OVERVIEW OF U.S. STRATEGY IN KYOTO NEGOTIATIONS AND BEYOND

The United States entered the negotiations, held December 1-11, 1997 in Kyoto, Japan, with three primary objectives. First, the agreement should include realistic targets and timetables for reducing greenhouse gas emissions among the world's major industrial nations. Second, the agreement should include an array of flexible, market-based approaches for reducing emissions. Third, the agreement should include meaningful participation of key developing countries. At the close of the Kyoto Conference, the Parties to the United Nations Framework Convention on Climate Change agreed to a Protocol to harness the forces of the global marketplace to reduce greenhouse gas emissions that reflected the first two of our objectives, and made an important down payment on the third objective.

The United States will continue its efforts to promote meaningful participation of key developing countries in bilateral and multilateral venues. In addition, the Administration will work with the other parties to the Protocol to develop rules for some of the important provisions in the agreement, including those related to international emissions trading, the Clean Development Mechanism, and carbon sinks. The Administration is working hard to make Kyoto a reality, to ensure that its critical flexibility mechanisms get up and running, and that its coverage becomes global. The following discussion details the Administration's three negotiating objectives, and their economic importance.

Realistic Targets and Timetables

The United States was committed to achieving realistic targets and timetables among developed countries that would represent a credible step in slowing the accumulation of greenhouse gases in the atmosphere, yet be measured enough to ensure continued economic prosperity. The specific limits adopted in the Protocol vary across countries, although those for the countries with the wealthiest economies are similar (see Table 1).

Table 1. Selected Annex I Countries' Emissions Targets

Country	**Emissions Target over 2008 to 2012**[10]
European Union	1990 minus 8%
United States	1990 minus 7%[11]
Japan	1990 minus 6%
Canada	1990 minus 6%
Russian Federation	1990 stabilization
Annex I Average	1990 minus 5.2%

Source: Kyoto Protocol, Annex B

Flexibility and Market Mechanisms

The ultimate economic cost to the United States and other countries of meeting the Kyoto Protocol targets depends critically on whether emissions reductions are pursued in a cost-effective manner. For this reason, the United States insisted that

[10] The 1990 base year actually refers to the 1990 levels for carbon dioxide, methane, and nitrous oxide and the choice of 1990 or 1995 levels for the three categories of synthetic greenhouse gases (Kyoto Protocol, Articles 3.1, 3.8). For some countries, their calculated "1990" target may thus be a hybrid of 1990 and 1995 emissions.

[11] The accounting system used in the Kyoto Protocol is different from the one used in the President's October 1997 proposal. As a result, the United States' Kyoto target represents emissions reductions no more than 3% greater than the President's October proposal (not 7%, as would appear from a surface comparison). First, the Protocol allows countries to use a 1995 baseline for the three types of synthetic gases, instead of the 1990 baseline used in the President's proposal. U.S. emissions of these gases were about 13 MMTCE higher in 1995 than in 1990 (Climate Action Report 1997). The change to a 1995 baseline for these gases implies that the Kyoto target is roughly equal to 1990 emissions minus 6%. Further, the Kyoto Protocol does not include carbon sinks in the calculation of the 1990 baseline, although certain carbon sinks will count toward meeting our 2008-2012 commitment. The omission of sinks from the Kyoto baseline changes the United States' target by about 50 MMTCE (about 3%) in comparison with the President's proposal (derived from Joyce 1995). Further, if U.S. forestry activities covered by the Protocol result in net carbon sequestration, the target will be still easier to attain.

the Protocol include flexible, market-based provisions designed to permit our environmental objectives to be accomplished at least cost. The mechanisms would do this by establishing an international market value for emissions reductions. This will create incentives for the reductions to be made in a manner that does not waste resources or impose avoidable costs on our people or industries.

The nature of the climate change problem suggests that flexibility and market mechanisms can substantially lower costs of achieving given levels of environmental protection. Indeed, 2,500 economists from academia, industry, and government stated in a letter signed last year advocating action on climate change that:

> "Economic studies have found that there are many potential policies to reduce greenhouse gas emissions for which the total benefits outweigh the total costs.... The most efficient approach to slowing climate change is through market-based policies" (Economists' Statement on Climate Change 1997).

