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WISE

The Washington Internships for Students of Engineering is a ten-week program for outstanding engineering students who have completed their junior year and display evidence of leadership skills and interest in public policy. The students spend the summer in Washington, DC learning how engineers contribute to public policy decisions on complex technological matters. Through frequent meetings and discussions with government officials and other policy-makers, students examine a variety of public policy issues. Each student completes a paper that analyzes specific engineering public policy issues of concern to the sponsoring society. For information about the WISE program, contact WISE, Attn: Anne Hickox, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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EXECUTIVE SUMMARY

Global climate change has become a prevalent policy issue in recent decades, emerging as a major world concern for the 21st century. Because climate change has no jurisdictional boundaries, agreements in legislation must be international in order to be effective. To address this issue, the United Nations Framework Convention on Climate Change (UNFCCC) is slated to meet in December 1997 at its third Conference of Parties (COP-3) in Kyoto, Japan. Until now, no binding and comprehensive climate change policies have been implemented by international agreement. The United States is preparing policy alternatives to propose at the Convention for an international mandate regulating greenhouse gas emissions suspected to be linked with climate change.

Environmental groups, the U.S. Environmental Protection Agency (EPA), and other organizations are concerned that if sharp reductions in greenhouse gas emissions are not demanded in the immediate future, anthropogenic (or human-generated) gases will cause irreversible damage to the global environment. Projected effects of climate change include an increase in the earth's average surface temperature, severe weather events such as flooding and storms, and shifts in regional climate that will result in increased incidence of some diseases and changes in agricultural conditions across the globe.

In order to diminish these threats, environmentalists are calling for explicit emissions limits to be met within a specified time frame. Arguments against these defined emissions ceilings pertain to the uncertainty that concentrations of greenhouse gases can be stabilized or lowered without impairing economic strength.

In drafting its proposals for COP-3, the United States government is addressing concerns that the domestic economy will suffer from restricting greenhouse emissions. Industries are apprehensive about new regulations that will dampen productivity by forcing them to invest in expensive technologies to utilize alternative fuels or research new methods that may lower emissions and thus hinder production outputs and profits.

In addition, industry fears that developing nations, including China, India, and Indonesia, will be excluded from participation in any international treaties on the grounds that their primary resources should be spent on socio-economic, rather than environmental, issues. However, many of the developing nations are significant emitters of greenhouse gases. Most of these emissions come from the burning of fossil fuels for cost-effective energy use.

At their present rate, developing nations are projected to exceed the developed world in their emissions within 30 years. If they are not regulated now, it is argued, the problem of climate change will be even more difficult to approach in the future. Also, failing to include developing nations in a mandate could be damaging to the

competitiveness of the United States and other industrialized nations in the global market and throw world trade dangerously out of balance.

In considering all of these issues and concerns, the United States government is weighing a number of proposals to present to the United Nations conference in Kyoto. These strategies are market-driven policies designed to cost-effectively reduce greenhouse gas emissions without impeding U.S. competitiveness in the global market. It is desired that other industrialized nations choose to adopt these measures, ensuring cooperation among capable governments and industries.

Among these strategies, joint implementation involves the open exchange of technology through private-sector investment in developing nations, where the investing corporation is given incentives to participate. A system of emissions trading credits has also been proposed for international implementation, in which countries could sell and trade emissions allowances, pursuing the lowest cost in emissions abatement. An internationally imposed carbon tax is also being considered, in an attempt to discourage the purchase and use of fossil fuels. In addition, the United States has initiated a direct-subsidies program aimed at promoting sustainable development and environmental health in developing nations.

The United States must protect its economic interests in any international agreements reached regarding climate change. However, the environmental considerations cannot be ignored in the interests of economic fitness. It is beneficial for the United States, in formulating its position and recommendations on climate change policy, to present proposals that address both environmental and economic concerns. Realizing that other nations may not agree to some of the market-based strategy alternatives, it is also imperative that the United States not compromise its position and prematurely agree to numerical emissions reduction targets without researching the technological and economic feasibility of time constraints.

GLOBAL CLIMATE CHANGE AS A POLICY ISSUE

Some time after the industrial revolution, it became apparent to the developed world that there is indeed a price to pay for technological advancement. For all of the new technologies and conveniences enjoyed by modern society, there is a threat to the earth and its natural resources. Industrialization began with the notion that resources were unlimited and that the only direction in which to move was straight ahead. History has proven, however, that caution must be taken to reduce the risk of irreversible damage. Since prevention is the best solution to most problems, it is therefore urged that action be taken now against global climate change to prevent crisis in the future.

Definition of Climate Change

The relatively new concept of climate change is most simply defined as the noticeable changes in weather and environmental patterns across the globe, due to both natural and anthropogenic, or human-made, causes. It is the anthropogenic causes that must be investigated as the effort to protect the environment proceeds. Given the power of nature, it is likely to survive the human race. The challenge lies in humanity's struggle to adapt to its environment. As such, responsibility must be taken for unnatural changes made to the climate.

Like the glass in a greenhouse, the atmosphere serves to trap heat from the sun around the earth, providing an environment warm enough for human, animal, and plant survival. This natural "greenhouse effect" is enhanced by increased concentrations of natural and anthropogenic greenhouse gases. As a result of increased industrialization beginning in the last century, higher amounts of these gases are discharged into the earth's atmosphere. It is theorized that increased emissions by factories, machines, and some industrial processes heat the atmosphere beyond its natural capacity, causing extreme changes in the global environment over a long period of time. Included among these greenhouse gases are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and halocarbons.

