global issues

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Climate Change: The Choices

Gathering Crisis Requires Worldwide Action

Our overriding environmental challenge is the worldwide problem of climate change, global warming — the gathering crisis that requires worldwide action. The vast majority of scientists have concluded unequivocally that if we don't reduce the emission of greenhouse gases, at some point in the next century we'll disrupt our climate and put our children and grandchildren at risk.
This past December, America led the world to reach a historic agreement committing our nation to reduce greenhouse gas emissions through market forces, new technologies, and energy efficiency.
We have it in our power to act right here, right now.

— State of the Union, January 27, 1998

We must work with business and industry to find the right ways to reduce greenhouse gas emissions. We must promote technologies that make energy production and consumption more efficient.

—White House Conference on Climate Change, October 6, 1997

President of the United States

global issues
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GLOBAL ISSUES

An Electronic Journal of the U.S. Information Agency

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USIA's electronic journals, published and transmitted worldwide at three-week intervals, examine major issues facing the United States and the international community, and inform foreign publics about the United States. The journals — ECONOMIC PERSPECTIVES, GLOBAL ISSUES, ISSUES OF DEMOCRACY, U.S. FOREIGN POLICY AGENDA and U.S. SOCIETY AND VALUES — provide analysis, commentary, and background information in their thematic areas. All journals are translated into French and Spanish, with the Hypertext versions published one week after the English; the Adobe Acrobat versions appear shortly thereafter. Selected issues are also translated into Arabic, Chinese, Portuguese, and Russian, with the latter two appearing on Hypertext and Adobe Acrobat versions. The opinions expressed in the journals do not necessarily reflect the views or policies of the U.S. Government. Articles may be reproduced and translated outside the United States unless there are specific copyright restrictions cited on the articles. Current or back issues of the journals can be found on the U.S. Information Service (USIS) Home Page on the World Wide Web at "http://www.usia.gov/journals/journals.htm". They are available in several electronic formats to facilitate viewing on-line, transferring, downloading, and printing. Comments are welcome at your local USIS office or at the editorial offices: Editor, Global Issues (I/TGIC), U.S. Information Agency, 301 4th Street SW, Washington, D.C. 20547, United States of America. You may also communicate via email to *ejglobal@USIA.gov.*

FOCUS

THE KYOTO PROTOCOL: A FRAMEWORK FOR ACTION

Stuart E. Eizenstat
Undersecretary of State
for Economic, Business and Agricultural Affairs

Excerpts of remarks made February 11, 1998, before the Senate Committee on Foreign Relations.

Rarely has there been an environmental issue more important or complex than global warming, and rarely has there been a greater need for the executive branch and the Congress to work closely together. I hope to leave you with a clear understanding of why we believe that it is necessary to act, [and] of how we intend to proceed internationally.

THE SCIENCE

Human beings are changing the climate by increasing the global concentrations of greenhouse gases such as carbon dioxide, methane, and nitrous oxide. Burning coal, oil, and natural gas to heat our homes, power our cars, and illuminate our cities produces carbon dioxide and other greenhouse gases as by-products — more than 6,000 million metric tons worth of carbon in the form of carbon dioxide annually.

Similarly, deforestation and land clearing also release significant quantities of such gases — another 1 to 2,000 million tons a year. Over the last century, greenhouse gases have been released to the atmosphere faster than natural processes can remove them. There is no ambiguity in the data — since 1860, concentrations of carbon dioxide have risen 30 percent, from 280 parts per million (ppm) to 365 ppm.

In December 1995, the authoritative Intergovernmental Panel on Climate Change (IPCC), representing the work of more than 2,000 of the world's leading climate change scientists from more than 50 countries, concluded that "the balance of evidence suggests that there is a discernible human influence on global climate.

"The IPCC assessment represents the best synthesis of the science of climate change. It concludes:

- Concentrations of greenhouse gases could exceed 700 ppm by 2100 under "business as

usual" — levels not seen on the planet for 50 million years. The projected temperature increase of 1 to 3.6 degrees Centigrade over the next 100 years could exceed rates of change for the last 10,000 years.

- Increased temperatures are expected to speedup the global water cycle. Faster evaporation will lead to a drying of soils and in some areas increased drought. Overall, however, due to the faster global cycling of water, there will be an increase in precipitation.

- Sea levels are expected to rise between 15 and 94 centimeters over the next century. A 50-centimeter sea level rise could double the global population at risk from storm surges — from roughly 45 million to over 90 million, even if coastal populations do not increase. Low-lying areas are particularly vulnerable.

- Human health is likely to be affected. Warmer temperatures will increase the chances of heat waves and can exacerbate air quality problems such as smog, and lead to an increase in allergic disorders. Diseases that thrive in warmer climates, such as dengue fever, malaria, yellow fever, encephalitis, and cholera are likely to spread due to the expansion of the range of disease-carrying organisms. By 2100, there could be an additional 50-80 million cases of malaria each year.

ELEMENTS OF THE KYOTO PROTOCOL

Last December in Kyoto, Japan, the nations of the world reached agreement on an historic step to control greenhouse gas emissions which cause global warming. In order to secure an effective agreement that is environmentally strong and economically sound, President Clinton and Vice President Gore established three major objectives.

Our first objective — realistic targets and timetables among developed countries — had to be a credible step in reducing the dangerous buildup of greenhouse gases, yet measured enough to safeguard U.S. prosperity at home and competitiveness abroad. In the end, we secured the key elements of the president's proposal on targets and timetables. The agreement and related decisions include:

- The U.S. concept of a multi-year time frame for emissions reductions rather than a fixed, single-year target. The multi-year time frame will allow the United States, other nations, and our industries greater flexibility in meeting our targets. Averaging over five years, instead of requiring countries to meet a specific target each year, can lower costs, especially given an uncertain future. The averaging can smooth out the effects of short-term events such as fluctuations in the business cycle and energy demand, or hard winters and hot summers that would increase energy use and emissions.

- The U.S. specific time frame of 2008-2012, rather than earlier periods preferred by the European Union (E.U.) and others, gives us more time to phase in change gradually and deploy new technologies cost-effectively, and thereby to cushion the effects on our businesses and workers.

- Differentiated targets for the key industrial powers ranging from 6 percent to 8 percent below baseline levels (1990 and 1995) of greenhouse gas emissions, with the United States agreeing to a 7 percent reduction. When changes in the accounting rules for certain gases and offsets for activities that absorb carbon dioxide are factored in, the level of effort required of the United States is quite close to the president's original proposal to return emissions to 1990 levels by 2008-2012, representing at most a 3 percent real reduction below that proposal, and perhaps less.

- An innovative proposal shaped in part by the United States, allowing certain activities, such as planting trees, which absorb carbon dioxide — called "sinks" — to be offset against emissions targets. This will promote cost-effective solutions to climate change and encourage good forestry practices. This will be of special benefit to the United States, a major forestry nation.

- As proposed by the United States, the Kyoto Protocol covers all six significant greenhouse gases even though the E.U. and Japan proposed and fought until the last moment to cover only three. This was an important environmental

victory — also supported by many in our own industry — because gases that other countries wanted to omit and leave uncovered, including substitutes for the now banned chlorofluorocarbons that endanger the ozone layer, are among the fastest growing and longest lasting greenhouse gases.

FLEXIBLE MARKET MECHANISMS

Our second broad presidential objective was to make sure that countries can use flexible market mechanisms to reach their targets rather than the mandatory "policies and measures," such as carbon taxes, favored by the European Union and many other developed countries.

The Kyoto Protocol enshrines a centerpiece of this U.S. market-based approach — the opportunity for companies and countries to trade emissions permits. In this way, companies or countries can purchase less expensive emissions permits from companies or countries that have more permits than they need (because they have met their targets with room to spare). This is not only economically sensible, but environmentally sound.

By finding the least expensive way to reduce emissions, we will be providing a strong incentive for achieving the maximum level of emissions reductions at the least cost. The United States has had a very positive experience with permit trading in the acid rain program, reducing costs by 50 percent from what was expected, yet fully serving our environmental goals.

We went even further by achieving a conceptual understanding with several countries, including Australia, Canada, Japan, New Zealand, Russia, and Ukraine, to trade emissions rights with each other. This "umbrella group" could further reduce compliance costs.

MEANINGFUL PARTICIPATION OF DEVELOPING COUNTRIES

Our third objective was to secure meaningful participation of key developing countries, a concern that the Senate obviously shares, as evidenced by last summer's Byrd-Hagel Resolution. Global warming is, after all, a global problem that requires a global solution — not only from the developed world but also from key developing countries.

Per capita emission rates are low in the developing world and will remain so for some time, and over 70 percent of today's atmospheric concentrations of greenhouse gases attributable to human activities are the result of emissions by the industrialized world.

At the same time, it is also true that by around 2015 China will be the largest overall emitter of greenhouse gases, and by 2025 the developing world will emit more greenhouse gases in total than the developed world. So from an environmental perspective, this problem cannot be solved unless developing countries get on board.

Some developing countries believe — wrongly — that the developed world is asking them to limit their capacity to industrialize, reduce poverty, and raise their standard of living.

We have made clear that we support an approach under which developing countries would continue to grow — but in a more environmentally sound and economically sustainable way, by taking advantage of technologies not available to countries that industrialized at an earlier time.

The Kyoto agreement does not meet our requirements for developing-country participation. Nevertheless, a significant down payment was made in the form of a provision advanced by Brazil and backed by the United States and the Alliance of Small Island States. This provision defines a Clean Development Mechanism, which embraces the U.S.-backed concept of "joint implementation with credit." The goal is to build a bridge — with incentives — between developed, industrialized countries, and developing nations.

This new mechanism will allow companies in the developed world to invest in projects in countries in the developing world — such as the construction of high-tech, environmentally sound power plants — for the benefit of the parties in both worlds. The companies in the developed world will get emissions credits at lower costs than they could achieve at home, while countries in the developing world will share in those credits, and

receive the kind of technology that can allow them to grow without ruining their environment. The Clean Development Mechanism has great potential, but developing countries will need to do more in order to participate meaningfully in the effort to combat global warming. In determining what developing countries ought to do, we should be aware that the circumstances of developing countries vary widely.

Some today are very poor; their greenhouse gas emissions are negligible and are likely to remain so for the foreseeable future. Others, whose greenhouse gas emissions are not substantial, are relatively well off. Some are poor on a per capita basis, but their greenhouse gas emissions today rival or surpass those of the most advanced industrialized nations. Still others have already joined ranks with the industrialized world in the OECD but have not yet fully accepted the added responsibility for protection of the global environment that comes with their new status.

Recognizing our common but differentiated responsibilities and respective capabilities, it will be necessary to develop an approach that provides for a meaningful global response to the threat of global warming, while acknowledging the legitimate aspirations of developing countries to achieve a better life for their peoples.

To succeed, we will need to ensure that those responsible for a significant share of global emissions accept their responsibility to protect the global environment. We will also need to ensure that those who are able to do so contribute according to their capacities and stage of development.

FRAMEWORK FOR ACTION

Where do we go from here? While historic, the Kyoto Protocol is only one step in a long process. It is, in essence, a framework for action, a work in progress, and a number of challenges still lie ahead.

Rules and procedures must be adopted to ensure that emissions trading rights, joint implementation, and the Clean Development Mechanism operate efficiently and smoothly. The Kyoto Protocol establishes emissions trading, but leaves open the specifics of operations. We will work hard to ensure that the rules and procedures adopted enable emissions trading, joint implementation, and the Clean Development Mechanism to work smoothly and efficiently, thereby encouraging the private sector to engage.

We will also work closely with our industries to be sure they are satisfied that the emissions trading system that is developed is as efficient and effective as possible to meet their needs.

Most significant, we must work to secure the meaningful participation of key developing countries. We must be creative in initiating bilateral agreements. We have made a promising start with an agreement we reached with China during last fall's summit. We must also use regional and multilateral fora to achieve our objectives — such as the Summit of the Americas process, in the Asian Partnership for Economic Cooperation (APEC) process, the president's trip to Africa, and the G-8 Summit in the United Kingdom.

We will put on a full-court diplomatic press to bring developing nations into a meaningful role in helping solve the global climate challenge. We will accept nothing less, nor would we expect the U.S. Senate to do so. As the president has indicated, the United States should not assume binding obligations under the protocol until key developing countries meaningfully participate in meeting the challenge of climate change.

Although the Kyoto Protocol was a historic step forward, more progress is necessary with respect to participation of key developing countries. It would be premature to submit the treaty to the Senate for its advice and consent to ratification at this time.

The administration also plans to continue to work with the international financial institutions to promote market-based energy sector policies in developing countries that will help reduce developing country greenhouse gas emissions. Multilateral development bank policies, including those of the Global Environment Facility, strongly

influence international lending and private capital flows for energy, industrial, and transportation investments. Policies that favor market pricing, privatization, clean technologies, and environmentally friendly approaches will make implementing the Kyoto Protocol easier and will speed the growth of markets for new technologies that help reduce emissions in developing countries .

We will work with the international financial institutions themselves — from the World Bank to the regional development banks — and with other countries, especially developed countries, to achieve these goals in the coming years.

The Kyoto agreement does not solve the problem of global warming, but it represents an important step in dealing with a problem that we cannot wish away. A premature decision to reject the protocol would deprive us of the opportunity to complete its unfinished business. If we fail to take reasoned action now, our children and grandchildren will pay the price.