The market mechanisms used to lower costs can be characterized in terms of three categories of flexibility: (1) "when" flexibility; (2) "what" flexibility; and (3) "where" flexibility, which may be the most important of all. Such methods have long been championed by economists interested in increasing the efficiency of environmental protection, as well as by those environmentalists interested in maximizing the environmental benefits of a given investment.

"When" Flexibility (Timing)

The freedom to delay or accelerate reductions within an agreed upon time frame -- while ensuring the credibility of emissions reductions -- can lower costs.

The Kyoto Protocol incorporates this principle of "when" flexibility in four ways:

- First, the period over which the initial emissions reductions occur begins and ends in a more realistic time frame than what had been proposed by many other countries. By adopting a gradual and credible path of reductions in the early years, adjustment costs can be greatly reduced while attaining the same ultimate environmental goals.

- Second, under the Kyoto Protocol, the emissions target is not stated in terms of a specific year, but rather in terms of an average over a five-year period (2008-2012) (Kyoto Protocol, Article 3.1). Averaging over five years, instead of requiring countries to meet a specific target each year, can lower costs, especially given an uncertain future. 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.

- Third, there is allowance for "banking" emission reductions within the 2008-2012 commitment period for use in a subsequent commitment period, although the emission targets of the subsequent periods have not yet been specified (Kyoto Protocol, Article 3.13).

- Fourth, Clean Development Mechanism (CDM) credits achieved between 2000 and 2007 can be banked for use in the first or subsequent commitment periods (Kyoto Protocol, Articles 12.10, 3.13).

"What" Flexibility (Gases and Sinks)

"What" flexibility relates to the form the emissions reductions take and is available across two dimensions. The first is the inclusion in the agreement of all six types of greenhouse gases (Kyoto Protocol, Annex A). Emissions of different kinds of gases, not just carbon dioxide, contribute to the greenhouse effect. Reductions in emissions of one gas can be used to substitute for increases in emissions of another by an amount that has equivalent environmental effects using IPCC conversion factors for all greenhouse gases, based on their global warming potentials (see Table 2). The Kyoto Protocol stipulates that countries with binding targets are to reduce their *total* greenhouse gas emissions by certain percentages (Kyoto Protocol, Article 3.1), but does not require specific reductions for specific gases. For instance, the global warming potential per unit mass of sulfur hexafluoride is about 24,000 times greater over 100 years than CO_2, suggesting that it might be cheaper to achieve the same environmental benefit by eliminating one ton of SF_6 rather than 24,000 tons of CO_2.

The second dimension of "what" flexibility is the treatment of sinks, i.e., land use activities that promote the removal of carbon from the atmosphere through the growth of plants. Certain kinds of sinks, in particular afforestation and reforestation net of deforestation, will be used to attain the target by offsetting emissions. Promoting afforestation and reforestation may reduce atmospheric concentrations of CO_2 at much lower costs than reducing emissions of greenhouse gases resulting from industrial activity. In addition, other carbon sinks, such as agricultural soils, could be added to the list of sink activities in the future (Kyoto Protocol, Article 3.4).

Table 2. Global Warming Potentials of Greenhouse Gases Included in the Kyoto Protocol

Chemical/Species	**Chemical Formula**	**Global Warming Potential (100 year time horizon; carbon equivalence) per unit mass**
Carbon Dioxide	CO_2	0.27
Methane	CH_4	6
Nitrous Oxide	N_2O	85
HFC-23	CHF_3	3,191
HFC-32	CH_2F_2	177
HFC-41	CH_3F	41
HFC-43-10mee	$C_5H_2F_{10}$	355
HFC-125	C_2HF_5	764
HFC-134	$C_2H_2F_4$	273
HFC-134a	CH_2FCF_3	355
HFC-152a	$C_2H_4F_2$	38
HFC-143	$C_2H_3F_3$	82
HFC-143a	$C_2H_3F_3$	1,036
HFC-227ea	C_3HF_7	791
HFC-236fa	$C_3H_2F_6$	1,718
HFC-245ca	$C_3H_3F_5$	153
Sulfur hexafluoride	SF_6	6,518
Perfluoromethane	CF_4	1,773
Perfluoroethane	C_2F_6	2,509
Perfluoropropane	C_3F_8	1,909
Perfluorobutane	C_4F_{10}	1,909
Perfluorocyclobutane	c-C_4F_8	2,373
Perfluoropentane	C_5F_{12}	2,045
Perfluorohexane	C_6F_{14}	2,018

Source: Houghton et al. 1996, p. 22 and adjusted based on carbon content of CO_2.