Carbon dioxide has been the primary focus of the greenhouse gas debate, largely because it is the one most abundantly emitted by anthropogenic processes, primarily fossil fuel combustion, though it is naturally occurring itself.ⁱ Concentrations of CH₄ and N₂O, also naturally occurring, are increasing due to agricultural development, waste disposal, and fossil fuel use. While CH₄ is more reactive in the atmosphere than CO₂, its sources are more difficult to identify; thus less emphasis is placed on its control.ⁱⁱ

ⁱ *Climate Change 1995 - The Science of Climate Change: Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change*. New York: Cambridge University Press, 1995, 20.

ⁱⁱ *Climate Change 1995 - The Science of Climate Change*, 22.

Halocarbons (including chlorofluorocarbons and hydrofluorocarbons) are essentially anthropogenic greenhouse gases, and most likely have an effect opposite to that of other greenhouse gases. Because of their reaction with stratospheric ozone, halocarbons may actually have a cooling effect on the surface of the earth.ⁱⁱⁱ These heating and cooling effects, it is important to note, do not occur uniformly over the earth's surface, nor do they negate each other. Different regions of the earth, like the poles versus the equator, experience widely varying effects, hence the term "climate change."

Exacerbating the threat of climate change is the decrease in size, number, and capacity of the earth's natural sinks, such as forests, which are areas that absorb some of the greenhouse gases in the atmosphere. For example, rain forests around the world are being depleted at a rate of "one and a half football fields a second."^{iv} This deforestation - a result of poor agricultural practices, over-development, and expanding industrial presence - is just one example of how natural sinks are diminishing, reducing the earth's natural ability to deal with increased amounts of these greenhouse gases.

Oceans, as well, may be potentially altered by a changing climate. The warming of the atmosphere could accelerate glacier melts at the poles of the earth, increasing fresh water run-off into oceans and thus raising sea-levels. Also, heat from the atmosphere absorbed by the oceans would cause expansion and again raise sea-levels as molecular activity and energy increase.^v For coastal areas, this poses dangerous threats of severe flooding and loss of land area as the oceans creep further onto the shoreline.

Motivations Behind the Call for Policy

Evidence that the earth has already been affected by increased greenhouse activity is convincing of the need for action. Since the late nineteenth century, the average temperature of the earth's surface has risen by between 0.54 and 1.08°F, and it is predicted that its temperature will rise 6°F by 2100. Further, ten of the warmest years on record this century have occurred since 1980.^{vi}

ⁱⁱⁱ *Climate Change 1995 - The Science of Climate Change*, 22.

^{iv} Andrew Revkin, *Global Warming: Understanding the Forecast*. New York: Abbeville Press Publishers, 1992, 78.

^v Revkin, 110.

^{vi}3. "Climate Change State of Knowledge." Washington DC: Office of Science and Technology Policy, July 1996.

The greatest motivating factor in the climate change issue is public health. Studies cite increases in the number of vector-borne diseases, such as malaria, and non-vector-borne diseases, such as cholera, as a result of the increase in the earth's temperature. In tropical climates, a rise in temperature will heighten the incidence of heat-related mortalities and the air quality in general will decline.^{vii}

Public health concerns also involve regional food supplies in developing areas, where climate affects agricultural development and land uses more severely in the absence of economic resources. The availability of arable land could be drastically reduced in some regions. If fields are scorched by high temperatures, crops will fail, leaving local populations short on food, not to mention depriving local economies of sale profits.^{viii} These threats to present and future generations are the driving force behind the present call for a global policy to address climate change.

CLIMATE CHANGE POLICY BACKGROUND

The Vienna Convention and Montreal Protocol

^{vii} "Climate Change State of Knowledge."

^{viii} "Climate Change State of Knowledge."

Because global climate change is an issue inherently free from jurisdiction, the United Nations has attempted to address policy from a world standpoint, imploring all nations to take some form of responsibility. The initial action taken to prevent global climate change was an indirect one, dealing primarily with the ozone layer. The Vienna Convention for the Protection of the Ozone Layer in 1985 set up the first mandate for nations to educate themselves on the threats posed by emissions of anthropogenic greenhouse gases. Included among the goals were research efforts by nations in the areas of ozone depletion and its ramifications, as well as technological possibilities aimed at preventing harm to the global climate. The Vienna Convention also encouraged the exchange of technologies among nations, including developing areas that have little or no resources to approach the problem independently.^{ix}

Subsequently, the Montreal Protocol on Substances that Deplete the Ozone Layer, signed in January 1989 and updated in 1990 and 1992, called for the eventual phasing out of a number of substances known to be greenhouse gases that cause ozone depletion, such as halons and aerosols. The Protocol also introduced provisions that would allow for the trading of rights to pollute a number of specified substances, such as chlorofluorocarbons (CFCs), a policy that served as a precursor to the presently proposed emissions trading credits system.^x

Addressing the problem of developing nations' participation in protecting the ozone layer, the Montreal Protocol instituted a separate standard for their compliance with new regulations. If developing nations kept emissions of certain controlled substances below specified levels, they would be given an extended time limit in which to comply with new regulations. Also, a multilateral fund was established by industrialized nations to aid developing nations in environmental areas.

The United Nations Framework Convention on Climate Change

In 1991, the United Nations sponsored a conference of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC/FCCC). The UN Framework Convention on Climate Change was signed in June 1992 at the Rio de Janeiro Conference on Environment and Development (or "Rio Earth Summit") and was entered into force in March 1994 as the first binding international agreement addressing climate change exclusively.^{xi} The convention calls for international cooperation in the "stabilization of greenhouse gas concentrations in the atmosphere at

^{ix} "Phasing out CFCs: The Vienna Convention and its Montreal Protocol." (Climate Change Fact Sheet 224), <http://www.unep.ch/iucc/fs224.html>.