THE ROLE OF ENERGY EFFICIENCY IN THE UNITED STATES

By Dan Reicher
U.S. Assistant Secretary of Energy
for Energy Efficiency and Renewable Energy

At the climate treaty negotiations in Kyoto last December, the parties to the United Nations Framework Convention on Climate Change reached agreement on a historic protocol for reducing greenhouse gas emissions. The protocol calls for protecting the global environment by improving the way energy is produced and consumed, among other measures.

This is an overview of how the United States is advancing energy efficiency and renewable energy technologies, and how these efforts will reduce U.S. greenhouse gas emissions.

A recent study by five national laboratories for the U.S. Department of Energy — entitled the "Interlaboratory Working Group, Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy-Efficient and Low-Carbon Technologies by 2010 and Beyond" (available at www.ornl.gov/ORNL/Energy) — points to large opportunities for reducing greenhouse gas emissions by improving energy efficiency and increasing reliance on renewable energy sources. The production and use of energy is the major anthropogenic source of greenhouse gas emissions, particularly carbon dioxide.

Energy efficiency reduces the energy required to deliver a given unit of goods or services in the transportation, buildings, and industrial sectors, thereby reducing carbon dioxide emissions. Renewable energy sources, such as wind, photovoltaics, solar thermal, geothermal, hydropower, and biomass provide clean energy without reliance on more conventional sources, such as coal and petroleum, that release vast amounts of carbon dioxide when used as fuel.

The national laboratory study finds that the energy savings and environmental benefits that flow from deploying energy efficient technologies and advancing renewable energy can significantly lower the cost of reaching the targets set forth in the Kyoto agreement.

Stabilizing U.S. greenhouse gas emissions at 1990 levels by 2010 will require, among other measures, an average reduction of nearly 500 million metric tons of carbon emissions per year, most of it from energy production and use in the transportation, buildings, and industrial sectors of the U.S. economy.

Such reductions require an aggressive set of national energy policies. Tax incentives and carbon emissions trading systems could encourage the private sector to take measures to reduce greenhouse gases. Under an emissions trading system, countries or companies can purchase less expensive emission permits from countries or companies that have more permits than they need (because they have met their targets with room to spare). This free-market approach, pioneered in the United States for lowering sulfur oxide emissions, provides the flexibility that allows the marketplace to arrive at the most economic means to reduce emissions.

To be effective, however, U.S. energy policy must provide for accelerated research, development, and deployment of technologies that either increase energy efficiency or make use of renewable resources. With a range of technology options and incentives available, markets will be better able to respond flexibly and efficiently to find the least-cost means to meet the challenge of climate change.

To that end, President Clinton has proposed a new program of tax cuts and research and development (R&D) aimed at cutting greenhouse gas emissions. Over five years, $3,600 million in tax credits would encourage the purchase of fuel-efficient cars, homes, and household equipment, the installation of rooftop solar systems and combined heat and power systems, and the production of wind and biomass energy. Additional R&D funding of $2,700 million over five years would be applied to the development of advanced energy technologies, with applications that can benefit the utility, industrial, buildings, transportation, and Federal sectors of the economy.

UTILITY TECHNOLOGIES

For the U.S. electric utility sector, the national laboratories study estimated that carbon emissions reductions of up to 186 million metric tons per year are achievable by 2010. Concern over carbon emissions will likely lead to growth in the use of wind power, co-firing of coal, and biomass in power plants, increased power plant efficiency, extension of the life of nuclear power plants, and expansion of hydropower.

Utilities may find it cost-effective to replace coal with natural gas in some power plants, retire older coal-fired plants, construct new turbine and combined cycle plants, and increase the dispatch of gas-fired plants. To achieve significant reductions in utility carbon emissions, however, the U.S. government must also expand R&D in renewable energy and advanced fossil fuel technologies, among other measures.

The anticipated restructuring of the U.S. electricity market is expected to produce significant environmental benefits through both market mechanisms and policies that promote investment in energy efficiency and renewable energy. The Clinton administration's recently announced restructuring plan proposes the creation of a renewable portfolio standard and a public benefit fund.

The renewable portfolio standard would guarantee that a minimum level of additional renewable generation is developed in the United States by requiring electricity sellers to cover a percentage of their electricity sales with generation from non-hydroelectric renewable technologies such as wind, solar, biomass, or geothermal generation. The public benefit fund would create a $3,000-million-per-year public benefit fund to provide matching funds to states for low-income assistance, energy efficiency programs, consumer education, and the development and demonstration of emerging technologies, particularly renewables.

As part of its tax incentive package, the administration has also proposed an extension of the 1.5-cent-per-kilowatt-hour tax credit for the generation of electricity from wind and "closed-loop" biomass systems, a 10-percent investment credit for certain combined heat and power systems, a 15-percent tax credit for purchases of rooftop solar equipment, and increased funding for R&D on utility technologies that reduce carbon emissions.

INDUSTRIAL TECHNOLOGIES

The U.S. industrial sector can contribute an estimated 55 to 95 million metric tons of carbon emissions reductions by 2010 (between 10 and 17 percent of industrial emissions forecast for that year). Current U.S. Department of Energy programs to increase industrial energy efficiency have focused on the nation's most energy-intensive industries, namely: forest and paper products, chemicals, aluminum, steel, metal casting, and glass, which together account for more than 80 percent of all carbon emissions from U.S. manufacturing. These industries have worked in partnership with the department to develop and implement detailed plans for research, development, and deployment of industrial technology. These efforts are complemented by U.S. Government-supported R&D in technologies that improve industrial energy productivity, such as advanced turbine systems, sensors and controls, advanced materials, and combined heat and power systems for generating electricity. Combined heat and power systems, for example, exploit the 80 to 90 percent efficiencies that can be achieved by using the waste heat from industrial processes. Such advances will improve the productivity of U.S. industry while preventing pollution.

BUILDING TECHNOLOGIES

Reductions of 25 to 60 million metric tons of carbon emissions can be realized by 2010 through improved efficiency and use of renewable energy in buildings. By working in partnership with manufacturers, national laboratories, and home developers over the past two decades, the U.S. Government has helped improve the efficiency of many home appliances, building equipment, and building designs. Five such innovations by the Department of Energy (including low-emissivity windows, efficient refrigerator compressors, and electronic ballasts for lighting) have resulted in energy savings for American consumers that have amounted to more than $28,000 million since 1978. Carbon emissions reductions in the buildings sector will require an increased market share for these and newer technology innovations. Improvement of the energy efficiency of new and existing buildings will also be needed.

The Department of Energy and the Environmental Protection Agency cooperate on the Energy Star program to encourage manufacturers and retailers to voluntarily label energy efficient appliances and equipment such as computers and refrigerators. This program is being extended to energy efficient windows, washing machines, televisions, and other products. Advanced lighting systems, intelligent systems to monitor and control the operation of commercial buildings, reflective roof coatings, and integrated building equipment and appliance systems will also contribute to emissions reductions. Recent Clinton Administration proposals include a new 20 percent tax credit for the purchase of energy-efficient building equipment, a $2,000 tax credit for the purchase of an energy-efficient new home, and increased funding for building technology R&D.

TRANSPORTATION TECHNOLOGIES

The future level of carbon emissions in the transportation sector will depend heavily on whether Americans continue to increase the weight and horsepower of the vehicles they drive, as well as increasing the distances they travel. The U.S. Government is working with auto manufacturers to develop a new generation of vehicles that are three times as fuel efficient as today's sedan, with no loss in size, safety, comfort, or cost. In addition, the Department of Energy works with manufacturers to develop advanced, cleaner, and more efficient engines and fuels, including diesel, that can be used in both trucks and in the increasingly popular sport utility vehicles. Research and development of fuel cells with the support of the department shows great promise for dramatically increasing the efficiency and decreasing emissions from vehicles.

Transportation technologies that increase fuel efficiency and incorporate low-carbon technologies could reduce carbon emissions by 90 to 105 million metric tons by 2010, for a 15 percent savings over projected transportation energy use. These savings would occur if the average fuel economy of new cars were 38 to 43 miles per gallon in 2010, the fuel economy of heavy trucks were 10 miles per gallon, and if ethanol from agricultural and forest wastes used as a blending component for gasoline achieved a 3- to 5-percent market share. The Clinton Administration has proposed a substantially expanded R&D effort in advanced automotive technologies, as well as tax incentives for the purchase of high-efficiency vehicles.

FEDERAL ENERGY MANAGEMENT

As the United States' largest energy user, the U. S. Government spends roughly $8,000 million each year on the energy required to operate its facilities, vehicles, and industrial equipment. U.S. Government leadership in developing the technical expertise, procurement practices, and financing mechanisms to improve the efficiency of its federal facilities contributes to the national goal of reducing carbon emissions. The establishment of regional, streamlined energy savings performance contracts is allowing federal agencies to improve energy efficiency through private sector investment mechanisms. With the use of these mechanisms, known as Energy Savings Performance Contracts, private sector firms provide the initial installation for energy efficiency upgrades to federal facilities. Future energy cost savings at these facilities are then shared between these firms and the U.S. Government. Such efforts to reduce energy use at federal facilities have the potential to save over four million metric tons of carbon emissions by 2010.

The carbon emissions reduction targets developed in Kyoto represent a great challenge and an outstanding opportunity. Energy efficiency and renewable energy technologies have the potential for widespread application and can greatly facilitate the attainment of Kyoto goals at a reasonable cost, while maintaining or improving energy services. As in the past, technological innovation can deliver important economic advantages, as the production and use of energy becomes more efficient, more productive, and cleaner. Using advanced energy efficiency and renewable energy technologies, Americans will not have to reduce their travel, turn down their thermostats, or decrease their manufacturing output to meet U.S. carbon emission reduction goals.

AN OPTIMISTIC OUTLOOK FOR CURBING EMISSIONS

Vice President Al Gore

Excerpts from the vice president's remarks December 8, 1997, at the climate change convention in Kyoto, Japan.

We have reached a fundamentally new stage in the development of human civilization, in which it is necessary to take responsibility for a recent but profound alteration in the relationship between our species and our planet.

Because of our new technological power and our growing numbers, we now must pay careful attention to the consequences of what we are doing to Earth — especially to the atmosphere. There are other parts of Earth's ecological system that are also threatened by the increasingly harsh impact of thoughtless behavior:

- The poisoning of too many places where people — especially poor people — live, and the deaths of too many children — especially poor children — from polluted water and dirty air;
- The dangerous and unsustainable depletion of ocean fisheries; and
- The rapid destruction of critical habitats — rain forests, temperate forests, borial forests, wetlands, coral reefs, and other precious wellsprings of genetic variety upon which the future of humankind depends.

But the most vulnerable part of Earth's environment is the very thin layer of air clinging near to the surface of the planet that we are now so carelessly filling with gaseous wastes that we are actually altering the relationship between Earth and the sun — by trapping more solar radiation under this growing blanket of pollution that envelops the entire world.

The extra heat that cannot escape is beginning to change the global patterns of climate to which we are accustomed, and to which we have adapted over the past 10,000 years.

The trend is clear. The human consequences — and the economic costs — of failing to act are unthinkable. More record floods and droughts. Diseases and pests spreading to new areas. Crop failures and famines. Melting glaciers, stronger storms, and rising seas.

Our fundamental challenge now is to find out whether and how we can change the behaviors that are causing the problem.

To do so requires humility, because the spiritual roots of our crisis are pridefulness and a failure to understand and respect our connections to God's Earth and to each other.

None of the proposals being debated here (Kyoto) will solve the problem completely by itself. But if we get off to the right start, we can quickly build momentum as we learn together how to meet this challenge.

Our first step should be to set realistic and achievable, binding emissions limits, which will create new markets for new technologies and new ideas that will, in turn, expand the boundaries of the possible and create new hope. Other steps will then follow. And then, ultimately, we will achieve a safe overall concentration level for greenhouse gases in Earth's atmosphere.

The first and most important task for developed countries is to hear the immediate needs of the developing world. And let me say, the United States has listened and we have learned.

We understand that your first priority is to lift your citizens from the poverty so many endure and build strong economies that will assure a better future. This is your right: it will not be denied.

Reducing poverty and protecting Earth's environment are both critical components of truly sustainable development. We want to forge a lasting partnership to achieve a better future. One key is mobilizing new investment in your countries to ensure that you have higher standards of living, with modern, clean, and efficient technologies.

That is what our proposals for emissions trading and joint implementation strive to do.

To our partners in the developed world, let me say we have listened and learned from you as well. We understand that while we share a common goal, each of us faces unique challenges.

We came to Kyoto to find new ways to bridge our differences. In doing so, however, we must not waiver in our resolve.

For my part, I have come here to Kyoto because I am both determined and optimistic that we can succeed. I believe that by our coming together in Kyoto we have already achieved a major victory, one both of substance and of spirit. I have no doubt that the process we have started here inevitably will lead to a solution in the days or years ahead.

COMMENTARY

CHANGES NEEDED IN U.S. ENERGY POLICY

Senator Richard Lugar, Chairman
Senate Agriculture, Nutrition and Forestry Committee

Excerpts of the senator's opening remarks made March 5, 1998, at a committee hearing on the Kyoto Protocol.