"Where" Flexibility (International)

Greenhouse gas emissions have the same environmental consequences regardless of where in the world they occur. Therefore, the least-cost approach to controlling climate change is to reduce emissions wherever such reductions are cheapest. The Kyoto Protocol includes three important cost-saving provisions of this nature.

- First, it provides for countries that take on binding targets -- at present the industrial countries -- to trade greenhouse gas emissions allowances with each other (Kyoto Protocol, Article 17, initially referred to as Article 16bis). This market in emissions allowances could ensure that emissions reductions occur where they are least expensive within the industrial countries. In particular, U.S. companies could purchase emissions reductions in other participating countries when doing so would reduce their costs -- thus lowering costs without diminishing the level of environmental protection. It is worth noting that regardless of where the reductions take place, countries and their people will bear the cost of ensuring reductions sufficient to meet their specific Kyoto targets, while everyone will enjoy the environmental benefits.

- Second, the agreement provides for joint implementation by Annex I countries (Kyoto Protocol, Article 6). Thus if some industrial countries do not develop programs to trade allowances internationally, U.S. firms could nonetheless implement projects in those countries for which they could receive emissions reduction credits in the United States.

- Third, the agreement allows industrial countries or firms in those countries, through the Clean Development Mechanism, to invest in "clean development" projects in the developing world and use certified emissions reductions from these projects toward meeting their targets (Kyoto Protocol, Article 12). Investment in these kinds of projects would promote sustainable development in developing countries. Many such clean development projects may be quite inexpensive, measured in terms of the cost per ton of emissions avoided, as has been illustrated by the U.S. joint implementation pilot program. The low cost implies that both developing countries and industrial countries could benefit through these clean development efforts.

Opportunities for Cost-Savings through International Trade in Emissions Allowances

One of the primary principles of classical and neoclassical economics is that trade can make the participating parties better off. In the case of reducing greenhouse gas emissions, trade in emissions allowances could reduce the costs of firms and/or countries with higher abatement costs because they can choose to pay low-cost abaters to further reduce their emissions. Similarly, countries with lower abatement costs are better off by participating in international emissions markets because of the net income they can earn by selling emissions allowances abroad. This is no different from high-cost producers of any good wanting to buy at lower world market prices from willing exporters. If a firm finds it relatively costly to "produce" an emissions reduction, it may find it economically advantageous to purchase emissions from low-cost "producers". An international market for emissions also would create incentives for high-cost producers to innovate and find ways to become low-cost producers, and thus sellers of emissions. A wide range of both formal and anecdotal evidence shows that the flexibility mechanisms, particularly trade in emissions, would allow the world to achieve global emissions reductions at substantially reduced cost. Given the magnitude of the reductions necessary, an effective trading system would be needed to achieve our environmental goals while minimizing the cost and disruption to our people and firms.

