, HSBC, The World’s Local Bank, at 2, available at http://www.hsbc.com/1/PA_1_1_S5/content/assets/sustainability/101026_hsbc_climate_confidence_monitor_2010.pdf (stating that climate change is consistently a top international concern ranking third behind concerns for economic stability and terrorism.).

¹⁰⁰ *Id.*

¹⁰¹ *Id.*

¹⁰² *Id.*

¹⁰³ *Id.*

¹⁰⁴ *Id.* Pew Center, Fewer Americans See Solid Evidence of Global Warming, *supra* note 6, at 1.

¹⁰⁵ *Id.*

¹⁰⁶ *Id.*

¹⁰⁷ *Id.*

¹⁰⁸ Max Fisher, *Why Republicans Deny Climate Change* (Oct. 18, 2010), at 1, available at

<http://www.theatlanticwire.com/opinions/view/opinion/Why-Republicans-Deny-Climate-Change-5422>.

¹⁰⁹ *Id.*

¹¹⁰ See e.g. Dick Morris, *The New Republican Right* (Oct. 20, 2010), available at

<http://www.dickmorris.com/blog/the-new-republican-right/>..

¹¹¹ Pew Center, Wide Partisan Divide, *supra* note 6, at 1.

¹¹² *Id.*

¹¹³ *Id.*

¹¹⁴ *Id.*

¹¹⁵ Pew Center, Fewer Americans See Solid Evidence of Global Warming, *supra* note 6, at 1.

¹¹⁶ *Id.*

¹¹⁷ *Id.*

¹¹⁸ *Id.*

¹¹⁹ *Trail Smelter (U.S. v. Can.)*, 3 R.I.A.A. 1905, 1938 (1949).

¹²⁰ Thomas W. Merrill, *Golden Rules for Transboundary Pollution*, 46 DUKE L.J. 931, 947 (1997).

¹²¹ *Id.*

¹²² *Id.* at 948-950.

¹²³ *Id.* at 950.

¹²⁴ *Corfu Channel (U.K. v. Alb.)*, 1949 I.C.J. 4 (Apr. 9).

¹²⁵ *See generally Corfu Channel (U.K. v. Alb.)*, 1949 I.C.J. 4 (Apr. 9).

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ *Id.*

¹²⁹ For more information on each of these individual efforts and developments, see for example Hunter, Salzman & Zaelke, *International Environmental Law and Policy* (3d ed. 2007).

¹³⁰ David A. Wirth, *The Rio Declaration on Environment and Development: Two Steps Forward and One Back, or Vice Versa?*, 29 GA. L. REV 599, 600-601 (1995).

¹³¹ *Id.* at 601.

¹³² Lakshman Guruswamy, *International Environmental Law: Boundaries, Landmarks, and Realities*, 10 NAT. RESOURCES & ENV'T 43, 45 (1995).

¹³³ *Id.*

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ *Id.*

¹³⁷ Jodie Hierlmeier, *UNEP: Retrospect and Prospect – Options for Reforming the Global Environmental Governance Regime*, 14 GEO. INT'L ENVTL. L. REV. 767, 773 (2001).

¹³⁸ *See generally* Gregory C. Shaffer and Mark A. Pollack, *Hard vs. Soft Law: Alternatives, Complements, and Antagonists in International Governance*, 94 MINN. L. REV. 706 (2010) (noting that soft law is often defined as that law which is non-binding, and discussing how both hard law and soft law can complement each other and lead to greater international cooperation).

¹³⁹ Wirth, *supra* note 130, at 602-603.

¹⁴⁰ *Id.*

¹⁴¹ *Id.* at 599.

¹⁴² *Id.* at 604.

¹⁴³ *Id.* at 634.

¹⁴⁴ United Nations Framework Convention on Climate Change, June 3-14, 1992, *Rio Declaration on Environment and Development*, at 1, available at <http://www.unep.org/Documents.Multilingual/Default.Print.asp?documentid=78&articleid=1163>.

¹⁴⁵ *Id.*

¹⁴⁶ David Hunter, James Salzman & Durwood Zaelke, *International Environmental Law and Policy* 195 (3d ed. 2007). See also Nicholas A. Robinson, *The Sands of Time: Reflections on the Copenhagen Climate Negotiations*, 27 PACE ENVTL. L. REV. 599, 606 (2010).