In December [1997], leaders from 150 countries gathered in Kyoto, Japan to address the issue of climate change. The result, "the Kyoto Protocol," has met with intense controversy. It is unlikely to be ratified by the Senate in its present form.

In preparation for Kyoto, the Senate passed the Hagel-Byrd resolution in July, urging the president not to sign any treaty that failed to include emissions limitations on developing countries. However, the United States signed the Kyoto Protocol, with administration officials conceding that it does not include "meaningful participation" by the "key developing countries."

The national debate over the protocol may force this nation to overcome its tendency to separate energy and environmental policies. In reality, many of our environmental problems are related to our need for energy. Changes in energy policy are essential to addressing environmental concerns.

Events beyond our borders also have tremendous impact on American energy security and environmental interests. As the economies and populations of China, India, South Korea, Mexico, Brazil and other key developing countries rapidly increase, so too will their need for energy. Such growth will fuel the greenhouse gas problem.

The United States currently emits 22 percent of the world's greenhouse gases while generating 26 percent of the world's wealth. As our economy and population grow, so too will our carbon emissions. The Energy Information Administration projects that U.S. carbon emissions will increase 34 percent from 1990 to 2010, assuming a very modest economic growth rate of only 2.2 percent per year. If economic growth is higher, our emissions growth is likely to be even greater. We must find ways to address the climate change problem without suppressing our economic growth or hurting our businesses, farms, and workers.

At Kyoto, administration negotiators agreed that we would reduce our greenhouse gas emissions by 7 percent below 1990 levels by the period 2008-2012. To meet this target, which is only 10 to 14 years away, it is estimated that we must reduce our levels of greenhouse gases in 2010 by 30 percent or more from forecasted levels. A 30 percent reduction would amount to approximately 560 million metric tons of carbon equivalents annually.

Where will these reductions come from?

According to the Energy Information Administration, a high technology option would produce reductions of only 79 million metric tons of carbon equivalent, which is a 4 percent reduction from projected 2010 levels. There are also opportunities for increasing the carbon storage capacity of our forests and soils, which administration estimates show might reduce our reduction obligations by a similar amount.

The administration is reportedly relying upon international trading of emissions and purchases of credits under the Clean Development Fund to account for a large portion of our reductions.

To address these many issues, I believe that the president should establish an interagency Energy and Environmental Security Task Force. We cannot cope with any of our pending environmental or energy security problems without a new energy policy.

We must also address the serious threat of worldwide deforestation. Experts indicate that about 20 percent of the increase in greenhouse gas concentrations is due to the elimination of carbon sinks in our soils and forests. We are losing 30 million acres of tropical forests per year. Yet the Kyoto Protocol may not allow the United States to count projects that we fund in developing nations to avoid deforestation and promote sustainable agriculture as part of our contribution to addressing the climate change problem.

Richard Lugar, a Republican from Indiana, is also a member of the Senate Foreign Relations Committee.

THE NEXT STEPS

Kathleen McGinty
Chair of the White House Council
on Environmental Quality

Excerpts of remarks made February 4, 1998, before the U.S. House of Representatives Science Committee.

Our efforts following up on Kyoto are directed at achieving further progress in obtaining meaningful participation by developing countries and in implementing the president's plan to harness market forces at home and abroad to enhance energy efficiency, environmental quality, and economic prosperity.

THE KYOTO PROTOCOL

Although the agreement reached in Kyoto will not reverse the build-up of greenhouse gases in the atmosphere, it will begin slowing the rate of increase. Equally important, it puts in place a solid foundation upon which the global marketplace can increasingly be engaged in reducing greenhouse gas emissions. The agreement draws heavily from the proposals advanced by the United States.

In October of last year, President Clinton outlined a number of elements critical to achieving an effective agreement. He underscored that any agreement had to contain: 1) realistic medium-term, legally binding targets for developed countries; 2) flexible, market-based implementation mechanisms; and 3) measures to secure the meaningful participation of key developing countries.

I am pleased to report that we fully achieved our first two objectives, and through the innovative Clean Development Mechanism made a down payment on the third. Next steps must include further work on operational details of international emissions trading, compliance mechanisms, and developing country participation.

The president has made it clear that he does not intend to send the Kyoto Protocol to the Senate for ratification until we have achieved meaningful participation by key developing countries.

NEXT STEPS — INTERNATIONAL ACTIVITY

While the Kyoto agreement secures major elements that the United States sought to ensure such as flexible, market-based mechanisms for addressing concerns about global warming, future negotiations will still need to address several important issues. The parties now move forward with working group meetings scheduled for June and the next meeting of the parties to the climate convention scheduled for November in Buenos Aires. Issues that will be addressed at that and subsequent meetings include the following:

- guidelines for implementing the international emissions trading provisions included in the protocol;
- guidelines for implementing the Clean Development Mechanism;
- further refinement of how to treat sinks (such as forests that capture and sequester greenhouse gases);
- participation of developing countries; and
- additional provisions related to compliance and enforcement.

NEXT STEPS — DOMESTIC ACTIONS

In his State of the Union message, the president described his proposed tax cut and technology

initiative aimed at jump-starting efforts to enhance our nation's energy efficiency and economic competitiveness. This program was laid out in detail in the president's budget.

It targeted $6,300 million over the next five years to provide incentives for our industry, businesses, and consumers to make and purchase more energy efficient products. It challenges the innovative abilities of the private sector and helps ensure that those firms that succeed in developing energy saving products will have a substantial market in which to sell those products.

For consumers, it provides a double bonus. First, it helps reduce the initial costs of purchasing energy saving products. Second, throughout the lifetime of the product, consumers will benefit from reduced energy costs.

The president's 1999 budget includes $3,600 million over five years in tax credits aimed at encouraging broader use of existing energy saving technologies and spurring further innovations. It also includes $2,700 million in new research and development investments to ensure that innovative greenhouse gas reducing products continue to flow through the pipeline and into the marketplace in the coming years.

Examples of specific provisions contained in the president's budget include the following:

- Tax credits for highly fuel efficient vehicles: This credit would be $4,000 for each vehicle that gets three times the base fuel economy for its class beginning in 2003. A credit of $3,000 would be available beginning in 2000 for vehicles that get double the base fuel economy for its class. These credits would be available to jump start these markets and would be phased out over time.

- Tax credits for energy efficient equipment: These credits (all of which are subject to caps) would include a 20 percent credit for purchasing certain types of highly efficient building equipment, a 15 percent credit for the purchase of solar rooftop systems, and a 10 percent credit for the purchase of highly efficient combined heat and power systems.

- Research and development support: Additional resources are provided for key areas of renewable energy and for carbon sequestration. Activities related to the Partnership for a New Generation of Vehicles include expanded research in fuel cells, batteries, and ultra-clean combustion engines. Two new partnerships are proposed for heavy trucks and light trucks, including sport-utility vehicles.

These budget proposals implement one of the key commitments made by the president in his October 22nd speech at the National Geographic Society. In that speech the president also pledged that the federal government, as the largest user of energy, would take the lead in enhancing our efforts at improving energy efficiency; that we would work closely with the private sector in developing voluntary programs to reduce emissions; that we would grant early credit for reductions that occur prior to a binding target; and that we would help shape utility restructuring in ways that contribute to reductions in greenhouse gas reductions. We are working today to make all of these commitments real.

Beyond the president's budget proposals, a number of encouraging developments have taken place in both the public and private sectors in the short time since Kyoto. Let me briefly mention four of them.

1. Fuel Efficient Vehicles: At the recent automobile show in Detroit, General Motors (GM) announced four passenger hybrid electric and fuel cell vehicles that can achieve fuel efficiencies of up to 80 miles per gallon. The production prototypes could be available as early as 2001. Ford also unveiled a prototype of a mid-size high efficiency sedan that achieves 63 miles per gallon using an advanced diesel engine. Ford also plans to develop hybrid electric and fuel cell versions of this prototype. Chrysler unveiled its full-size experimental hybrid electric vehicle with a projected 70-miles-per-gallon fuel economy.

These technological advances were made possible through the efforts of the Partnership for a New Generation of Vehicles between the administration, U.S. auto companies, and their suppliers.

2. Compressed Air Challenge: Air compressors represent about 3 percent of total industrial electricity use and one percent of total U.S. electricity consumption. In mid-January, the Department of Energy (DOE) and major equipment manufacturers announced a new agreement aimed at significantly enhancing efficiency in this sector.

Under the agreement, changes in equipment and operating practices are anticipated to reduce energy use in this category by 10 percent by 2010 at a cost savings of $150 million per year while reducing greenhouse gases by 700,000 metric tons of carbon.

3. BP (British Petroleum) Solar Opening: BP Solar has opened its first manufacturing plant in the United States. Located outside San Francisco, the vice president flipped a switch to start the plant. This facility will produce a new generation of thin film photovoltaic cells. The BP Solar plant, together with DOE's recently announced Million Solar Roof Initiative (a plan to put one million solar panels on rooftops by 2010), planned plant expansions, and openings by other solar cell manufacturers, as well as the president's budget request for enhanced funding for renewable technologies, demonstrate that efforts to increase market penetration based on harnessing the sun's energy are now making significant advances. In fact, the vice president was able to announce that the private partners in the Million Solar Roofs Initiative have already announced plans for well over half the solar panels needed to get to our goal — a full 10 years early.

4. VCR/TV Energy Star Program: TV and VCRs represent one of the fastest growing sources of electricity demand. Consumers spend over $1,000 million annually to power VCRs and TVs that are switched off. In early January the vice president announced a pathbreaking partnership between the Environmental Protection Agency and the major manufacturers of these electronic goods.

The program is quite ambitious with a goal of achieving up to a 70-percent-reduction in energy use when the equipment is turned off without sacrificing product quality, utility, or increasing costs. The average household could cut its energy bills by 30 percent or $400 per year by switching to the full line of Energy Star products.

These examples further underscore the potential for energy and cost saving opportunities to reduce our emissions of greenhouse gases. In sum, the Kyoto Protocol represents a significant diplomatic achievement for the United States and a key contribution to the critical effort to safeguard our children from the effects of potentially severe climatic disruption. At the same time, this effort is a work in progress.

Much remains to be done if we are fully to seize the environmental and economic benefits of action on this pressing issue.

CLIMATE CHANGE POLICY AFTER KYOTO

By Raymond J. Kopp, Richard D. Morgenstern
and Michael A. Toman

The Kyoto climate agreement signals a new level of international attention to limiting "greenhouse gas" emissions. But many important issues remain to be resolved before ratification by the U.S. Senate and implementation.

On December 10, 1997, 160 nations reached agreement in Kyoto, Japan, on limiting emissions of carbon dioxide and other "greenhouse gases." The Kyoto Protocol is a significant victory for advocates who have sought to persuade world leaders to address climate change. It is intended to signal to governments, businesses, and households that limits will be placed on future emissions of greenhouse gases, and that now is the time to begin developing the necessary technologies. Advocates also express the hope that acceptance by industrialized countries of binding emissions limits would make developing countries more willing to take emissions-limiting actions appropriate to their own circumstances.

As we discuss below, however, the protocol itself has significant gaps; the costs of meeting the stipulated targets are not tremendous but not trivial either; and there is still a great deal to settle with respect to the domestic policy agenda.

A protocol that is both workable in practice and capable of being ratified by the Senate must come to grips with three basic questions. First, does it represent a sound framework for attaining long-term global emissions-reduction goals, and is it clear enough to serve as a sort of international contract to which parties can commit?

Second, how costly are the targets and timetables for greenhouse gas reduction agreed to by the United States and other Annex I (developed) countries — are they as affordable as the Clinton administration says, or as burdensome as the fossil fuel industry has asserted? Third, what measures would the United States deploy to achieve the goals laid out in the protocol?

REFINING THE PROTOCOL

The negotiators deferred action on several important but controversial elements to a subsequent meeting scheduled for Buenos Aires in the fall of 1998. President Clinton has indicated that he will not send the protocol to the U.S. Senate for ratification until more progress is made on these issues. We believe that, at a minimum, the following must be accomplished before ratification and implementation can occur:

The rules and institutions that will govern international trading of greenhouse gas emissions among Annex I countries must be better established.

Article 6 of the protocol provides for emissions trading, but only in the vaguest of terms. How the trading program is carried out will greatly affect the capacity to hold down compliance costs. A program that establishes a freely functioning, largely private market in emissions permits, where private entities may execute trades with minimal bureaucratic red tape, will be the most efficient and will lead to the greatest cost savings. In contrast, a market permitting only trades by governments, or a market where private trades are hamstrung by overly restrictive rules, will sap the cost savings.

The rules and institutions governing joint implementation (the so-called Clean Development Mechanism) must be developed in detail.

Under Article 12, Annex I countries can jointly undertake projects with developing countries to reduce emissions in the latter countries and count those reductions toward compliance with their own commitments where it is possible to establish meaningful baselines against which reductions can be measured.

Again, however, the protocol does not address how such projects can be undertaken. A well-supervised but freely functioning market, combined with credible certification and enforcement of reductions, would yield real greenhouse gas reductions at lower cost. An overly restrictive and bureaucratic system would sap possible gains.

The criteria used to judge compliance, and any penalties for noncompliance, must be clearly articulated.