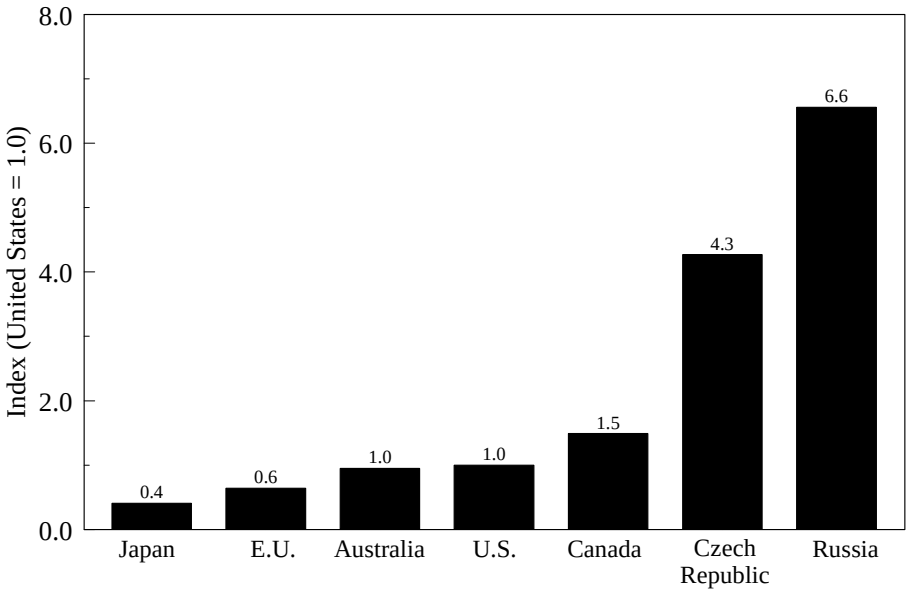
The benefits of achieving emissions reductions targets through international trading have been evaluated by numerous economists in the energy modeling community. Barrett (1992), for example, found that stabilizing emissions country-by-country could cost the European Union (E.U.) 50 times as much as stabilizing emissions for the E.U. as a whole. OECD's GREEN model shows that the costs of abatement vary among regions of the globe with comparable emissions targets by a factor of 10 (Burniaux et al. 1992). GREEN also indicates that allowing trade among regions would lower worldwide compliance costs by a factor of two.

The Stanford Energy Modeling Forum (EMF) conducts exercises with a set of energy-economic models to assess hypothetical energy policy scenarios. In the EMF-14 exercise, six models assessed two emissions pathways over the next 100+ years to achieve a 550 ppm carbon dioxide concentration target. For these two emissions pathways, the models calculated the economic costs of reducing emissions with and without international trading. While the magnitude of the cost-savings varied across models, the finding that trading reduces costs among the group of trading partners was very robust. In the six models included in the EMF exercise, international trading reduced the cost of meeting the global emissions targets by nearly 60% (Weyant 1997).

In addition to the results of formal economic models, several key descriptive statistics also clearly illustrate the opportunities for economic gains from the trade of emissions allowances. For example, several Annex I countries have higher energy-to-GDP ratios than the United States (see Figure 14). Since these countries are less energy efficient than the United States, they present potentially attractive opportunities for U.S. firms to engage in trading and joint implementation projects, thereby securing reductions at relatively lower cost than might be available in the United States.

Several other Annex I countries, including Japan and the European Union are, on average, more energy efficient than the United States. These countries may find it relatively more expensive than U.S. firms to reduce carbon dioxide emissions domestically because they have already "squeezed out" most of the inexpensive improvements in energy efficiency.

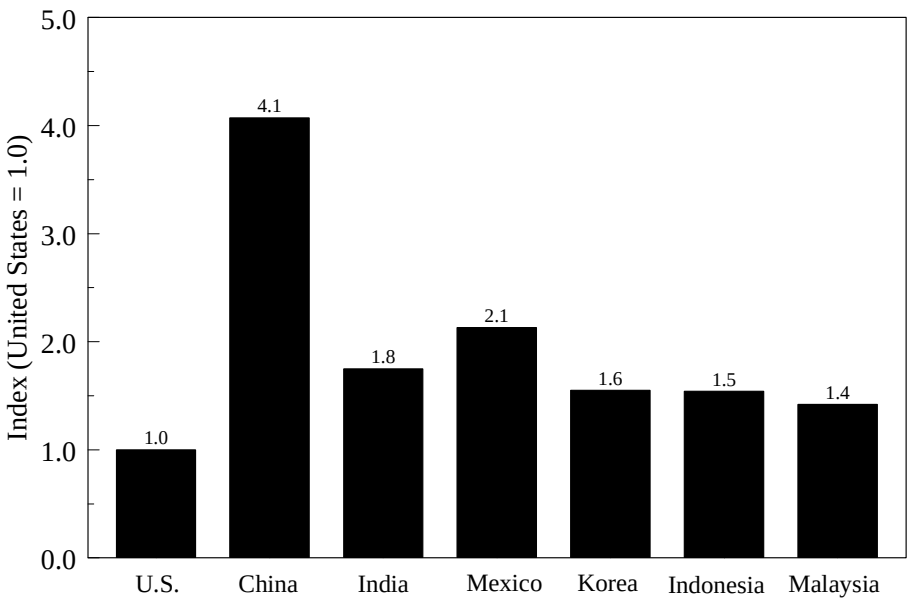
Figure 14. 1995 Energy/GDP Ratios for the U.S. and Several Other Annex I Countries