^x "Phasing out CFCs: The Vienna Convention and its Montreal Protocol."

^{xi} "The Convention on Climate Change: What Does it Say?" (Climate Change Fact Sheet 250), <http://www.unep.ch/iucc/fs250.html>.

a level that would prevent dangerous anthropogenic interference with the climate system,”^{xii} a goal which has yet to be reached.

Since the 1992 convention, the participating nations, known collectively as the Conference of Parties (COP), have met twice. COP-1, meeting in Berlin, Germany in March 1995, resulted in the Berlin Mandate. The Berlin Mandate prescribed, but did not delineate, international negotiations to address emissions reductions goals, to be completed by COP-3 in Kyoto, Japan in December 1997. The Berlin Mandate also recognized the differing levels of responsibility shared by all nations, calling for “the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions.”^{xiii} As such, developing nations are included in the imperative for action, but are not given a definitive level of involvement.

COP-2, meeting in Geneva, Switzerland in July 1996, served as a review mechanism for the progress being made in emissions reductions around the globe and as a means of strengthening the Parties’ commitment to an international policy by COP-3.

CLIMATE CHANGE POLICY CONCERNS

Major U.S. Players in the Climate Change Debate

Several groups within the United States government are voicing their ideas and concerns about imminent climate change policy. The U.S. Environmental Protection Agency (EPA), the nation’s primary environmental advocacy and regulatory agency, has formulated a number of the proposals that the United States is considering. In addition, presidential advisors and councils, such as the Council on Environmental Quality and the Committee of Advisors on Science and Technology, have input into the United States’ position on climate change proposals. The administration is concerned with addressing climate change effectively from an environmental perspective. Doing so in cooperation with other nations, including those in the developing world, can simultaneously protect the domestic economy.

^{xii} “The Convention on Climate Change: What Does it Say?” (quoting Article 2 of the United Nations Framework Convention on Climate Change, May 1992).

^{xiii} “The Berlin Mandate,” 7 April 1995.

Representing the United States in global climate change negotiations is the Department of State, led by Under Secretary for Global Affairs Timothy Wirth. The State Department's goal is to ensure that action is taken quickly against the threat of anthropogenic climate change while at the same time securing the participation of the developing world.

Congress is also vocalizing a number of responses to United States proposals. Among them is the Byrd-Hagel Resolution (S. Res. 98), introduced by Sen. Robert Byrd (D-WV) and Sen. Chuck Hagel (R-NE). The resolution, which was approved on July 25, 1997 by a vote of 95 - 0, is a non-binding resolution that states that the U.S. should not sign any global climate change treaty unless it meets two conditions. First, any treaty that mandates a numerical emissions reduction targets for industrialized nations must do the same for developing nations. Second, measures must be included that ensure the safety of the U.S. economy in a global market.

In addition, environmental organizations have interest in the climate change debate. Groups such as Ozone Action and Greenpeace have voiced the opinion that immediate action is necessary to protect the environment. Thus, they are proponents of strict regulations that put the environment in the forefront of the argument.

United States industries make up another sector with inherent interests in climate change policy. Its main goal is to protect the domestic economy and maintain United States competitiveness in a global market. A number of coalitions have formed among industry representatives, such as the Global Climate Coalition and the International Climate Change Partnership. These groups have representatives from a wide range of energy-intensive industries, including petroleum, automotive, chemical, and power companies.

There is also concern from labor groups such as the AFL-CIO, specialized unions, and trade associations, over domestic employment. If U.S. competitiveness is threatened by climate change policies, then so are U.S. jobs. The American Farm Bureau Federation, for instance, argues that "most farmers familiar with the climate change treaty are less concerned with the illness than they are with the cure that's being prescribed for them."^{xiv} In other words, laborers are driven more by their livelihoods and less by environmental issues.

Participation of Developing Nations

One of the central arguments in the climate change debate, from the perspective of the United States, is the level of participation that developing nations should have in a global climate change treaty. In the interest of protecting labor and competitiveness on

^{xiv} Statement of Bruce Neidig, President, The American Farm Bureau Federation, before the International Economic Policy, Export and Trade Promotion Subcommittee, Foreign Relations Committee, United States Senate, 19 June 1997.

a global market, the United States must be certain that agreements reached on an international level do not compromise U.S. industries. Thus, developing nations should be included in any treaty.

This is not only a concern of the United States, however. An accepted estimate by the United Nations and the United States is that within 30 years the presently developing world will surpass the developed world in greenhouse gas emissions. Figure 1 illustrates the projection that United States CO₂ emissions, for instance, will peak before 2075, while those of the rest of the world, including developing nations, increase exponentially (primarily as a result of the burning of fossil fuels like coal, one of the cheapest and most convenient sources of energy readily available to the developing world).^{xv} The American Farm Bureau Federation said of the United States, “by forcing compliance of developed countries only, we fail to invest our efforts where they will achieve the greatest emissions reductions.”^{xvi} If action is not taken, then the developing world will continue in its present direction and do further harm to the environment, aside from the economic threats this path poses to industrialized nations.

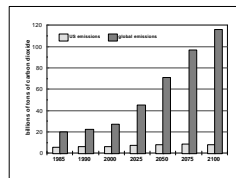


Figure 1 Baseline CO₂ Emissions Assuming High Economic Growth

If developing nations are not legally bound to reduce greenhouse emissions under the same or similar conditions as the United States and the rest of the industrialized nations, then they will be able to continue unrestricted production of exportable goods and gain an edge in global trading. Industries that are forced to research new technologies or limit production as a means of limiting emissions will have an obvious disadvantage, losing stakes both domestically and internationally.