The protocol contains a number of technical provisions for assessing national performance in measuring emissions and meeting emissions control objectives. These provisions build on previous efforts under the United Nations Framework Convention on Climate Change but are complicated by the more comprehensive nature of the new protocol. Beyond these technical questions, the fundamental issue is what actions, if any, would be taken if a country were found not to be in compliance. The emissions goals of Annex I countries are taken to be binding under international law, but the protocol itself contains no stipulations for sanctions in the event of noncompliance.

A binding agreement on the part of the major developing countries to limit their emissions at some specified point in the future must be obtained.

The Framework Convention clearly states that developing countries do not bear the same obligations as developed nations for emissions control in the short term. Nevertheless, the protocol could and should contain commitments from developing countries to limit their emissions growth. Developing countries could achieve such limits through "no regrets" measures that would be prudent to take in any case and through agreements to eventually cap emissions as their economic circumstances improve in exchange for assistance in adopting clean technologies.
The lack of any early commitment by developing countries not only aggravates short-term concerns in the United States and other industrial countries about international competitiveness but also raises the specter of developing countries becoming "locked in" to more fossil-fuel-intensive technologies.

To make longer-term objectives more credible, moderate but specific near-term goals should be set for Annex I countries and these countries should be able to use early emissions reductions to meet longer-term requirements.

Other than a passing reference in Article 3 to the need for "demonstrable progress" in achieving commitments by 2005, the protocol is silent on interim measures. Yet without interim targets, prospects for achieving more ambitious longer-term goals become problematic and the incentives to engage in long-term investments in new capital and technology are undercut. Incentives for cost-effective reductions before 2008 to meet long-term requirements also are limited since the protocol makes no provision for emitters to "bank" such reductions.

IMPLEMENTING THE PROTOCOL

In the runup to Kyoto, a number of experts pointed out that both the environment and the economy might be served by following a slower path to emissions control than the protocol stipulates while developing the technologies for more aggressive and affordable emissions reductions later. Others disputed this view. In any event, the agreement reached in Kyoto sets the stage for discussion and for future debate in the Senate.

Some have claimed that meeting the protocol's targets ultimately will be inexpensive or even free because there is a large untapped reservoir of cheap energy-efficiency opportunities available today and new technologies will materialize in the near future. Others predict economic collapse.

In our judgment, neither extreme view is correct. The likelihood is substantial, however, that the proposed target and timetable will impose significant costs on the United States and the global economy, even after accounting for new technology stimulated by domestic policies. The limit agreed to by the United States implies a reduction of about one-third compared with what the U.S. Department of Energy estimates carbon dioxide emissions will be by the end of the next decade.

Even with the flexibility to reduce emissions of other gases, achieving emissions reductions of such magnitudes in fifteen years at most will lead to higher energy prices and thus costs that will be borne throughout the economy.

These costs in turn will give rise to serious debates about fairness. Recent public opinion polling indicates increased concern about climate change and some willingness to shoulder burdens to curb greenhouse gas emissions, but there is no compelling evidence that the public is ready to accept significant increases in energy prices or other costs. In light of these costs, it is an open question whether the Senate is willing to ratify the target and timetable stipulated in the protocol.

An important first step in fostering a productive debate nationally and in the Senate over the protocol is better understanding of its benefits and costs. Advocates should dispense with the pretense that emissions reductions of the scale and speed proposed can be achieved at negligible or even negative cost, or that reductions necessarily doom the economy. To shine a brighter light on the costs and consequences of the protocol requires an investment in better and more inclusive analysis and review of estimates, so that competing claims can be adjudicated and new ideas introduced.

Even after questions about the protocol itself are settled, domestic policy options for achieving the targets and timetables require more thorough consideration. The United States deserves credit for advancing some specific measures. Still, the proposal the administration offered in October — $5,000 million in incentives for new technology — will not be enough to move the economy from where it is today to where it needs to be to meet the Kyoto goals.

Ultimately, if the United States even is to approach the Kyoto goals, energy prices must rise enough — especially for coal, the most carbon-rich fossil fuel — to induce enough conservation, energy efficiency, fuel switching, and development and deployment of new technologies and energy forms. How large this price rise will have to be depends on what domestic policies are used. No agreement yet exists on this policy menu. Even if an efficient mechanism like emissions trading is used within the United States, important questions of who gains and loses from the policy remain to be settled.

To cut U.S. emissions as cost-effectively as possible, Congress and the administration should commit to the use of incentive-based policies for emissions control. Well-intentioned but costly proposals to mandate energy efficiency through rigid command-and-control measures must be avoided. In addition, policies aimed at encouraging the development and dissemination of low-emissions technology need careful scrutiny to avoid waste (for example, through an ill-focused subsidy policy).

The institution of some modest interim measures to limit greenhouse gases is important for establishing the credibility of longer-term reduction goals. A domestic emissions trading program with looser controls than the protocol requires is one example. Such a program could be combined with a "safety valve" to cap the price of a tradable emissions permit at some prespecified level that would rise over time, with the government offering additional emissions permits as needed to maintain the price caps.

Such an approach would complement the policies the administration already has announced and provide valuable information about how emissions control policies work, as well as their costs to the economy. It also would offer such near-term benefits as improved air quality from reduced conventional air pollutants and encouragement for the development of lower-emissions technologies. Even stronger incentives for early demonstrable progress would be provided if any early emissions reductions below an established baseline (for example, actual 1997 emissions levels) could be banked to meet subsequent constraints.

NECESSARY ACTIONS

To enhance the prospects for an effective climate policy, U.S. negotiators at Buenos Aires must take the lead in establishing the basis for well-functioning emissions trading and joint implementation. They must also take the lead in developing an approach for truly meaningful participation by developing countries. To enhance the credibility of the longer-term goals in the protocol, the United States needs to work to establish cost-effective and affordable interim measures. These initiatives need to be combined with a renewed effort to better gauge the costs and benefits of the protocol obligations and a search for effective and innovative domestic policy tools.

Last but not least, the American public needs to better engage in debating this complex, long-term issue.

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THE ECONOMIC IMPACT OF KYOTO

Janet Yellen
Chair of White House Council of Economic Advisers

Excerpts of remarks made March 4, 1998, before the U.S. House of Representatives Commerce Committee.

In order to evaluate the likely net economic impact of the Kyoto Protocol, excluding the benefits of mitigating climate change itself, we have drawn upon a variety of tools to assess the various possible costs and non-climate benefits of the administration's emissions reduction policy.

To give away the punch line, our conclusion is as follows: *the net costs of our policies to reduce emissions are likely to be small, assuming those reductions are undertaken in an efficient manner and we are successful in securing meaningful developing-country participation as well as effective international trading, and the Clean Development Mechanism (CDM) in future negotiations.*

To our knowledge, no model has yet been set up to analyze the implications of the Kyoto Protocol, since this agreement is only a few months old and remains unfinished. In particular, no model is currently designed to assess Kyoto's treatment of sinks (such as forests that absorb carbon from the atmosphere), or all six greenhouse gases.

Our thinking has been informed, however, by simulations conducted with the Second Generation Model (SGM) of Battelle Laboratories, one of the leading models in the field. The SGM is one of the models best positioned to analyze the role of international trade in emissions permits, which we consider to be a critical element of the Kyoto Treaty.

However, the SGM does not cover all six gases included in the Kyoto Protocol or include a role for sinks. We have used the SGM model as one input into our overall assessment of the Kyoto treaty, but have attempted to supplement its results with additional analysis to account for such special features of the agreement as the inclusion of six gases, a possible trading arrangement that could include a subset of the Annex I (developed) countries, and the Clean Development Mechanism.

ASSESSING THE POTENTIAL COSTS OF EMISSIONS REDUCTIONS

The costs of cutting emissions can be much reduced if flexible, market-based mechanisms are used. Our economic analysis highlighted the importance of such flexible, market-based mechanisms — which are therefore reflected, at the president's insistence, in the Kyoto Protocol and our ongoing diplomatic strategy.

Within the Kyoto Protocol, this means an insistence on international trading, joint implementation, the Clean Development Mechanism, and, ultimately, on meaningful developing-country participation. Domestically, this means that we implement any emissions reductions through a market-based system of tradeable emissions permits, which ensures that we achieve reductions wherever they are least expensive. But this also means taking serious and responsible steps in the short run to prepare us to meet our obligations in the longer term.

The first such step is the inclusion in this year's budget of an aggressive, $6,300 million program of tax cuts and R&D investments. The goal is both to stimulate the development of new energy-saving and carbon-saving technologies and to encourage the dissemination of those that exist already.
A second responsible step entails industry-by-

industry consultations to prepare emission reduction plans in key industrial sectors. The administration will work in partnership with industry to identify ways in which the federal government might remove regulatory hurdles that discourage energy efficiency. In addition, the Department of Energy will spearhead a comprehensive effort to improve the energy efficiency of the federal government's own operations and purchases.

The third step is the promotion of an environmentally responsible electricity restructuring bill, which the president identified as part of his domestic climate change package. An electricity sector freed from government regulation would be a more efficient energy sector. Costs to consumers would fall.

In addition, stronger incentives for improved generation efficiency in conjunction with appropriate market-based provisions could achieve modest reductions in emissions. A reasonable overall estimate of the contribution of federal electricity restructuring to the rest of the president's program to address climate change is that it would make further progress to the same emissions reduction goals at a cost saving of roughly $20,000 million per year. These steps should be taken regardless of Kyoto, because they make sense in terms of energy efficiency.

ESTIMATED REDUCTION IN COSTS FROM ANNEX I TRADING

In the language of the treaty, "Annex I" is the set of countries that have agreed to take on binding limitations in emissions of greenhouse gases. Even without meaningful developing-country participation — which the president has emphasized is essential before the treaty would be submitted for ratification — costs could be reduced substantially by emissions trading among the Annex I countries.

To provide some indication of the possible efficiency improvements, Russia and Ukraine consume six times as much energy per dollar of output as does the United States. Such large international differences in energy efficiency suggest that adoption of existing U.S. technology would yield very large emissions reductions in these countries.

Estimates derived from the SGM model confirm that emissions trading among Annex I countries can reduce the U.S. cost of achieving its targets for 2008-2012 emissions by about half relative to a situation in which such trading was not available. This concept of costs is meant to capture aggregate resource costs to the U.S. economy, including the cost to domestic firms of purchasing emissions permits from other countries where emissions reductions may be cheaper than in the United States.

Although these estimates reflect idealized international trading in efficient markets, the overall conclusion is clear. The dramatic reduction in costs potentially available from Annex I trading within the SGM model — cutting the costs involved by half — highlights why the president insisted that international trading be part of the Kyoto Protocol; and why its achievement by our negotiators in Kyoto was such an important accomplishment.

ESTIMATED REDUCTION IN COSTS FROM UMBRELLA TRADING

One possibility that emerged in Kyoto, which none of us foresaw, was the idea developed by the U.S. delegation that the United States might undertake trading with a subset of Annex I countries, dubbed the "umbrella."

Countries that have expressed interest in the umbrella include the United States, Australia, Canada, New Zealand, and Russia, with strong indications of interest from some others. This subset of Annex I countries shares a common interest in promoting market-based mechanisms, specifically, fully flexible rules for international trading of emissions permits.

It is too early to state the precise form the umbrella will take. But we can envision a number of potential benefits. The umbrella could, for example greatly reduce costs to the United States. Results that we have derived from various SGM simulations of efficient international trading suggest that, relative to the situation in which

there is no trading at all, the umbrella can reduce costs by an estimated 60 to 73 percent, depending on whether the former Warsaw Pact countries fall within the umbrella.

ESTIMATED REDUCTION IN COSTS FROM DEVELOPING COUNTRY PARTICIPATION

The substantial potential gains from meaningful developing-country participation are highlighted by the significant benefits that will likely accrue from the limited role that the developing countries have already agreed to through the Clean Development Mechanism, which is modeled after the U.S. joint implementation concept.

The CDM cannot realistically be expected to yield all the gains of binding targets for developing countries, but it might shave costs by roughly another 20 to 23 percent from the reduced costs that result from trading among Annex I countries.

Another possibility is that we persuade some of the key developing countries that are the largest emitters to commit to targets, and allow us to buy emissions reductions from them. Simulations with the SGM model suggest that full participation by non-Annex I countries could cut roughly 55 percent off the reduced costs that result from Annex I trading.

The actual cost reduction would depend on the extent of developing-country participation that is ultimately obtained, as well as on the effectiveness of international trading arrangements. The more developing countries that take on modest binding targets and trade in international permit markets, the lower will be the costs.

ACCOUNTING FOR CARBON SINKS

The preceding discussion has emphasized the importance of trading arrangements and the CDM. In reaching an overall economic assessment, it is also important to factor in the potential role of carbon sinks. Again, the U.S. delegation obtained a novel concept — that carbon-absorbing activities called sinks could be used to offset emissions.

The arrangements concerning carbon sinks in the Kyoto Protocol have received less attention than they merit. The protocol specifies that removals of carbon dioxide (CO_2) by sinks count toward meeting the target. The protocol counts the net emissions effects of three sink activities — afforestation, reforestation, and deforestation.

Very preliminary estimates of the implications for the United States of the Kyoto provision on sinks indicate that they could comprise a significant portion of the total required emissions reductions. Moreover, decreasing the required emissions reduction by, for example, 10 percent would likely result in cost-savings greater than 10 percent.