Source: Energy Information Administration 1997c.

Many large Non-Annex I countries also have much higher energy-to-GDP ratios than the United States (see Figure 15). A system of international emissions trading would provide the economic incentive for these countries to accelerate their transition to an energy efficient and carbon-lean economy. The very high energy intensity of many Non-Annex I countries suggests that many investments in energy efficiency would quickly pay for themselves, yielding negative-cost reductions. These low-cost opportunities could provide alternative options for U.S. firms to reduce emissions inexpensively through the Clean Development Mechanism, and, if developing countries adopted emissions targets, through international emissions trading. The Clean Development Mechanism and international trading would benefit both the industrial countries and the developing countries. For example, Chinese coal-fired boilers are about 25 percent less efficient than the norm for industrialized countries. If China's industrial boilers achieved typical international efficiency levels, then carbon emissions from these boilers would fall 15 to 20 percent and China's total emissions could fall by 5 percent (The World Bank 1996). A recent World Bank study concluded that China could reduce its coal consumption by 20 percent by adopting best practice technology in their power and industrial sectors (The World Bank 1997a). If China adopted a growth emissions target and undertook sensible "no regrets" actions to achieve these emissions reductions, they would make their economy better off even before they gain the benefits from selling their excess emissions in the international trading market.

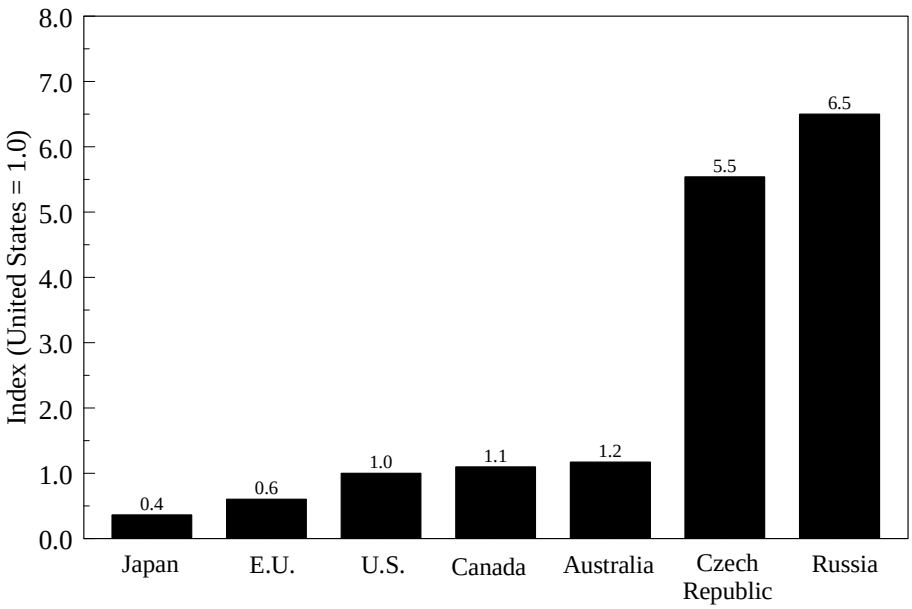
Figure 15. 1995 Energy/GDP Ratios for the U.S. and Several Developing Countries



Source: Energy Information Administration 1997c.