^{xv} “Carbon Charges as a Response to Global Warming: the Effects of Taxing Fossil Fuels.” Washington DC: Congressional Budget Office, August 1990, 50-51.

^{xvi} Bruce Neidig, 19 June 1997.

Figure 2 demonstrates another facet of the United States' concern that it will assume the majority of the financial responsibility if developing nations do not take action to reduce emissions.^{xvii} The issue can be illustrated using a hypothetical climate change policy involving all nations, where the cost is assumed to be two percent of each nation's gross domestic product (GDP). The resulting benefit, in reduced damage due to anthropogenic climate change, is also an assumed two percent of the GDP of each nation, a situation in which the end justifies the means for all parties involved.

However, if only industrialized (Annex 1) nations, accounting for approximately 25 percent of emissions through the year 2100, participate in the policy, then the benefit for the industrialized nations is reduced to the equivalent of 0.5 percent of each nation's GDP, where developing nations receive a free advantage in the form of environmental improvement. Further, if only the United States (ten percent of emissions through 2100) implements this hypothetical policy, then the cost also remains at two percent, while the benefits drop to 0.2 percent of the GDP of the United States.

In the last two scenarios, the some nations are receiving the benefits of the implemented policy while assuming none of the costs. Non-participating nations are free-riders when "it is impossible to exclude countries from the benefits of the policy

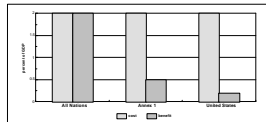


Figure 2 Cost to Participant vs. Benefit to Participant of Hypothetical Climate Change Policy

change.”^{xviii} The same policy that is implemented multilaterally, bearing equal costs and benefits, could result in minimal benefits for the cost if it is implemented only by the

^{xvii} Based on W. David Montgomery. "Developing a Framework for Short- and Long-Run Decisions on Climate Change Policies." Washington DC: American Council for Capital Formation Center for Policy Research, October 1995, 3.

^{xviii} Montgomery, 4.

United States. This predicament must be avoided if the United States intends to protect its global economic interests.

Numerical Targets and Timetables

Though there is agreement among the industrialized nations that action needs to be taken now against drastic climate change threats in the future, the debate remains whether specific emissions targets should be established. If they are established, what should be the targeted time frame? For example, the European Union (EU) has proposed that the industrialized world reduce emissions to a level 15 percent below those of 1990 by 2010. Within the EU, however, there is debate between the richer and the poorer countries over how that number will be reached and how obligations will be distributed among emitters.^{xix}

The Association of Small Island States (AOSIS), however, supports a proposal striving for the cutting of emissions by 20 percent from 1990 levels by 2005. These strict standards are rationalized by future projections that sea-levels will rise, posing severe threats to leaving small island nations. Russia (an Annex I nation), in a different plan, suggests stabilization of emissions at 1990 levels by 2010, or stabilization at 1990 levels by 2020 for countries in transition to developed status. These examples illustrate the wide range of opinion among countries of how much abatement is possible and how quickly it can be accomplished.

Unlike other industrialized nations, the United States has not yet proposed a specific emissions reduction target level. However, it is recognized that a numerical target will be set. In addition, the United States is supporting eventual binding limits for developing nations. At a hearing before the House Commerce Subcommittee on Energy and Power, Under Secretary of State for Global Affairs Timothy Wirth related the U.S. proposal that “calls on developing country Parties [to the Convention] to adopt, by 2005, binding provisions so that all Parties have quantitative greenhouse gas emissions obligations and so that there is a mechanism or ‘trigger’ for automatic application of those obligations.”^{xx}

Many United States industry representatives believe it is simply too soon to be discussing numerical levels because research has not been in-depth enough to clearly determine what is feasible and what is necessary in terms of reducing emissions. The Business Roundtable, for example, “an association of chief executive officers committed to improving public policy,” publicly announced its disapproval of imminent

^{xix} “EU Ministers Agree to New Plan On Greenhouse Gases for U.N. Meeting,” Daily Environment Report, 23 June 1997, AA-3.

^{xx} Statement of The Honorable Timothy E. Wirth, Under Secretary of State for Global Affairs, before the Subcommittee on Energy and Power, Committee on Commerce, U.S. House of Representatives, 15 July 1997.

international regulations. In an advertisement in *The Washington Post*, 130 of its members agreed that “a balanced approach is only possible with careful study, input from a wide variety of sources, and extensive public debate.” They further “urge the Clinton/Gore administration not to rush to policy commitments until the environmental benefits and economic consequences of the treaty proposals have been thoroughly analyzed.”^{xxi}

A fact in support of this argument is the continuing research of scientists around the country into global climate change. Though for the most part scientists stay outside of the political sphere, they are continuing their pursuit of answers. Scientists at NASA’s Goddard Institute for Space Studies, for instance, are using satellite technology to research “the longer-term linkages between atmospheric chemistry and the global climate.”^{xxii}

Some other groups do not agree that it is too early to set reduction targets, including the EU, which feels that the United States, as the leading emitter of anthropogenic greenhouse gases, has a responsibility in taking a leadership position in the policy-making arena against climate change. Some environmental groups are pushing for swifter action. Greenpeace official Aphrodite Mourelatou, commenting on the EU’s target reduction proposal of 15 percent of 1990 levels by 2010, criticized the plan as “disastrous both environmentally and politically” and indicated that Greenpeace was supportive of the loftier goal set forth by AOSIS.^{xxiii} Proposals for numerical targets carry with them the interests of each debating party, and this debate will most likely continue into COP-3.