SYNTHESIS

Assuming that effective mechanisms for international trading, joint implementation, and the Clean Development Mechanism are established, and assuming also that the United States achieves meaningful developing-country participation, our overall assessment is that the economic cost to the United States of attaining the targets and timetables specified in the Kyoto Protocol will be modest.

It is worth emphasizing that other model results reflecting the details of the Kyoto Protocol are consistent with our conclusion. Under the assumptions of either trading under the umbrella or within Annex I, and the CDM and permit trading with developing countries, estimates derived using the SCM model suggest that the net energy resource costs of attaining the Kyoto targets for emissions reductions might amount to $7,000 million to $12,000 million per year in 2008 to 2012.

This implies that overall costs, excluding not only climate and non-climate benefits, but also such cost-mitigating factors as sinks and payoffs from the president's electricity restructuring and climate change initiatives, would reach roughly one-tenth of 1 percent of projected GDP (Gross Domestic Product) in 2010.

A more tangible measure of costs is the estimated effects on energy prices. Excluding the impact of electricity restructuring and the ancillary benefits of mitigation and better forest management, the SGM-based estimate, corresponding to the gross

energy cost estimate cited above, is an emissions price in the range of $14 to $23 per ton of carbon equivalent. This translates into an increase in energy prices between 2008 and 2012 at the household level of between 3 and 5 percent; an increase in fuel oil prices of about 5 to 9 percent; natural gas prices of 3 to 5 percent; gasoline prices of 3 to 4 percent (or around 4 to 6 cents per gallon); and electricity prices of 3 to 4 percent.

This increase in energy prices at the household level would raise the average household's energy bill in 10 years by between $70 and $110 per year, although such predictions may not be observable because they would be small relative to typical energy price changes, and nearly fully offset by electricity price declines from federal electricity restructuring.

In particular, this increase in energy prices is small relative to the average of year-to-year real energy price changes experienced by U.S. consumers since 1960. Such annual changes have averaged 3-8 percent. In addition, by 2008-2012, the anticipated 10 percent decline in electricity prices from the restructuring that is part of our climate change agenda is projected to lead to expenditure reductions of about $90 per year for the average household,

EFFECTS ON U.S. INDUSTRY

Some have expressed fears that the Kyoto Protocol might adversely affect the competitive position of American industry. Evaluating how the Kyoto Protocol could affect the competitiveness of a few specific manufacturing industries — especially those that are energy-intensive, such as aluminum and chemicals — is complex.

But to provide some perspective on this issue, consider the following facts. First, on average, energy constitutes only 2.2 percent of total costs to U.S. industry.

Second, energy prices already vary significantly across countries. According to the 1997 Statistical Abstract, for example, 1996 premium gasoline costs $1.28 per gallon in the United States, but only 8 cents per gallon in Venezuela. Electricity prices also vary significantly — in the United States they were 5 cents per kilowatt hour in 1995, a fraction of Switzerland's price of 13 cents per kilowatt hour. Yet U.S. industry is not moving en masse to Venezuela, nor is Swiss industry moving to the United States.

Third, roughly two-thirds of all emissions are not in manufacturing at all, but in the transportation and buildings sectors, which by their very nature are severely limited in their ability to relocate to other countries. We therefore believe we need developing country participation because the climate change problem is global and cost-effective solutions are essential to avoid adverse effects on competitiveness.

CONCLUSION

In conclusion, the Kyoto Protocol and the president's general approach to climate change reflect the insight of economic analysis. The Kyoto Protocol includes key provisions on international trading and clean development projects.

The president's approach relies on market incentives — first, with a system of tax cuts and R&D investments, and then later with a market-based system of tradeable permits to ensure that our objectives are achieved as efficiently as possible.

TWO COMPANIES ON LEADING EDGE IN EMISSIONS TRADING

By Martin Smith and Gord Lambert

The use of private market mechanisms, such as emissions trading, has been viewed by many economists and policy makers as a means for achieving difficult environmental goals in an efficient manner. Already employed in some countries to help meet pollution reduction targets for air quality problems like acid rain and urban smog, trading has also been proposed to help in the reduction of greenhouse gas emissions that many scientists believe are contributing to changes in global climate, or what is often referred to as global warming.

The new international agreement negotiated in Kyoto, Japan, in December of 1997 establishes emissions limitations (or "budgets") applying to 39 nations (or "parties") during the period from 2008-2012 and applies these limitations to a number of major greenhouse gases such as carbon dioxide (CO_2). The Kyoto Protocol also specifically provides for the buying and selling of greenhouse gas "emission reduction units" among the parties to the protocol.

However, rules governing such emissions trades have yet to be developed, and substantial uncertainty remains as to whether trading in greenhouse gases will be supported by the major emitters themselves, namely industrial corporations, some of whom oppose action on global warming at this time. There is also uncertainty as to whether trading, particularly international trading, will prove administratively feasible and politically acceptable between nations, considering the significant differences that exist in governmental institutions and regulatory systems.

Against this backdrop, two firms — an American electric utility and a Canadian integrated oil and gas company — announced on March 5, 1998, an agreement for a major greenhouse gas emissions reduction trade. While there have been at least two prior publicly announced international trades involving a modest amount of greenhouse gases (e.g., 10,000 metric tons), the magnitude of this agreement, over 10 million tons of CO_2, and the potential value of the agreement, about $6 million, was seen by the Canadian and American governments as a major demonstration and test case for the future role of emissions trading.

Likewise, the two companies involved in the transaction, Niagara Mohawk Power Corporation of Syracuse, New York, and Suncor Energy Incorporated of Calgary, Alberta, hope the agreement will be an important first step toward the creation of a global market and an international trading system for reductions in this area.

OVERVIEW OF THE TRADE AGREEMENT

Under the terms of the agreement, Suncor Energy will make an initial purchase of 100,000 metric tons of CO_2-equivalent greenhouse gas emissions reductions from Niagara Mohawk. In addition, Suncor will obtain an option on up to 10 million tons of reductions, to be delivered over a 10-year period beginning in 2001. Finally, Niagara Mohawk will reinvest a minimum of 70 percent of any proceeds from the sale of reductions into new projects, activities, or measures that further reduce emissions of greenhouse gases. The two trading partners may work together on such projects.

The reductions to be traded under the agreement fall into two major categories. The first includes emissions reductions achieved through projects

and measures undertaken by Niagara Mohawk since 1990, the baseline year against which emissions increases or reductions are typically measured. To qualify for trading purposes, such reductions must be "surplus," that is, emissions reductions must be below the 1990 baseline emissions level, minus 7 percent (the emissions level used to establish emissions budgets for both Canada and the United States in the Kyoto Protocol).

Niagara Mohawk activities that have created such reductions include power plant performance improvements, energy efficiency improvements, and use of less-polluting fuels. The second category or source of reductions reflects new reductions to be achieved by Niagara Mohawk in the future, such as reductions resulting from development of new renewable wind, solar, and biomass energy resources.

Documentation of the emissions reductions to be used in the trade is being undertaken in several ways. First, Niagara Mohawk has been and will continue to report its total greenhouse gas emissions and emissions reduction activities to the U.S. Department of Energy under the voluntary reporting program established in Section 1605(b) of the Energy Policy Act. Suncor Energy will continue to report its annual greenhouse gas emissions performance as part of its participation in Canada's Climate Change Voluntary Challenge and Registry Program.

In addition, the Environmental Resources Trust (ERT), a not-for-profit institution founded by the Environmental Defense Fund, will further qualify and quantify Niagara Mohawk emissions reductions to be applied in the trade. ERT will also create accounts for the two companies into which the verified emissions reductions can be deposited and later transferred.

PERSPECTIVES AND INTERESTS OF THE TRADING PARTNERS

Niagara Mohawk Power Corporation and Suncor Energy share a number of perspectives and interests that helped to make this international trade possible. Both Niagara Mohawk and Suncor believe potential climate change is a serious environmental issue which, recognizing the many remaining scientific uncertainties, nonetheless warrants prudent, cost-effective and early action to reduce or offset greenhouse gas emissions

Both companies have set targets for greenhouse gas emissions reductions that were publicly communicated to their respective governments, and both companies believe that market-based mechanisms, such as emissions trading, are crucial to meeting these targets.

Equally important, both companies initiated deliberate internal programs in the early 1990's to undertake, coordinate, and track projects and activities resulting in reductions of greenhouse gas emissions. Suncor, for example, has committed to actions in seven areas that address the risk of climate change. These areas include such things as internal mitigation, alternative energy sources, and domestic and international offsets.

Through these efforts, Suncor projects its greenhouse gas emissions per unit of production will be 32 percent lower in the year 2000 than they were in 1990. Similarly, Niagara Mohawk has been active in a dozen program areas, resulting in a reduction in its current greenhouse gas emissions of about 25 percent below 1990 levels.

Results to date and targets for 2000 notwithstanding, both Niagara Mohawk and Suncor recognize in the Kyoto Protocol a clear signal that national and international efforts to limit greenhouse gas emissions can be expected to continue and intensify after the year 2000. Furthermore, Suncor expects to experience emissions increases shortly after the new century begins due to significant increases in production and facility expansion. Thus, the company determined it was necessary to intensify its efforts to reduce or offset emissions after the year 2000.

While continued pursuit of internal energy efficiencies remains Suncor's first priority, a complementary component of Suncor's strategy to deal with the challenge of projected emissions increases, combined with increased government pressure for emissions reductions, is to explore opportunities for obtaining offsetting emissions reductions elsewhere in the world where additional

reductions may be achieved at a lower cost.

Along with seeking greater internal company emissions reductions, Suncor has, therefore, also cosponsored a forestry conservation project in Belize, South America, invested in a wind power project in southern Alberta, and negotiated the international trade with Niagara Mohawk. In the words of Suncor Chief Executive Officer Rick George, "One idea that we fully support is creating a system of domestic and international credits to encourage greenhouse gas reduction efforts around the globe."

Niagara Mohawk, for its part, strongly endorses Suncor's view that the climate change issue is a global problem that requires a global solution, with maximum flexibility regarding where reductions can be obtained, and close cooperation between nations. Niagara Mohawk also supports the U.S. government's position that national and international emissions trading is a vital component of any program to combat global warming. If properly structured, trading can lead to net environmental benefits as well as benefits in economic efficiency.

For example, as a result of an earlier domestic greenhouse gas trade with the Arizona Public Service Company (APS), Niagara Mohawk was able to fund development of a biomass project in its New York service territory and invest in an international "joint implementation" wind and solar renewable energy project with APS in Mexico. The reinvestment provision of the trade with Suncor Energy will continue this pattern of obtaining additional environmental benefits beyond the value of the trade itself.

Finally, Niagara Mohawk believes efforts to mitigate potential climate change need to go forward sooner rather than later, and early reductions of greenhouse gas emissions should be encouraged by government policy. Companies that have made early reductions should be given credit for their actions. The trade with Suncor was designed to demonstrate that early reductions can create financial value and stimulate the emergence of market trading, in turn encouraging broader participation by private sector corporations in emissions reduction activities and leading to further reductions that would otherwise not have occurred.

As stated by Niagara Mohawk's Chief Executive Officer Bill Davis, "By making this international trade, we hope to help forge a new marketplace that will make economically efficient options to reduce the risk of global climate change more viable."

CONDITIONS FOR FULL IMPLEMENTATION OF THE TRADE AGREEMENT

Since there are as yet no formal mechanisms in place for international trading in greenhouse gas emissions, full implementation of the trade will require recognition and sanction by the governments of the United States and Canada. Niagara Mohawk and Suncor will work together to pursue such approvals as an international trading system is developed and put into place. Also, the agreement is contingent upon proper verification and depositing of Niagara Mohawk emissions reductions to be used in the trade in an account with ERT, a process which is already moving forward.

Finally, because most of the reductions for the trade will be created prior to the beginning of the first emissions budget period (2008), implementation will require a government program that gives credit for voluntary early reductions.

The Kyoto Protocol does not specifically address credit for early reductions, other than a provision allowing credit for certain Clean Development Mechanism projects in developing countries undertaken between the years 2000 and 2008 (Article 12). However, nations with emissions budgets can decide to set aside or "reserve" a portion of their future budget to stimulate and reward early reduction efforts. The United States and Canada are currently considering early reduction credit programs. Suncor and Niagara Mohawk are contributing to the deliberations.

Global warming is a global issue that will require global solutions. Niagara Mohawk and Suncor hope their trade agreement will serve as a useful and beneficial test case of what can be accomplished when two companies and two nations work together.

Martin Smith serves as chief environmental scientist for Niagara Mohawk Power Corporation in Syracuse, New York. Gord Lambert is corporate director for Environment, Health, and Safety at Suncor Energy Incorporated in Calgary, Alberta, Canada.

INDUSTRY SHIFTING GEARS — SEEKING SOLUTIONS

By Jim Fuller

A growing number of U.S. industry leaders are beginning to consider the impact of global warming and the need to develop new energy-efficient technologies to cut greenhouse gases suspected of causing climate change.

Representatives from more than 160 countries meeting in Kyoto, Japan, in December 1997 hammered out a protocol that calls for developed countries to reduce their emissions of greenhouse gases by an average of 5.2 percent below 1990 levels by the years 2008-2012. Such heat-trapping gases, primarily carbon dioxide, are produced from the burning of fossil fuels used to heat homes, power automobiles, and sustain industrial production.