¹⁴⁷ Agenda 21, U.N. Conference on Environment and Development, U.N. Doc A/CONF. 151/26 (1992) available at <http://www.un.org/esa/dsd/agenda21/>.

¹⁴⁸ See Guruswamy, *supra* note 132, at 44-45.

¹⁴⁹ *Id.* at 46

The emergence of the right to development was an important and central theme of the Rio Conference. It was so critical that there was even initial tension as to what to name the conference. The fact that there was agreement on the conference title and that both the terms “environment” and “development” are included was itself considered an important achievement. This tension between developed and developing nations is a common thread throughout the development of international environmental law.

¹⁵⁰ Margaret Rosso Grossman, *Climate Change and the Law*, 58 AM. J. COMP. L. 223, 228 (2010).

¹⁵¹ *Id.*

350 ppm is the target level generally advocated by IPCC scientists, and is also associated with the 350.Org campaign. Whereas 550 ppm is the target level advocated as an upper bound by others such as in the 2006 Stern Review on the Economics of Climate Change available at

http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm.

).

¹⁵² John C. Dernbach and Seema Kakade, *Climate Change Law: An Introduction*, 29 ENERGY L.J. 1, 9 (2008).

¹⁵³ *Id.*

¹⁵⁴ *Id.*

¹⁵⁵ *Id.* See also UNFCCC, Essential Background, The Convention and the Protocol, at 1, available at http://unfccc.int/essential_background/items/2877.php (last visited Nov. 10, 2010).

¹⁵⁶ *Id.*

¹⁵⁷ *Id.*

¹⁵⁸ *Id.* at 10.

¹⁵⁹ *Id.*

¹⁶⁰ IPCC Second Assessment Climate Change Report (1995), at 22, available at <http://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf>.

¹⁶¹ Hunter, *supra* note 146, at 677.

¹⁶² *Id.*

¹⁶³ *Id.*

¹⁶⁴ *Id.*

¹⁶⁵ *Id.*

¹⁶⁶ Dernbach, *supra* note 152, at 11.

¹⁶⁷ Todd M. Lopez, *A Look at Climate Change and the Evolution of the Kyoto Protocol*, 43 NAT. RESOURCES J. 285, 296 (2003).

¹⁶⁸ *Id.*

¹⁶⁹ *Id.*

¹⁷⁰ *Id.*

¹⁷¹ *Id.*

¹⁷² *Id.* at 297.

¹⁷³ *Id.*

¹⁷⁴ Hunter, *supra* note 146, at 680.

¹⁷⁵ *Id.*

¹⁷⁶ *Id.*

¹⁷⁷ *Id.* (Annex I countries are the industrialized countries which include but are not limited to the U.S., European Union, Russian Federation, and the United Kingdom.).

¹⁷⁸ *Id.* See also Lopez, *supra* note 167, at 298.

¹⁷⁹ *Id.*

¹⁸⁰ *Id.* at 680, 691.

¹⁸¹ Dernbach, *supra* note 152, at 10.

¹⁸² Hunter, *supra* note 146, at 680.

¹⁸³ *Id.* at 688.

¹⁸⁴ *Id.* at 689. See also Lopez, *supra* note 167, at 303.

¹⁸⁵ Dernbach, *supra* note 152, at 12.

¹⁸⁶ Hunter, *supra* note 146, at 689-690.

¹⁸⁷ Grossman, *supra* note 150, at 229.

¹⁸⁸ Hunter, *supra* note 146, at 690.

¹⁸⁹ *Id.* at 702.

¹⁹⁰ Grossman, *supra* note 150, at 230.

¹⁹¹ U.S. Department of State, *U.S. Submission on Copenhagen Agreed Outcome*, Introductory Comments (May 29, 2009), at 1, available at <http://www.state.gov/g/oes/rls/other/2009/124101.htm>.

¹⁹² Grossman, *supra* note 150, at 230.