UNITED STATES PROPOSED POLICY ALTERNATIVES

In attempts to involve developing nations in the process, a number of market-driven strategies have been proposed as part of a comprehensive treaty on global climate change. The objective of such policy alternatives is to provide additional resources to the countries that need them while at the same time giving industrialized nations

^{xxi} *The Washington Post*, 10 June 1997, A 7-9.

^{xxii} NASA Goddard Institute for Space Studies Atmospheric Chemistry Research, <http://www.giss.nasa.gov/Research/chemistry>.

^{xxiii} “EU Ministers Agree to New Plan On Greenhouse Gases for U.N. Meeting,” AA-3.

incentive to more generously share information and technologies. Among the market-based policies proposed are differentiation, joint implementation, emissions trading credit schemes, fossil fuel taxation, and direct subsidies to developing nations.

Differentiation

In approaching climate change from a worldwide scope, giving attention to both environment and economy, each nation will have varying strategies. One of the ways proposed by the United States and other industrialized nations to accommodate varying economic and technological systems around the world is to use differentiation in domestic policies. Differentiation is simply allowing for flexibility in the implementation of international agreements.

Contrary to the concept of common “command-and-control” measures, differentiation does not specify what methods must be used to reach targeted levels. Yet it also does not compromise definite stabilization targets. Nations are simply given options regarding how to reach those levels. Once a protocol has been established globally, nations can utilize the most cost-effective methods for compliance available to them. The United States would benefit from differentiation because of its allowance for innovative, as well as creative, use of technologies to reduce greenhouse emissions.

Joint Implementation and Additionality

Joint implementation is another of the market-driven strategies proposed for a global plan to reduce the emissions of anthropogenic greenhouse gases. It refers to industry involvement in developing areas in order to establish methods and technologies that will reduce that nation’s greenhouse gas emissions, as undertaken by the United States Initiative on Joint Implementation (USIJI). Instituted in 1993, USIJI promotes communication among industrialized nations and developing nations that could benefit from new technologies. In order to accelerate this technology flow, joint implementation will “encourage private sector investment and innovation in the development and dissemination of new technologies for reducing net emissions of greenhouse gases.”^{xxiv}

The initiative fosters the exchange of resources, including training programs, processes, methods, or machinery, between industry and developing communities so that they may incorporate “cleaner” technology into their original infrastructures. Provisions such as this promote the concept of sustainable development, where environmental awareness and technologies in developing nations will continue successfully into the future. As an incentive, the participating industries receive credits for aiding in the reduction of greenhouse emissions.

^{xxiv} President William J. Clinton and Vice President Albert Gore, Jr. *The Climate Change Action Plan*. October 1993, All-1.

Among the benefits of joint implementation cited by its proponents is the improvement of the environment of the participating country, including increases in air and even water quality. In addition, the cooperation draws business into developing areas, creating jobs as well as increasing the local standard of living. Thus, joint implementation projects seek to decrease the total global level of greenhouse emissions by involving all active parties who share responsibility.^{xxv}

Industry favors joint implementation as a regulatory alternative, acknowledging that climate change policy is impending and that market-based strategies would do the least harm to them economically. The International Climate Change Partnership (ICCP) is a representative coalition of industry, one of many like it that has expressed this opinion. Kevin J. Fay, executive director of ICCP, related industry support in his statement that policies such as joint implementation “can help to maximize greenhouse gas emission reductions most cost-effectively. ICCP is fully supportive of such mechanisms as part of any agreement in Kyoto and beyond.”^{xxvi}

The United States is utilizing joint implementation only in a pilot phase until the year 2000, citing non-financial benefits for participating industries. The incentives that inherently exist as part of the program include input into the development of international criteria for joint implementation, public recognition, technical assistance provided on a limited basis by the federal government, and access to new opportunities in the global market.^{xxvii}

Another incentive that presently exists is the possibility that stricter international regulations may soon be in place. Undertaking a joint implementation project now would offer U.S. industries additional time in meeting future standards. However, following the same assumption of strict emissions standards, there is also the possibility that a U.S. corporation would find it most financially beneficial to simply move operations into an underdeveloped area, where higher emissions are tolerated and labor is less expensive.

Based on the concept of joint implementation, “additionality” is encouraged by the United States. Additionality fosters the same benefits as joint implementation, but demands more of the participating industry. Any project brought into a developing nation would have to be one that goes above and beyond the necessary requirements in reducing emissions. As such, industries are at the same time promoting sustainable

^{xxv} “Description of the U.S. Initiative on Joint Implementation,” <http://www.ji.org/usiji/descrip.html>, 1-2.

^{xxvi} Statement of Kevin J. Fay, Executive Director, International Climate Change Partnership, before the Subcommittee on International Economic Policy, Export and Trade Promotion, Committee on Foreign Relations, U.S. Senate, 19 June 1997.

^{xxvii} “Description of the U.S. Initiative on Joint Implementation,” 3-4.

development in the region, theoretically sharing technology that will not be obsolete in the coming decades.

Because of the abstruse nature of additionality, however, industry has been wary of supporting the policy. It is difficult to quantify a new technology's longevity and value in this age. Therefore, industries hesitate to put time and money into proposing a project if there is little certainty of its acceptance or effectiveness.