To meet their emissions-reduction targets, governments must turn to industry to develop environmentally friendly and energy-efficient products and technologies. Speaking at the White House Conference on Climate Change in October 1997, President Clinton said that industry played a central role in addressing the challenge of climate change.

"We must work with business and industry to find the right ways to reduce greenhouse gas emissions," Clinton said. "We must promote technologies that make energy production and consumption more efficient."

Clinton also pointed out that many companies have already begun to take steps to reduce the threat of global warming. For example, he said, a number of electric utilities are working with homeowners to promote a new technology called geo-exchange, which uses geothermal pumps to heat and cool homes. This method costs far less than traditional systems while reducing greenhouse gas emissions by 40 percent or more.

One important element of Clinton's domestic plan to reduce greenhouse gases is the building of partnerships with key energy producing and emitting industries to develop sector-by-sector initiatives. Daniel Dudek, senior economist with the Environmental Defense Fund, points out that the president's plan also promises tax credits for early emissions reductions by industry. "Companies have the opportunity of being both pro-active and self-serving," he said.

Up to now U.S. businesses have mainly opposed the Kyoto accord, saying it will put jobs at risk by piling additional costs onto the shoulders of companies struggling against international competition. But there have also been signs of a shift in attitude among industry executives, with a growing number of companies beginning to focus on how to reduce greenhouse gas emissions.

In recent months, oil company executives representing major firms such as Texaco, Sun, and Shell oil companies have made remarks suggesting that fossil fuels may be changing the world's climate and that companies must begin to address the problem.

Robert Campbell, chief executive of the major East Coast oil refiner Sun Oil, told Clinton in a letter that the White House conference "reinforced my view that there is sufficient scientific concern about man-made climate impacts to justify initiation of prudent mitigation measures now."

Peter Bijur, the head of Texaco, told a high-level meeting of financial leaders earlier this year that

"the debate really isn't about the science anymore. It's about what companies are doing, and what they are doing is to look at the next generation of technologies and improving efficiencies of operations, reducing emissions of refineries and things like that."

A Texaco spokesman told reporters that Bijur's comments were about using Texaco's technology and other strengths to be more competitive into the next century. For instance, he said, Texaco has technology that can convert natural gas into a clean-burning, highly efficient diesel fuel that would help reduce the amount of natural gas that is flared at the top of smokestacks, which contributes to the buildup of greenhouse gases.

Clement Main, vice president for international relations at Texaco, said the best way to involve developing countries in measures to mitigate climate change is to make investment, technologies, and managerial expertise available to them through direct investments and joint ventures.

"The ability of developing countries to replace outdated industrial infrastructures and to utilize more efficient available technology will be crucial to achieving meaningful global results," he said.

Red Cavaney, who heads the American Petroleum Institute, said that once you move beyond industry's concerns over the Kyoto agreement, you get different views from industry officials on how individual companies are going to implement emissions reductions and on how they look at different alternative energy sources.

Dudek said that beyond the oil companies, he has also seen a shift in attitude among utility and car companies that want to help shape the emerging rules for reducing emissions. He said Kyoto provided a wake-up call to those industries.

Industry officials also point out that investment cycles in many sectors — for example, electric power-generating plants — can extend over several decades, and car fleets are not replaced overnight but over 10 years or more. Government and industry measures to implement the Kyoto agreement must take such realities into account.

Auto makers are already working on a variety of new vehicles that offer maximum mobility and minimum pollution. The nation's Big Three car companies and Toyota Motor Corporation, through the Clinton administration's Partnership for a New Generation of Vehicles, have agreed to develop hydrogen fuel-cell cars and a mid-size family car using an advanced internal combustion engine that cuts current emissions of hydrocarbons by 70 percent. Early versions of the family car are scheduled to go on sale as early as 1999.

At this year's Detroit auto show, major auto makers displayed prototypes of hybrid electric-and-gasoline cars that will get up to 34 kilometers to the liter and predicted a slow phase-out of the internal combustion engine in 20 to 30 years. Auto executives report that with the recent signing of the global-warming treaty and with clean-air standards tightening in the United States, Europe and elsewhere, it suddenly is no longer business as usual for the industry.

"We need to do it," said Harry Pearce, vice chairman of General Motors Corporation. "We want to do it. And we're going to do it. We're deadly serious about it."

In the utility sector, two pioneering companies — one American and the other Canadian — recently signed a ground-breaking agreement that is considered the first step toward the creation of an international trading system for reductions of greenhouse gas emissions. The establishment of a global emissions trading system is one of the key proposals of the Kyoto Protocol.

Under the latest agreement, the Canadian oil and gas company, Suncor Energy, will purchase the equivalent of 100,000 metric tons of emission reduction credits from Niagara Mohawk Power Corporation of Syracuse, New York, with an option to buy up to an additional 10 million tons of credits over a 10-year period. Through the agreement, Suncor will be able to achieve its voluntary emission reduction targets for less money, while Niagara Mohawk will have extra cash for future clean energy products.

Vice President Gore praised the agreement, pointing out that while the rules for emissions

trading are not yet final, "the market itself is already emerging."

Michael Marvin, executive director of the Business Council for Sustainable Energy — a group that includes electric utility, energy efficiency, natural gas, and renewable energy companies — said "there is little question" that companies are moving toward reducing emissions.

"While divergent views remain on whether the government should mandate reductions of emissions, more and more of U.S. industry is beginning to take advantage of the technological advancements available to assist in reducing emissions, and the competitive advantages such actions will bring to their bottom line," he said.

Marvin cited the decision by Georgia-Pacific, one of the largest forest products companies in the world, to insulate just 450 meters of its industrial steam lines used in the production of plywood. The company estimated that the insulation cut steam usage by 2,700 kilograms per hour, saving over 16 metric tons of fuel per day, and reduced carbon dioxide emissions by 5 to 6 percent.

Marvin also pointed to the economic strides being made by the renewable energy industry. He said solar manufacturing plants, for example, are opening up across the country, employment is increasing at 30 percent per year, and new improvements are being made in solar photovoltaics, solar pool heating, and solar thermal technologies.

But despite the growing number of industry officials that acknowledge a need to focus on reducing greenhouse gas emissions, many companies remain opposed to the Kyoto Protocol. Constance Holmes, chair of the Global Climate Coalition, which represents 230,000 companies told Congress recently that ratification of the climate agreement would cause substantial economic damage and loss of jobs, and would not achieve its stated goal of stabilizing greenhouse gas concentrations.

Jim Fuller writes on the environment and other global issues for the United States Information Agency.

ENVIRONMENTAL GROUPS BACK RENEWABLE ENERGY

By Jennifer Coffey

Nongovernmental organizations say that the United States and other industrialized nations must accelerate the pace of renewable energy production and the adoption of new energy-efficient technologies to meet the climate change goals agreed to recently in Kyoto.

The Kyoto Protocol, if approved by the U.S. Senate, would require the United States to reduce its greenhouse gas emissions to 7 percent below 1990 levels by the years 2008 to 2012. Other key industrial countries face similar emissions reduction targets that range from 6 to 8 percent below 1990 levels.

Christopher Flavin, senior vice president of research at the Worldwatch Institute, a major environmental group, said that efforts by many developed countries to cut fossil fuel subsides, improve energy efficiency standards, and provide incentives for renewable energy and reforestation are among the modest initiatives that have already begun to slow down the accelerating growth in greenhouse gas emissions.

Flavin said that renewable energy production is expanding at a breakneck speed. For example, wind generation — the world's fastest growing energy source in the 1990s — is expanding by 25 percent a year. In contrast, the markets for coal and oil are expanding at only 1 percent a year.

Flavin also pointed out that a new generation of micro-power plants that use small gas turbines and fuel cells to provide electricity and heat for office and residential buildings could make obsolete the coal-fired power plants that generate about one-third of today's carbon emissions.

"These exciting developments suggest that a strong Kyoto Protocol would create more winners than losers, open the way for dramatic changes in the world energy economy, and set off a competition among nations for dominance of the energy markets of the 21st century," he said.

Flavin said that the pace of adoption of renewables and other new energy technologies will depend on whether government policies— many of which shore up the status quo and retard the development of alternatives — are transformed.

"Experience in countries such as Denmark, Germany, and Japan shows that relatively modest policy shifts — allowing new energy technologies access to the market, and leveling the playing field — are all it takes to spur an energy revolution."

He also said that it is essential for the industrial countries to accelerate the energy revolution and encourage its spread to developing countries before those countries go forward with plans to build hundreds of fossil-fuel-burning power plants and millions of motor vehicles that could be producing carbon pollution for decades to come.

Ken Bossong, executive director of the Sustainable Energy Coalition, agreed with the Worldwatch Institute's assessment, adding that the U.S. domestic program to reduce greenhouse gas emissions does not go far enough.

"The administration's proposal to invest $3,600 million over the next five years in new tax incentives for energy efficiency and renewable energy is a step in the right direction," he said. "However, this package pales when compared with the more than $5,000 million in tax incentives

presently available each year for fossil fuel technologies.

"The tax dollars already being spent to promote coal, oil, and natural gas are roughly seven times the amount now being proposed to be spent on efficiency and renewables," he continued. "If the White House is sincere in wanting real reductions in greenhouse gas emissions caused by the combustion of fossil fuels, the first step should be to stop subsidizing polluting technologies."

Some economists are concerned that reducing dependence on fossil fuels would cripple the U.S. economy through a loss of jobs and the cost of replacing equipment in fossil-fuel burning industries. However, many environmental groups believe that the United States is not only capable of meeting the goals of the protocol in an affordable fashion, but can secure its economic stability through a restructuring of the energy industry. Bossong, for example, said that the benefits of supporting renewable energy and energy efficient technologies would offset any initial costs of implementing the protocol.

"The administration should realize that a package of substantially more aggressive funding and tax proposals, coupled with new transportation, appliance, and utility incentives will produce far more gain than pain," he said.

"The relatively small economic cost associated with these proposals should be more than compensated for by the creation of new domestic industries and jobs, expanded international markets, improved balance of trade, reduced oil imports, and enhanced national security, and the avoided environmental and public health costs of climate change and pollution," he added.

Other environmental groups believe that the Kyoto Protocol is a solid first step in reducing greenhouse gas emissions, but insist that there is still more work to be done.

"It's a useful first step that doesn't nearly go far enough," said Dan Becker of the Sierra Club. "We are going to focus on pressing the United States to take pollution reduction steps at home that will achieve and exceed the Kyoto Protocol. The biggest step is to make cars go further on a gallon of gas. The protocol is far too weak compared to what scientists say we need to do, but it's a step forward, and that's good."

Becker also expressed concern about the emissions trading system set up by the protocol. Under an emissions trading regime, countries or companies can purchase less expensive emissions permits from countries or companies that have more permits than they need because they have met their targets with room to spare. Rules and guidelines — particularly verification, reporting, and accountability — have yet to be worked out.

"We are concerned that rather than calling for specific reductions by specific polluters, emissions trading gives polluters causing global warming a license to pollute or trade pollution within the system," Becker said. "And without a policing system, it's hard to see how an honor system can work to reduce pollution."

Fred Krupp, executive director of the Environmental Defense Fund (EDF), praised the Kyoto Protocol as a landmark agreement that could "redirect the Earth from the path of an overheating climate and to a safer world."

Commenting on specific policies contained in the protocol, EDF senior economist Dan Dudek noted that "the protocol affirms the importance of emissions trading by companies in reducing greenhouse gas emissions. However, details on the critical elements necessary for this protocol to function, such as compliance and the rules for trading, are yet to be determined."

He added that the protocol's promise will only translate into real environmental gains for the planet if the commitments made in Kyoto are fully implemented and early reductions of greenhouse gases are achieved.

In contrast to the optimistic outlook of several organizations, other groups feel the protocol is not a feasible way to reduce greenhouse gas emissions. They believe that the lack of participation by key developing countries — mainly China, Brazil, and Mexico — would hinder U.S. international competitiveness. Others believe that the target

years set by the protocol, 2008-2012, do not allow industries enough time to switch over to more energy efficient methods while remaining economically productive.

Gail McDonald, president of the Global Climate Coalition — a group that represents manufacturing, utility, and mining companies — said her organization opposes binding targets and timetables. "The Kyoto Protocol is flawed. It requires drastic reductions without the commitment of other countries and would be very expensive for the United States," she said.

"Without developing countries' commitment, the United States alone cannot make a significant enough impact on emissions because emissions in developing countries will be growing," McDonald added. "We believe that a global problem requires global participation."

The Union of Concerned Scientists (UCS) also addressed the role of developing countries in emissions reduction, predicting that they will eventually agree to limit their emissions.

"The Kyoto Protocol is just one step in the ongoing international effort to limit global warming," a UCS spokesman said. "The protocol is not a one-shot deal, but the beginning of a long effort to prevent the serious consequences of global warming. In light of the vehement opposition by some countries and by the U.S. coal and oil industries, the protocol is a substantial achievement."

Jennifer Coffey is an intern on the Global Issues journal staff.

DEVELOPING COUNTRIES GET HELP FROM SCIENTISTS

By Jim Fuller

Scientists from the United States and other industrialized countries are helping the world's developing and transitioning nations find ways to reduce greenhouse gas emissions that cause global warming.