¹⁹³ *Id.*

¹⁹⁴ *Id.*

¹⁹⁵ *Id.*

¹⁹⁶ *Id.* See also Simon Lomax, *Weak Economy Puts U.S. Halfway to Obama's CO2 Cut (Update1)*, Bloomberg (Dec. 8, 2009), at 1, available at <http://www.bloomberg.com/apps/news?pid=newsarchive&sid=avsKgyllsEMA> (noting that due to a weak economy that “[c]arbon dioxide output from the U.S. energy sector has already fallen half as much as needed to meet the 2020 emissions reduction target the Obama administration took to the Copenhagen climate-change summit.”).

¹⁹⁷ *Id.*

¹⁹⁸ *Id.*

¹⁹⁹ *Id.*

²⁰⁰ *Id.* See also Alister Doyle, *Factbox - Pledges of Climate Aid, Vital to U.N. Deal*, Reuters (August 26, 2010), at 1, available at <http://www.reuters.com/article/idUSLDE67O1AA> (noting that “[p]ledges by rich countries to provide developing nations with ‘fast start’ funds to fight climate change are closing in on a \$30 billion goal for 2010-12.”).

²⁰¹ *Id.*

²⁰² *Id.* See also Lomax, *supra* note 196, at 1.

²⁰³ *Id.*

²⁰⁴ *Id.* at 231.

²⁰⁵ See e.g. Ambassador Stuart Eizenstat, *The U.S. Role in Solving Climate Change: Green Growth Policies Can Enable Leadership Despite the Economic Downturn*, Keynote Address to the Energy Bar Association, 30 ENERGY L.J. 1, 1 (November 14, 2008).

²⁰⁶ See UNFCCC Conference of Parties 16 website at http://unfccc.int/meetings/cop_16/items/5571.php (last visited Nov. 1, 2010).

²⁰⁷ Hannah Bentley and Steve Zikman, *Local Governments Key to Cancun Climate Talks*, 25-FALL NAT. RESOURCES & ENV'T 57, 57 (2009).

²⁰⁸ Eizenstat, *supra* note 205, at 2.

²⁰⁹ *Id.*

²¹⁰ Bonnie Docherty and Tyler Giannini, *Confronting a Rising Tide: A Proposal for A Convention on Climate Change Refugees*, 33 HARV. ENVTL. L. REV. 349, 386 (2009).

²¹¹ *Id.*

²¹² Eizenstat, *supra* note 205, at 2.

²¹³ Thomas Ferraro, *Policy Impact of Republican Gains in Congress*, Reuters (Nov. 3, 2010), at 1, available at <http://www.reuters.com/article/idUSTRE6A250N20101103> (noting that “Republicans will take control of the House of Representatives and have a much stronger position in the Senate in 2011 after voters on Tuesday punished Democrats over concerns about the weak U.S. economy.”).

²¹⁴ Grossman, *supra* note 150, at 231.

²¹⁵ *Id.*

²¹⁶ *Id.* at 233.

²¹⁷ *Id.* at 234.

²¹⁸ *Id.*

²¹⁹ *Id.* at 234-235. See also EPA Fact Sheet, Mandatory Reporting of Greenhouse Gases (40 CFR Part 98) Rule Overview (Aug 2010), at 1, available at <http://www.epa.gov/climatechange/emissions/downloads09/FactSheet.pdf>.

²²⁰ *Id.* at 235.

²²¹ *Id.*

Note, however, that even prior to gaining control of the U.S. House of Representatives on Nov. 2, 2010, some Republican members of the U.S. Congress introduced measures to strip the U.S. EPA of their

authority to regulate GHGs, and if this is not successful to alternatively limit the funding necessary to implement any future GHG reduction program.

²²² *Id.* at 238-239.

²²³ *Id.* at 239.

²²⁴ *Id.*

²²⁵ *Id.* at 240.

²²⁶ Pew Center on Global Climate Change, *Climate Policy Memo #1 - Cap and Trade v Taxes* (March 2009), at 1, available at <http://www.pewclimate.org/docUploads/Policy-Memo-1-CapTradevTax-09%2007%2001.pdf>.

²²⁷ *Id.*

²²⁸ *Id.*

²²⁹ *Id.* See also Laura Petersen, *Global Economy Must Tally Environmental Costs – Report*, *New York Times* (Oct. 20, 2010), at 1, available at <http://www.nytimes.com/gwire/2010/10/20/20greenwire-global-economy-must-tally-environmental-costs--4664.html> (recommending the implementation of “a variety of financial tools, such as charging for services, creating environmentally friendly markets with eco-labeling and providing financial incentives and subsidies for environmentally friendly businesses” in order to internalize environmental values and costs.).