Emissions Trading Credits

Also aimed at protecting United States interests in the global market, an international system of greenhouse gas emissions trading credits has been proposed. Its main intent is to provide a means for nations to reduce greenhouse emissions at minimal cost. Basically, nations would be given credits (also referred to as permits, quotas, or allowances) to emit greenhouse gases. A permit holder could legally emit only as much as it held permits for, one ton of pollution per permit, for example. These permits could be bought or sold among nations as needed. Thus, parties that incur lower abatement costs would benefit financially from selling some of their permits and investing in emissions reduction. Conversely, other parties may find it more cost-effective to buy permits that allow for the emissions without spending funds on new technologies. Figure 3 depicts the possible financial savings of this cooperative scheme over uniform abatement efforts carried out by individual nations.^{xxviii}

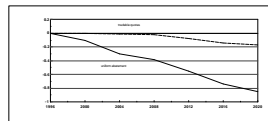


Figure 3 Percent Change in Gross National Expenditure Over Time: Tradable Quotas vs. Uniform Abatement

^{xxviii} Based on Brian Fisher. *The Economic Impact of International Climate Change Policy*, paper presented at Competitive Enterprise Institute Conference, "The Costs of Kyoto: Climate Change Policy and its Implications," Washington DC, 15 July 1997, 8.

The EPA Proposal

The EPA announced a proposal that outlines the details of an international emissions trading scheme. The proposal quotes a possible savings of up to 50 percent of present emissions reductions costs, noting that “the ultimate effectiveness of a trading system in lowering the costs of reducing emissions will depend on its ability to keep transaction costs low, and its success in creating and maintaining the credibility of the commodity being traded.”^{xxix} There are a number of intrinsic conditions included in the proposal for an emissions trading scheme that will ensure this objective.

First, the EPA recognizes the need for legally binding emissions agreements that set a clear target for nations to reach in reducing greenhouse gas emissions. Once this target is established internationally (most likely as a percentage of 1990 levels), each participating nation would be allocated an emissions budget, in tons of carbon equivalent emissions allowed or tons-allowed. For each period, only a certain number of tons of emissions would be permitted worldwide, thus maintaining the legal limit. This system is therefore appropriately “designed to foster and facilitate compliance with Parties’ emissions budget by providing a mechanism which encourages low cost emission reductions but requires significant, automatic consequences for failure to achieve the required budget levels.”^{xxx}

The result of failing to comply with emissions agreements would involve primarily financial punitive measures. The party in violation would be restricted in its trading until proper review by the governing body was performed. Where appropriate, the nation would be fined for its non-compliance or penalized with a lower emissions budget in the following budget period.^{xxxi} In addition, nations that bought allowances from the non-complying party would be restrained from making use of the acquired credits. The proposal also states that nations could use discretion in dealing with specific issues of non-compliance.

Second, participating nations must be held responsible for their emissions; thus, a standard system of recording and monitoring greenhouse gas emissions must be installed. The EPA proposes that standardized methods of measuring and recording emissions be implemented internationally to ensure proper compliance and that annual reports be provided by each nation, tracking emissions levels and budget transactions. Under this plan, the Framework Convention on Climate Change (FCCC) Secretariat

^{xxix} “U.S. Views: International Emissions Trading,” Washington DC: United States Environmental Protection Agency, June 1997, 1.

^{xxx} “U.S. Views: International Emissions Trading,” 2.

^{xxxi} “Fact Sheet on Supplemental U.S. Climate Change Proposals,” (revisions on the U.S. draft protocol proposal to the Ad Hoc Group on the Berlin Mandate). Washington DC: Department of State, June 1997, Article 2.6.bis.

would be responsible for overseeing the inventory process, the details of which are still being scrutinized.

Finally, it is necessary for nations that participate in a trading program to be able to comply with emissions regulations effectively. There must be suitable systems in place to track greenhouse gas emissions domestically before a nation can actively participate in trading allowances internationally. There must also be an appropriate governmental body organized that will verify the nation's compliance with emissions regulations and organize the domestic programs necessary to do so.

Domestically, there are options that participating nations have in allotting their credits. A party could implement national regulations on its companies, and trading permits internationally to aid in the funding of domestic programs. Alternatively, the national government could divide permits among private companies, which would in turn trade amongst themselves or, with approval from the government, trade credits internationally. A nation could also choose to combine these strategies and implement both approaches.

Debatable Issues in the EPA Proposal

A system of emissions trading credits would thus appear advantageous to all parties involved. Of primary interest is the fact that a trading scheme does not compromise the establishment of a clear emissions reduction target. A definite emissions ceiling would exist, ensuring that pollution would not exceed a specified level in a given time frame. Secondly, the trading of credits allows for cost-efficient means of meeting emissions standards. Companies which can afford abatement undertake it, while the cost of meeting emissions standards is shared by all parties.

The most recognized advantage of an international credit trading program is its global approach to the climate change issue. Such a method would allow for international cooperation and assessment of progress in reducing emissions. However, therein also lies a salient question: who will supervise the program? The logistics of assembling an unbiased and technically proficient party to enforce regulations would be both complicated and expensive. While the FCCC Secretariat is named as the primary authority in the EPA's proposal, details of this plan would have to be extensively organized if the proposal were to be accepted.

Also, the worldwide scope of the trading system could vastly alter the economic balance of trade and capital on the global market. This concern has left industry, always protective of U.S. competitiveness in the global market, uncertain about the actual benefits of the trading scheme proposal. While it has proven effective in a domestic scope, as a means of reducing sulfur dioxide (SO₂) in the atmosphere and reducing acid rain, international economic implications are much greater, since many countries are known not to have sufficient technology to reach proposed target levels.

There would be such an increase in the flow of trading and money as a result of the system that it may harm the economic balance of the global market.

This concern is supported by a study conducted by the Australian Bureau of Agricultural and Resource Economics. It found that the United States would be the only nation that actually does not benefit financially from a tradable quotas approach, as opposed to “business-as-usual uniform abatement” of emissions. Concluding that difference in costs is minimal, “the significant reduction in marginal emissions abatement costs in other Annex I regions relative to that for the United States reduces the competitiveness of U.S. industry compared to the situation it faced with uniform targets.”^{xxxii} Taking into consideration the variable nature of present computer models used for these projections, this scenario still presents a legitimate case for industry’s hesitations.