The U.N. Framework Convention on Climate Change, which has been ratified by more than 160 nations so far, requires all parties to prepare national inventories of their greenhouse gas emissions and to outline steps needed to mitigate the problem.

The continuing global accumulation of greenhouse gases, such as carbon dioxide produced by the burning of fossil fuels, is thought by many scientists to be contributing to a rise in average global surface temperature. Warmer temperatures affect precipitation, and crop cycles, and they increase the range of animal pests, which can contribute to the spread of tropical diseases.

In their efforts to develop greenhouse gas emission inventories and evaluate options for controlling those emissions, developing nations and countries with economies in transition are receiving technical support and training from experts drawn from U.S. national laboratories, universities, private companies, and non-governmental organizations. The transitioning nations include the former Soviet republics and East European nations.

American experts work under the auspices of the U.S. Country Studies Program, which since 1993 has provided financial and technical support to 55 developing and transitioning countries for climate change studies. Under the Country Studies Program — announced by President Clinton in 1992 — U.S. researchers coordinate their activities in developing countries with experts from Canada, Germany, Japan, the Netherlands, as well as organizations like the U.N. Environment Program and the World Bank.

Jayant Sathaye, senior scientist at the Ernest Orlando Lawrence Berkeley National Laboratory in Berkeley, California, said the lab plays a lead role in helping developing countries assess their vulnerabilities to global warming and formulate climate change action plans. The action plans list specific measures to mitigate climate change and to cope with its impacts.

"We have organized training workshops, provided technical assistance to the participating nations, and organized workshops for reporting results," Sathaye said. "The results go into the preparation of each country's climate action plan. They are also used to prepare climate change projects that can be funded by various agencies, including the World Bank and private sector groups."

Since 1994, the Berkeley team has organized greenhouse gas mitigation workshops in Africa, Asia, Latin America, and Central Europe — bringing together scientists from 35 nations. The work done at these workshops provided information used by negotiators working on a treaty to limit international greenhouse gas emissions at the Third Conference of Parties to the U.N. Framework Convention on Climate Change last December in Kyoto, Japan.

Sathaye, who attended the Kyoto conference, said he reported to the delegates on "the problems of implementing mitigation programs in the developing and transitioning countries, the costs of mitigation, the kinds of technology that should be transferred to reduce carbon emissions, and the conditions for successful transfer."

Sathaye said a new report released in August, funded by the U.S. Country Studies Program, examines the trend toward increasing greenhouse gas emissions in 14 developing and transitioning nations and what these countries can do to control the increases. The transitioning countries covered in the report are Bulgaria, Czech Republic, Estonia, Hungary, Kazakstan, Poland, Russia, Slovak Republic, and Ukraine. The developing countries covered are Mexico, Nepal, Nigeria, Sri Lanka, and Venezuela.

According to the report, baseline (business-as-usual) emissions of greenhouse gases in most of the transitioning countries begin to increase in the first decade of the next century, exceeding 1990 levels sometime during that period. The greenhouse gas emissions from the developing countries are expected to increase as their economies and populations grow.

For example, in Mexico's baseline scenario, carbon dioxide emissions roughly double in the period 1995 to 2010, growing faster than gross domestic product. In the case of Nigeria, the overall increase during the same period ranges from 30 percent in a low-growth scenario to 80 percent in a high-growth scenario.

Each nation's study focused on a different set of options for reducing their emissions. The choices included rehabilitating existing power plants, developing renewable energy sources, improving energy efficiency, and switching to low-carbon fuels.

In the Czech Republic, for example, it was found that increased use of energy-saving technologies would reduce baseline energy consumption in 2010 by 8 percent. The Russian study considered a large number of energy conservation measures whose implementation would reduce primary energy consumption by 23 percent.

Mexico's study focused on cogeneration in a number of industries and efficient lighting in homes and other buildings — measures that would bring about a 13 percent reduction in carbon dioxide emissions in 2005.

Many of the studies voiced the need for both foreign investment and international assistance on a larger scale to promote the transfer of technologies that offer greenhouse gas mitigation and other benefits. Helping to strengthen local capacity to evaluate and implement mitigation measures is also very important.

Another report released at the Kyoto Conference describes the greenhouse gas mitigation activities in 12 Asian nations. The overall project, funded primarily through the U.N. Development Program, the Asian Development Bank, and the government of Norway, included studies by more than 175 experts in the 12 countries.

The studies found that the largest greenhouse gas emissions among this group of Asian nations are from the People's Republic of China, India, Indonesia, and Republic of Korea. On a per person basis, however, the projected emissions of these countries even 23 years from now remain only a fraction of those of the industrial nations today, the report said.

The report's 2020 analysis of India's energy sector showed that carbon emissions can be reduced 5 percent — at no additional cost compared to a scenario of continuing current trends — using promising new industrial technologies, energy conservation measures, and more natural gas for electric power generation.

"The main thing we found with the Asian studies is that the developing countries are already doing a lot to reduce their emissions, but not for climate change reasons," Sathaye said. "They are improving their energy efficiencies and removing energy subsidies. But the studies show that they can do a lot more without jeopardizing their economic growth — with anywhere from a 5 to 15 percent reduction in emissions possible without negative cost."

But Sathaye added that these countries need new capital and technology to achieve these reductions, providing a role for the United States and other donors to play in promoting the use of climate-friendly technologies.

Jim Fuller writes on the environment and other global issues for the United States Information Agency.)

REPORTS AND DOCUMENTS

ANALYSIS OF KYOTO PROTOCOL

The United States played a prominent role in negotiating the Kyoto Protocol to the U.N. Framework Convention on Climate Change.

Following are excerpts of a December 1997 report on the Kyoto Protocol prepared by the Congressional Research Service of the Library of Congress.

SUMMARY

Negotiations on the Kyoto Protocol to the United Nations Framework Convention on Climate Change were completed December 11, 1997, committing the industrialized nations to specified, legally binding targets for emissions of six greenhouse gases. The treaty will open for signature on March 16, 1998.

The United States played a prominent role in these negotiations, and agreed to a target of reducing greenhouse gases by 7 percent below 1990 levels during a "commitment period" between 2008-2012. Because of the way sinks, which remove these gases from the atmosphere, are counted and because of other provisions discussed in this report, the actual reduction of emissions required to meet the target within the United States is estimated to be lower than 7 percent — probably more like 2 to 3 percent.

The administration has indicated that until developing countries also make commitments to participate in greenhouse gas limitations, it will not submit the protocol to the Senate for advice and consent, thereby delaying any possibility of ratification until after a November 1998 meeting of the parties in Buenos Aires, Argentina.

In the meantime, it is expected that several congressional committees will hold hearings on the implications of this protocol for the United States.

BACKGROUND

Responding to concerns that human activities are increasing concentrations of "greenhouse gases" (such as carbon dioxide and methane) in the atmosphere, most nations of the world joined together in 1992 to sign the United Nation's Framework Convention on Climate Change (UNFCCC).

This treaty included a legally non-binding, voluntary pledge that the major industrialized/developed nations would reduce their greenhouse gas emissions to 1990 levels by the year 2000.

However, as scientific consensus grew that human activities are having a discernible impact on global climate systems, possibly causing a warming of

Earth that could result in significant impacts such as sea level rise, changes in weather patterns, and health effects — and as it became apparent that major nations such as the United States and Japan would not meet the voluntary stabilization target by 2000 — parties to the treaty decided in 1995 to enter into negotiations on a protocol to establish legally binding limitations or reductions in greenhouse gas emissions.

It was decided by the parties that this round of negotiations would establish limitations only for the developed countries (those listed in Annex I to the UNFCCC, and referred to as "Annex I countries"; developing countries are referred to as "non-Annex I countries").

During negotiations that preceded the December 1-11, 1997, meeting in Kyoto, Japan, little progress was made, and the most difficult issues were not resolved until the final days — and hours — of the conference. There was wide disparity among key players especially on three items: (1) the amount of binding reductions in greenhouse gases to be required, and the gases to be included in these requirements; (2) whether developing countries should be part of the requirements for greenhouse gas limitations; and (3) whether to allow emissions trading and joint implementation, which allow credit to be given for emissions reductions to a country that brings about the actual reductions in other countries or locations where they may be cheaper to attain.

The United States proposal was for a reduction in all six major greenhouse gases to 1990 levels by the period 2008-2012, with joint implementation allowed. The European Union (EU) argued strongly for a 15 percent reduction from 1990 levels by 2010 for three greenhouse gases, using a "bubble", or cumulative, approach for the nations within the EU, but no joint implementation beyond that.

Japan proposed a 5 percent reduction from 1990 levels for three greenhouse gases. The group of developing countries (known as the G77) proposed that developed countries should stabilize their emissions of greenhouse gases at 1990 levels by 2000, then reduce them by 15 percent by 2010, with further reductions of 20 percent — for a total of 35 percent reduction by 2020 below 1990 levels.

SUMMARY OF THE KYOTO PROTOCOL

The Kyoto Protocol was completed in haste during an extension of the Kyoto meeting beyond its December 10 deadline, into the morning of December 11. It contains a number of areas for which details will have to be worked out over the next year.

The Protocol will be opened for signature March 16, 1998, and will enter into force when 55 nations have ratified it, provided that these ratifications include Annex I parties that account for at least 55 percent of total carbon dioxide emissions in 1990. The major commitments in the treaty on the most controversial issues are as follows:

- **EMISSION REDUCTIONS**. The United States would be obligated under the Protocol to a reduction of 7 percent below 1990 levels for all six greenhouse gases, averaged over the commitment period 2008 to 2012.

The protocol states that Annex I parties are committed — individually or jointly — to ensuring that their aggregate anthropogenic carbon dioxide equivalent emissions of greenhouse gases do not exceed amounts assigned to each country in Annex B to the Protocol, "with a view to reducing their overall emissions of such gases by at least 5 percent below 1990 levels in the commitment period 2008 to 2012." Annex A lists the 6 major greenhouse gases covered by the treaty.

The six gases covered by the protocol are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO_2), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). The most prominent of these, and the most pervasive in human economic activity is carbon dioxide, produced when wood or fossil fuels such as oil, coal, and gas are burned.

Annex B lists 39 nations, including the United States, the European Union plus the individual EU nations, Japan, and many of the former Communist nations. The amounts for each country are listed as percentages of the base year, 1990 (except for

some former Communist countries), and range from 92 percent (a reduction of 8 percent) for most European countries — to 110 percent (an increase of 10 percent) for Iceland.

The United States is committed on this list to 93 percent, or a reduction of 7 percent, to be achieved as an average over the five years 2008-2012.
Based on projections of the growth of emissions using current technologies and processes, the reduction in greenhouse gas emissions required of the United States would likely be well in excess of some 30 percent below where it would be otherwise by the 2008-2012 budget period.

However, according to administration officials, based on the accounting method adopted in the protocol, which includes (as the United States had urged) greenhouse gas sinks, it appears that the actions that must be taken to reduce emissions within the United States, after sinks are counted, would be substantially less than 7 percent — probably in the range of 2 to 3 percent. The administration is assuming that a significant portion of its 7 percent target could be met through some combination of emissions trading and joint implementation.

- **DEVELOPING COUNTRY RESPONSIBILITIES.** The United States had taken a firm position that "meaningful participation" of developing countries in commitments made in the protocol is critical to approval of the treaty by the U.S. Senate, and it argued that success in dealing with the issue of climate change and global warming would require such participation.

The developing country bloc argued that the Berlin Mandate — the terms of reference of the Kyoto negotiations — clearly excluded them from new commitments in this protocol, and continued to oppose emissions limitation commitments by non-Annex I countries.

The negotiations concluded without such commitments, and the United States indicated that it will not submit the protocol for Senate consideration — and therefore will not ratify it — until subsequent negotiations are held and meaningful commitments are made by developing countries. The next meeting of the parties will be in November 1998 in Buenos Aires, Argentina.

The protocol does call on all parties — developed and developing — to take a number of steps to formulate national and regional programs to improve "local emission factors," activity data, models, and national inventories of greenhouse gas emissions and sinks that remove these gases from the atmosphere.

All parties are also committed to formulate, publish, and update climate change mitigation and adaptation measures, and to cooperate in promotion and transfer of environmentally sound technologies and in scientific and technical research on the climate system.

- **EMISSIONS TRADING AND JOINT IMPLEMENTATION**. Emissions trading, in which a party included in Annex I "may transfer to, or acquire from, any other such party emission reduction units resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing anthropogenic removals by sinks of greenhouse gases" for the purpose of meeting its commitments under the treaty, is allowed and outlined in Article 6, with several provisos.

Among the provisos is the requirement that such trading "shall be supplemental to domestic actions." The purpose of this proviso is to make it clear that a nation cannot entirely fulfill its responsibility to reduce domestic emissions by relying primarily on emissions trading or joint implementation to meet its targets.

A number of specific issues related to the rules on how joint implementation and emissions trading will work are to be negotiated and resolved in subsequent meetings, as these issues are clarified and identified.

A major development is the establishment of a "Clean Development Mechanism," through which joint implementation between developed and developing countries would occur.
The United States had pushed hard for joint implementation (JI), and early proposals were formulated with the expectation that JI projects would be primarily bilateral.