²³⁰ *Id.*

²³¹ *Id.*

²³² Title IV of the 1990 Amendments to the Clean Air Act (1990 CAAA, Public Law 101-549).

(Note that some believe the Acid Rain cap and trade program was successful primarily because there was a lower sulfur coal already available in Wyoming’s Powder River Basin. Therefore, any “success” of the Acid Rain Program should not necessarily be used to support the proposed implementation of a cap and trade for GHGs since there are currently no low or zero emission alternative fuels readily and economically available for this inelastic product.).

²³³ See Maureen B. Cavanaugh, *On the Road to Incoherence: Congress, Economics, and Taxes*, 49 UCLA L. REV. 685 (2002) (A pigouvian tax, named after economist Arthur Pigou, is a tax levied on a market activity that generates negative externalities and is intended to correct the market outcome.).

²³⁴ Cinnamon Carlarne, *The Kyoto Protocol and the WTO: Reconciling Tensions Between Free Trade and Environmental Objectives*, 17 COLO. J. INT'L ENVTL. L. & POL'Y 45, 48 (2006).

²³⁵ Report of the Appellate Body on U.S. Import Prohibition of Certain Shrimp and Shrimp Products, Oct. 12, 1998, 38 I.L.M. 118 (1999).

²³⁶ Howard F. Change, *Towards a Greener GATT: Environmental Trade Measures and the Shrimp-Turtle Case*, 74 S. CAL. L. REV. 31, 32 (2000).

²³⁷ Grossman, *supra* note 150, at 252.

²³⁸ *Id.*

²³⁹ U.S. Government Accountability Office, Report to the Chairman, Select Committee on Energy Independence and Global Warming, Climate Change Adaptation: Strategic Federal Planning Could Help Government Officials Make More Informed Decisions (GAO-10-113, Oct. 2009), *available at* <http://www.gao.gov/new.items/d10113.pdf>. For details on selected federal agency efforts see GAO-10-114SP (Oct. 2009), *available at* <http://www.gao.gov/products/GAO-10-114SP>.

²⁴⁰ Grossman, *supra* note 150, at 253.

²⁴¹ *Id.*

²⁴² *Id.* at 254.

²⁴³ United Nations Development Programme (UNDP), Climate Change, *Subnational Initiatives*, at 1, *available at* <http://www.undp.org/climatechange/subnational.shtml> (last visited Nov. 2, 2010).

²⁴⁴ *Id.*

²⁴⁵ *See generally* Bentley, *supra* note 207, at 57. *See also* UNDP, *Subnational Initiatives*, *supra* note 231, at 1.

²⁴⁶ *Id.*

²⁴⁷ *Id.*

²⁴⁸ *Id.* See also Press Release, Office of the Governor, State of California, *Gov. Schwarzenegger Announces New Coalition of Subnational Leaders to Combat Climate Change* (Dec. 14, 2009), at 1, available at <http://gov.ca.gov/press-release/14032/> (noting that “[a]ction is needed at the national and international levels to reduce the effects of global warming, but California has shown that state and regional governments can also institute policies on their own that will see real environmental improvements and grow green jobs. R20 will continue that subnational leadership around the world by recognizing that meeting the challenges of climate change requires an unprecedented level of cooperation and collaboration through all levels of government.”).

²⁴⁹ *Id.* See also United Cities and Local Governments, *Cities to Raise Their Voices When Nations Gather at the Climate Summit in Copenhagen Next Week*, Local Government Climate Roadmap (Dec. 4, 2009), at 1, available at http://www.uclgcongress.com/index.php?option=com_content&view=article&id=70:cities-to-raise-their-voices-when-nations-gather-at-the-climate-summit-in-copenhagen-next-week&catid=39:topics&Itemid=18.

²⁵⁰ *Id.*

²⁵¹ *Id.*

²⁵² *Id.*

²⁵³ *Id.*

²⁵⁴ Grossman, *supra* note 150, at 248.

²⁵⁵ Elizabeth Burleson, *Climate Change Consensus: Emerging International Law*, 34 WM. & MARY ENVTL. L. & POL’Y REV. 543, 588 (2010).