National Permits and Emissions Fees

An alternative proposal to the international emissions trading scheme is a “system of national permits and emissions fees,” suggested by the Brookings Institution.^{xxxiii} Its main arguments against the EPA plan are stated simply: “An international permit system aimed at stabilizing emissions would not be politically viable in developed countries, would distort or compromise the world trade system, would be unattractive to developing countries, and would be difficult to monitor and enforce.”^{xxxiv} This study cites the need for feasible emissions level goals that can be reached by reducing the growth of emissions rather than mandating the stabilization of emissions levels.

In order to reach this more modest goal of slowing emissions growth, the Brookings Institution’s plan would establish permits, to be distributed or sold by the government, and fees, that would supplement the international permits and be directed under the national government. This system would provide incentive for countries to lower emissions whenever it could be done for less than the specified national fee. The proposal does not guarantee large emissions reductions, but would ensure that abatement would occur at lowest possible cost and that emissions would at least be reduced, an argument that many would consider insufficient. Also, the details of a policing body under this proposal have not been examined, leaving open questions about compliance and handling violations.

Fossil Fuel Taxation

^{xxxii} Fisher, 9.

^{xxxiii} Warwick J. McKibbin and Peter J. Wilcoxon. “A Better Way to Slow Global Climate Change.” Washington DC: The Brookings Institution, June 1997, 1.

^{xxxiv} McKibbin and Wilcoxon, 6.

As a means of discouraging the use of carbon-emitting substances, a tax could be imposed on fossil fuels, like coal and petroleum. The most effective way to do so, it can be argued, would be to tax the actual carbon content of fossil fuels (also referred to as a carbon charge), motivating energy-users to make use of alternative fuels or invest in cleaner technologies. A carbon tax has already been imposed in a number of industrialized nations, such as the Netherlands, Finland, Sweden, and Norway, and has been proposed in other regions, including nations across Europe.^{xxxv} The United States Congress has requested studies by its Congressional Budget Office on a carbon tax and its effects on the U.S. economy.

Theoretically, a carbon tax may be one of the most effective means of lowering emissions, since it essentially calls for the phasing out of one of the most prevalent pollutants, CO₂. However, a carbon tax is also argued to be one of the least efficient alternatives, in that the cost to the consumer and the harm to the national economy of the United States are both potentially too great. According to an analysis conducted by the American Council for Capital Formation's Center for Policy Research, in order to lower emissions to 1990 levels by 2010, a tax of up to \$200 per ton of carbon emitted may be required.^{xxxvi} Even lowering the tax to \$100 per ton would leave emissions above 1990 levels by the year 2010, a questionable result given the cost of achieving it.

In this situation, the United States stands to lose more than a possible \$350 billion each year in its gross domestic product (GDP).^{xxxvii} In addition, because fuel and energy costs would increase, other consumer areas would suffer. As seen in Figure 4, consumer spending could significantly decrease in areas affected by fossil fuel use as a result of a carbon tax.^{xxxviii} For example, there could be as much as a 27 percent decrease in electricity spending. This direct result does not account for the numerous other economic ramifications of a carbon tax, such as possible deflation of oil prices and its effect on foreign trade.

^{xxxv} "The Economics of Carbon Taxes." (Climate Change Fact Sheet 230), <http://www.unep.ch/iucc/fs230.html>.

^{xxxvi} Lawrence M. Horwitz. "The Impact of Carbon Dioxide Emission Reductions on Living Standards and Lifestyles." Washington DC: American Council for Capital Formation Center for Policy Research, October 1995, 1.

^{xxxvii} Horwitz, 2.

^{xxxviii} Based on Horwitz, 4.

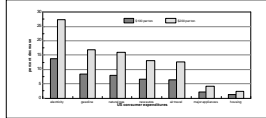


Figure 4 Estimated Negative Impacts of a Carbon Tax by 2010

Another argument against a carbon tax is that United States industries would simply relocate to developing nations, where fossil fuel would presumably be more readily available and remain untaxed. This would do major harm to the United States economy. Consumer costs could rise due to shipping charges incurred by industry and unemployment rates could increase as a result of factory and plant relocations.

In its own study, however, the Congressional Budget Office concluded that carbon taxation could be successful, under the right circumstances. It suggests that “rapidly imposing large charges could be hazardous for the economy, but the costs could be held to a loss of 1 percent to 2 percent of the GNP annually during the first decade by phasing in the charges and taking offsetting actions”^{xxxix} to control their effect on the economy. It is important to note that the same study points out that “the costs of reducing the consumption of fossil energy suggest that there may be merit in looking into other ways of dealing with [global climate change].”^{xl}

CURRENT U.S. POLICY ACTIONS

In a program proposed at the meeting of Earth Summit +5 in New York (June 26, 1997), President Clinton announced four environment initiatives to confront the issue of climate change. The Initiatives are an important step toward garnering support from

^{xxxix} “Carbon Charges as a Response to Global Warming: the Effects of Taxing Fossil Fuels,” xvi.

^{xl} “Carbon Charges as a Response to Global Warming: the Effects of Taxing Fossil Fuels,” xvii.

federal agencies, domestic industries, and environmental groups for imminent international policies, particularly those proposed by the United States.