Instead, negotiations resulted in agreement to establish the Clean Development Mechanism to which developed Annex I countries can contribute financially, and developing non-Annex I countries can benefit from financing for approved project activities; Annex I countries can then use certified emission reductions from such projects to contribute to their compliance with part of their emission limitation commitment.

Emissions reductions achieved through this mechanism can begin in the year 2000 to count toward compliance in the first commitment period (2008-2012). Again, specifics on how this mechanism will operate will be developed and, presumably, clarified at the November 1998 Conference of the Parties.

RATIFICATION

For the United States to ratify the protocol, the treaty must be submitted to the U.S. Senate for advice and consent. Ratification requires a two-thirds majority vote in the Senate for approval. Unless the United States ratifies the treaty, it will not be subject to its terms and obligations. President Clinton has voiced strong support for the Kyoto Protocol, and the United States is expected to sign it when it is opened for signature.

However, in recognition of the opposition expressed in the a Senate Byrd-Hagel Resolution, which passed 95-0, to a protocol that does not include requirements for emissions limitations by developing countries, the president has indicated that he will not submit the treaty to the Senate for advice and consent until additional negotiations have provided for meaningful developing country participation.

The next Conference of the Parties that would offer an opportunity to make such provisions will be in November 1998 in Buenos Aires.

The CRS report was written by Susan R. Fletcher, senior analyst in International Environmental Policy, Environment and Natural Resources Policy Division.

FACT SHEET: THE KYOTO PROTOCOL ON CLIMATE CHANGE

Following are excerpts of a fact sheet prepared by the Department of State's Bureau of Oceans and International Environmental and Scientific Affairs.

BACKGROUND

At a conference held December 1-11, 1997, in Kyoto, Japan, the Parties to the U.N. Framework Convention on Climate Change agreed to a historic protocol to reduce greenhouse gas emissions by harnessing the forces of the global marketplace to protect the environment.

The Kyoto Protocol in key respects — including emissions targets and timetables for industrialized nations and market-based measures for meeting those targets — reflects proposals advanced by the United States. The protocol makes a down payment on the meaningful participation of developing countries, but more needs to be done in this area. Securing meaningful developing country participation remains a core U.S. goal.

EMISSIONS TARGETS

A central feature of the Kyoto Protocol is a set of binding emissions targets for developed nations. The specific limits vary from country to country, though those for the key industrial powers of the European Union (EU), Japan, and the United States are similar — 8 percent below 1990 emissions levels for the EU, 7 percent for the United States, 6 percent for Japan.

The framework for these emissions targets is based largely on U.S. proposals:

- Emissions targets are to be reached over a five-year budget period as proposed by the United States, rather than by a single year. Allowing emissions to be averaged across a budget period increases flexibility by helping to smooth out short-term fluctuations in economic performance or weather, either of which could spike emissions in a particular year.

- The first budget period will be the U.S. proposal of 2008-2012. The parties rejected proposals favored by others, including budget periods beginning as early as 2003, that were neither realistic nor achievable. Having a full decade before the start of the binding period will allow more time for U.S. companies to make the transition to greater energy efficiency and/or lower carbon technologies.

- The emissions targets include all six major greenhouse gases. The European Union and Japan initially favored counting only three gases — carbon dioxide, methane, and nitrous oxide. Ensuring the inclusion of the additional gases (synthetic substitutes for ozone-depleting chlorofluorocarbons) that are highly potent and long-lasting in the atmosphere provides more comprehensive environmental protection and lends more certainty concerning the treatment of the additional gases.

- Activities that absorb carbon, such as planting trees, will be offset against emissions targets. The treatment of these so-called "sinks" was another controversial issue at Kyoto. Many countries wanted sinks to be excluded. The United States insisted that they be included in the interest of encouraging activities like afforestation and reforestation. Accounting for the role of forests is critical to a comprehensive and environmentally responsible approach to climate change. It also provides the private sector with low-cost opportunities to reduce emissions.

INTERNATIONAL EMISSIONS TRADING

The United States prevailed in securing acceptance of emissions trading among nations with emissions targets. This free market approach, pioneered in the United States, will allow countries to seek out the cheapest emissions reductions, substantially lowering costs for the United States and others.

Under an emissions trading regime, countries or companies can purchase less expensive emissions permits from countries that have more permits than they need (because they have met their targets with room to spare). Structured effectively, emissions trading can provide a powerful economic incentive to cut emissions while also allowing important flexibility for taking cost-effective actions.

The Kyoto Protocol enshrines emissions trading. Rules and guidelines — in particular for verification, reporting, and accountability — are to be worked out at the next meeting of the parties at Buenos Aires in November 1998.

The inclusion of emissions trading in the Kyoto Protocol reflects an important decision to address climate change through the flexibility of market mechanisms. Led by the United States, the conference rejected proposals to require all parties with targets to impose specific mandatory measures, such as energy taxes.

The United States also reached a conceptual agreement with a number of countries, including Australia, Canada, Japan, New Zealand, Russia, and Ukraine, to pursue an umbrella group to trade emissions permits. Such a trading group could further contribute to cost-effective solutions to this problem.

JOINT IMPLEMENTATION AMONG DEVELOPED COUNTRIES

Countries with emissions targets may get credit towards their targets through project-based emission reductions in other such countries. The private sector may participate.

Additional details may be agreed upon by the parties at future meetings.

CLEAN DEVELOPMENT MECHANISM

Another important free-market component of the Kyoto Protocol is the so-called "Clean Development Mechanism" (CDM). The CDM embraces the U.S. proposal for "joint implementation for credit" in developing counties.

With the Clean Development Mechanism, developed countries will be able to use certified emissions reductions from project activities in developing countries to contribute to their compliance with greenhouse gas reduction targets.

This Clean Development Mechanism will allow companies in the developed world to enter into cooperative projects to reduce emissions in the developing world — such as the construction of high-tech, environmentally sound power plants — for the benefit of both parties. The companies will be able to reduce emissions at lower costs than they could at home, while developing countries will be able to receive the kind of technology that can allow them to grow more sustainably. The CDM will certify and score projects. The CDM can also allow developing countries to bring projects forward in circumstances where there is no immediate developed-country partner.

Under the Clean Development Mechanism, companies can choose to make investments in projects or to buy emissions reductions. In addition, parties will ensure that a small portion of proceeds be used to help particularly vulnerable developing countries, such as island states, adapt to the environmental consequences of climate change.

Certified emissions reductions achieved starting in the year 2000 can count toward compliance with the first budget period. This means that private companies in the developed world will be able to benefit from taking early action.

DEVELOPING COUNTRIES

Various protocol provisions, taken together, represent a down payment on developing country participation in efforts to reduce greenhouse gas emissions:

- Developing countries will be engaged through the Clean Development Mechanism, noted above.

- The protocol advances the implementation by all parties of Article 4.1 commitments under the 1992 Framework Convention on Climate Change. For example, the protocol identifies various sectors (including the energy, transport, and industry sectors as well as agriculture, forestry, and waste management) in which actions should be considered in developing national programs to combat climate change and provides for more specific reporting on actions taken.

- While the conference rejected a proposal to create a new category of nations that would voluntarily assume binding emissions targets, developing countries may as a prerequisite for engaging in emissions trading still do so through amendment to the annex of the protocol that lists countries with targets.

Securing meaningful participation from key developing countries remains a priority for the United States. The administration has stated that without such participation, it will not submit the Kyoto Protocol to the Senate for advice and consent to ratification.

MILITARY EMISSIONS

The Kyoto Protocol achieves the objectives identified by the Department of Defense where international agreement was necessary to protect U.S. military operations.

- Emissions from "bunker" fuels (for international maritime or aviation use) are exempted from emissions limits.

- Emissions from multilateral operations pursuant to the United Nations Charter are exempted from emissions limits. This includes not only multilateral operations expressly authorized by the U.N. Security Council (such as Desert Storm, Bosnia, Somalia) but also multilateral operations not expressly authorized that are nonetheless pursuant to the U.N. Charter, such as Grenada.

- Countries may decide, among themselves, how to account for emissions relating to multilateral operations (for example, U.S. training in another NATO country). This provision avoids the need to use emissions trading to allocate such emissions.

COMPLIANCE AND ENFORCEMENT

The protocol contains several provisions intended to promote compliance. These include requirements related to measurement of greenhouse gases, reporting, and review of implementation.

The protocol also contains certain consequences for failure to meet obligations. For example, as a result of a U.S.-proposed provision, a party not in compliance with its measurement and reporting requirements cannot receive credit for joint implementation projects.

Effective procedures and a mechanism to determine and address non-compliance are to be decided at a later meeting. For both environmental and competitiveness reasons, the United States will be working on proposals to strengthen the compliance and enforcement regime under the protocol.

ENTRY INTO FORCE

The Kyoto Protocol will be open for signature in March 1998. To enter into force, it must be ratified by at least 55 countries, accounting for at least 55 percent of the total 1990 carbon dioxide emissions of developed countries. U.S. ratification will require the advice and consent of the Senate.

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THE COST OF COMBATING GLOBAL WARMING
(Foreign Affairs, Vol. 76, No. 6, November/December 1997, pp. 8-14)

ARTICLE ALERT

Abstracts of recent articles on climate change:

Bolin, Bert.
THE KYOTO NEGOTIATIONS ON CLIMATE CHANGE: A SCIENCE PERSPECTIVE
(Science, vol. 279, January 16, 1998, pp. 330-331)

The article analyzes the agreement reached by the Third Conference of Parties to the Framework Convention on Climate Change in Kyoto. The author writes that because of the long time carbon dioxide remains in the atmosphere, even a modest reduction in the rate of increase of atmospheric carbon dioxide — as called for by the Kyoto Protocol — would be of long-term significance. The author also says that the Kyoto delegates did not fully appreciate the inertia of the climate system, and that therefore it seems likely that another international effort will be required well before 2010 to consider whether further measures are warranted.

Calvin, William H.
THE GREAT CLIMATE FLIP-FLOP
(The Atlantic Monthly, vol. 281, no. 1, January 1998, pp. 47-64)

Recent discoveries by scientists indicate that the current global warming trend, caused by increasing greenhouse gas emissions, could trigger a "climate flip" that results not in warmth but in drastic cooling that could threaten the survival of civilization. According to the author, sufficient global warming could increase high-latitude rainfall or melt Greenland's ice — either of which could interfere with the mechanism that allows warm equatorial waters to flow around Greenland and Norway. Should this happen, Europe's climate could become more like Siberia's.

Cooper, Richard N.
TOWARD A REAL GLOBAL WARMING TREATY
(Foreign Affairs, vol. 77, no. 2, March/April 1998, pp. 66-79)

The author thinks that the Kyoto strategy will not succeed because it is premised on setting national emissions targets. These targets will never be met without the cooperation of the developing countries, and they will not consent. There is unlikely to be a generally acceptable principle for allocating valuable emission rights between rich and poor countries. Mutually agreed-upon actions, such as a nationally collected tax on greenhouse gas emissions, might offer some hope for international action to slow global warming.

Forrister, Derrick; and others.
KYOTO AND THE U.S. ECONOMY
(Environmental Forum, vol. 14, no. 6, November/December, 1997, pp. 40-47)

Using the Kyoto conference as a backdrop, the article offers a collection of widely divergent views on the possible effects of binding emissions controls to the U.S. economy. For example, the president of the National Manufacturers Association feels that an international climate change treaty "would be disastrous for the [U.S.] national interest," while the senior economist for the World Resources Institute believes that "the U.S. should be able to meet the modest targets ... with minimal economic disruption."

O'Meara, Molly.
THE RISKS OF DISRUPTING CLIMATE
(World Watch, vol. 10, no. 6, November/December 1997, pp. 10-24)

O'Meara, a staff researcher with a premier environmental nongovernmental organization, takes a comprehensive look at the risks of doing nothing to slow climate change. Citing evidence that Earth is "experiencing a twentieth century warming trend," and providing informed speculation on what unchecked emissions of "greenhouse" gases may bring, she argues that we cannot afford the risk of doing nothing.

Schelling, Thomas C.
THE COST OF COMBATING GLOBAL WARMING
(Foreign Affairs, vol. 76, no. 6, November/December 1997, pp. 8-14)

The author points out that any costs of mitigating climate change will be borne by the high-income countries. But the benefits will accrue to future generations in the developing world. Alternative uses of resources devoted to ameliorating climate change should be considered, including whether it makes more sense to invest directly in development. The need for greenhouse gas abatement cannot be separated from the developing world's need for immediate economic improvement. Professor Schelling poses the question of whether it wouldn't be better to invest in development today than pay for climate relief tomorrow.

CLIMATE CHANGE: Internet Sites

WEB SITES

USIA assumes no responsibility for the content or availability of these sites.

What is Global Warming?
prepared by the Union of Concerned Scientists
http://www.ucsusa.org/global/gwwhatis.html

White House Initiative on Global Climate Change
http://www.whitehouse.gov/Initiatives/Climate

United States Information Agency Climate Change Page
http://www.usia.gov/topical/global/environ/envcl.htm

United Nations Climate Change Secretariat
Kyoto Protocol in multiple languages
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Country by Country CO2 Emissions
http://www.panda.org/climate/country.shtml

Global Warming Central
Pace University School of Law provides key documents on climate change
http://www.law.pace.edu/env/energy/globalwarming.html

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