Similar to cross country comparisons of energy/GDP ratios, international comparisons of carbon dioxide emissions per unit of GDP provide insights on the opportunities for gains from trade. Countries vary by nearly two orders of magnitude in emissions of energy-related carbon dioxide per unit of GDP. At the low end are the poorest countries of sub-Saharan Africa: Rwanda, Burundi, Mali, and Chad. These are pre-industrial economies that still rely primarily on animal and human power supplemented by wood and crop wastes rather than commercial fuels and their energy markets are underdeveloped. The OECD countries lie in the middle of this range. Within the OECD, countries with low population density, an abundance of fossil fuels, a cold climate, or large average dwelling size use more energy per unit of GDP. Thus, Canada, Australia, and the United States are among the most carbon intensive in the OECD. Industrial countries undergoing an economic transition away from central planning are more carbon-intensive than most OECD countries. For every unit of output in Russia, more than six times the carbon is emitted than for the same amount of economic output in the United States (see Figure 16). These very high ratios in the former Soviet bloc countries are in part a result of the economic inefficiencies of central planning, including artificially low prices for coal and other fossil fuels, which in some cases still remain today.

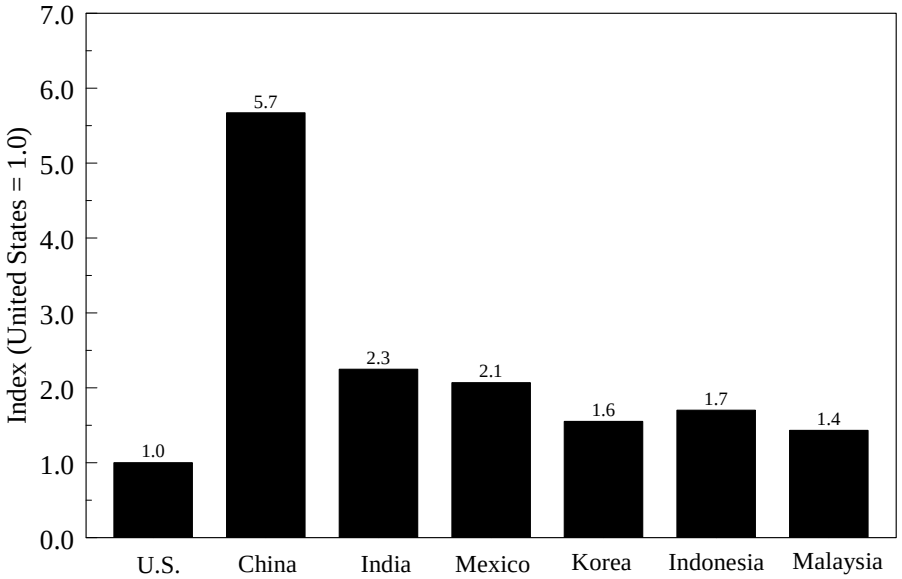
Figure 16. 1995 Carbon/GDP Ratios for the U.S. and Several Other Annex I Countries



Source: Energy Information Administration 1997c.

China's economy is also carbon-intensive, primarily because of its reliance on coal for electricity generation. Other countries with high carbon emissions per unit of GDP include India, Indonesia, and Mexico (see Figure 17). All these countries are in the middle stages of industrialization, and most have large coal or oil reserves.

Figure 17. 1995 Carbon/GDP Ratios for the U.S. and Several Developing Countries



Source: Energy Information Administration 1997c.

Making International Trading Work

Since the agreement in Kyoto, there have been several events signaling interest in transforming the concept of international trading into a practical, workable system. An early carbon emissions trade between two North American firms, a private sector proposal for an E.U. trading system, and cooperation among the Group of Eight countries illustrate this interest.

In March of this year, Niagara Mohawk Power of New York agreed to sell Suncor Energy of Canada 100,000 metric tons of greenhouse gas emissions reductions, with an option for up to 10 million tons over a 10-year period. The value for this agreement could potentially reach about $6 million. Niagara Mohawk plans to use some of the proceeds of the sale to undertake measures to reduce greenhouse gas

emissions, such as improving power plant performance and energy efficiency and developing renewable energy resources. Suncor Energy will secure emissions reductions at a lower cost than what it would have to pay to achieve the same reductions through measures at their own facilities. A third party, the non-profit Environmental Resources Trust, will document the emissions reductions to be undertaken by Niagara Mohawk.