Developing Country Climate Change Initiative

To be handled by the Agency for International Development, the Developing Country Climate Change Initiative is a plan to directly subsidize developing nations in their efforts to reduce greenhouse emissions. The program guarantees a minimum of \$150 million annually in foreign aid. The motivation behind this initiative goes back to the concern that many presently developing nations will exceed the United States in their greenhouse gas emissions within 30 years. To protect against further harm to the environment as a result, this subsidies program will “focus on providing technical assistance and training for improved forest and energy sector management, including promoting energy efficiency and the development of renewable energy sources.”^{xli} While aid to the developing world is the most direct way to gain environmental influence there, the United States’ assumption of large part of the financial burden is still an issue.

Overseas Private Investment Corporation Environmental Program

The Overseas Private Investment Corporation (OPIC) is an agency of the United States government that facilitates private investment by industry in the developing world. For its future projects, OPIC’s part in the President’s initiative involves the establishment of stricter guidelines for the sake of environmental and ecological protection of natural areas. OPIC will encourage joint implementation projects, require reporting of greenhouse gas emissions and other environmental hazards by U.S. industry participants, and maintain open communication with the public in order to address its concerns and consider its opinions.^{xlii}

Million Solar Roofs

In order to encourage the use of renewable energy sources and thus decrease the burning of fossil fuels, the Million Solar Roofs Project seeks to install one million solar water heaters and photovoltaic solar panels on roofs for businesses and communities by 2010. The Initiative quotes a reduction of over 660,000 tons of carbon dioxide per year as a result of these installations.^{xliii} The program will be directed by the Department of Energy, in cooperation with the Departments of Agriculture, Housing and Urban Development, and Veteran’s Affairs, the Small Business Administration, the Federal Emergency Management Agency, and the Freddie Mac, and Fannie Mae loan agencies.

^{xli} President William J. Clinton, in an address to the United Nations General Assembly Special Session, New York City, 26 June 1997.

^{xlii} President William J. Clinton, to the UN General Assembly Special Session.

^{xliii} President William J. Clinton, to the UN General Assembly Special Session.

Climate Change Technology Strategy

An integral part of any policy made to deal with climate change is the availability of new technologies to accomplish the greenhouse gas emissions reductions. This facet of the issue has been largely, and noticeably, absent from the public debates on climate change. Addressing this deficiency, the President issued a challenge to the nation's scientists, including his own advisors, industry experts, and universities, to research and develop innovative methods of lessening the effects of climate change. The strategy includes a focus on energy efficiency, clean power generation, and basic and advanced technological research.^{xliv} It remains to be seen how successfully this challenge will be met, and how the technology will fit into any agreements reached at COP-3 in Kyoto.

Thus far, the primary focus of the climate change debate has been the economic impact of proposed policies. This is certainly a major concern for all parties. However, it is pertinent that government and industry consider the technological implications of greenhouse emissions reduction mandates. Pragmatic methods must be established for both reducing greenhouse gas emissions as well as monitoring these emissions accurately, assuring the compliance of all parties responsible.

CLIMATE CHANGE POLICY RECOMMENDATIONS

In formulating its policy proposals on global climate change, the United States must keep a number of considerations in mind. First, U.S. industries will be significantly affected by international greenhouse gas emissions regulations. Second, models predict that the developing world will undoubtedly surpass the industrialized world in greenhouse emissions in the near future. Finally, cooperation with foreign nations is imperative in effectually reducing global greenhouse emissions. To address these stipulations, it is recommended that the United States:

- ☞ pursue the acceptance of its market-driven strategies in a global arena.
- ☞ petition the involvement of developing nations, for the protection of both the environment and the domestic economy.
- ☞ ensure that any proposal is technologically and economically feasible.
- ☞ proceed swiftly in the interest of prevention.

In order to approach climate change forcefully, while at the same time protecting domestic economic concerns, the United States must present its market-based policy alternatives for acceptance at the international level. Given the widely varying

^{xliv} President William J. Clinton, to the UN General Assembly Special Session.

economic statuses of nations around the world, collaboration would alleviate the financial burden of greenhouse emission abatement. The proverbial “level playing field” may not actually exist, but in this case must be pursued. This is not to say that the United States should not take responsibility as the present leading emitter of greenhouse gases. On the contrary, it and its stakeholders should take a leadership role in the abatement of emissions and in the prevention of further damage to the global environment.

It is imperative that the United States protect its economic interests in any international agreements reached regarding climate change. However, the environmental considerations cannot be neglected in the interests of economic fitness. It is beneficial for the United States, in formulating its position and recommendations on climate change policy to present its proposals that address both environmental and economic concerns.

Realizing that other nations may not agree to some of the market-based strategy alternatives, it is also imperative that the United States does not compromise its position and prematurely agree to numerical targets without researching the technological and economic feasibility of time constraints.

Differentiation and joint implementation would benefit not only the United States but also all participating parties, allowing for cost-effective reductions in greenhouse emissions. A system of emissions trading credits is also a viable option, but only if an efficient international control system is established. Regarding a fossil fuel tax, more resources should be spent on investigating definitive benefits and drawbacks or possible alternative measures. In the case of direct financial aid from the United States, as well as private sector investment projects, the administration needs to confirm that any funds it invests are being well-appropriated to projects that will foster both financial security and environmental health in developing nations.

If the United States is able to secure support for its market-based proposals, then time should not be wasted debating the issue further, following the understanding that “if governments wait until all uncertainties are eliminated, they may sacrifice an important opportunity to deal with the problem.”^{xlv} Assuming that the logistics of international policy require lengthy negotiations, then there will be time to sort through details of implementation and hear the arguments of all concerned parties. But it is essential for the world, and especially the United States, to come to a definitive conclusion to take action against climate change.

^{xlv} “Carbon Charges as a Response to Global Warming: the Effects of Taxing Fossil Fuels,” xvii.

ENDNOTES