In May, the International Petroleum Exchange (IPE) of London submitted a proposal to establish a market in carbon dioxide emissions to the European Commission. The proposal calls for developing an emissions market in the United Kingdom and then expanding it throughout the European Union. The IPE recommends that free markets be allowed to evolve and anticipates that a bilateral over-the-counter market and a futures market would likely evolve. A tracking system for emissions permits would be designed, and the IPE would play a role in accounting for emissions data and reconciling trades. In terms of the nature of the tradable permit, this proposal recommends that permits be denominated in units of carbon dioxide emissions, where emissions would be calculated from the quantity of carbon-based fuels used.

Also in May, the G-8 Summit in Birmingham, England yielded an agreement to work cooperatively on international trading, other flexibility mechanisms, and developing country participation. The Final Communique of the Summit noted that the G-8 countries "aim to draw up rules and principles that will ensure an enforceable, accountable, verifiable, open and transparent trading system." Continued cooperation among these countries could result in rules that would serve as the foundation for effective private sector trading in greenhouse gas emissions.

High Rates of Growth and Investment

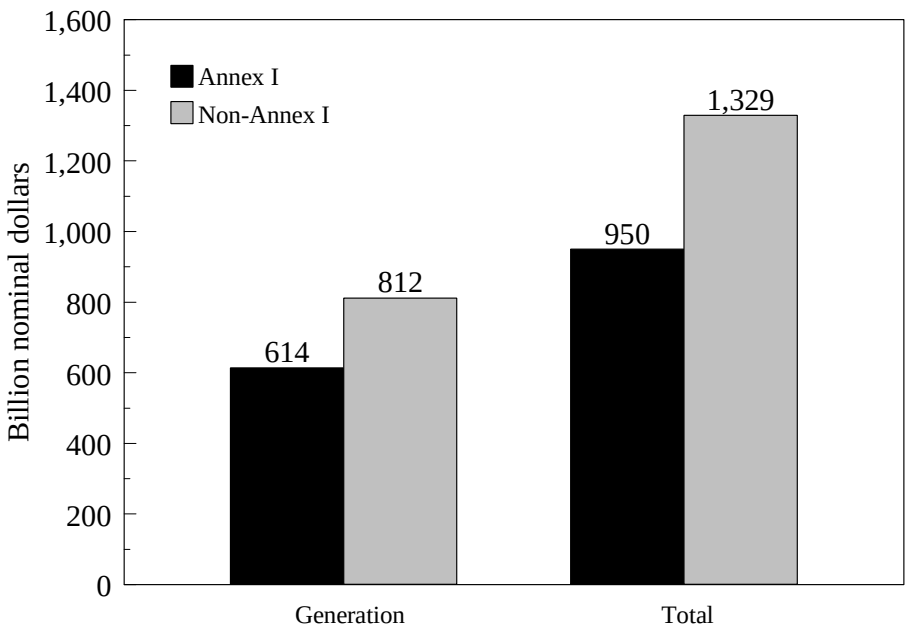
Because of their high growth rates, developing countries have greater opportunities than the OECD to reduce emissions relative to baseline projections by installing new, carbon-efficient plants and adopting other new technologies. In contrast to retrofitting existing plants, new investment in carbon-efficient plants is a less costly approach to abate emissions.

Non-Annex I countries accounted for only 18 percent of world GDP in 1994 -- and only $790 in GDP per capita, compared to $12,200 for Annex I (Panayotou and Sachs 1998). At the same time Non-Annex I GDP grew at 5 percent annually (1990 to 1994), compared to 1.2 percent for Annex I. This has important implications for abatement opportunities.

Although Annex I countries still have, as a group, much higher economic output than Non-Annex I countries, the faster economic growth in Non-Annex I countries implies

higher rates of investment. For example, investments in electric power generation are projected to be greater in Non-Annex I than in Annex I through 2010 (Energy Information Administration 1998a; see Figure 18). Many of these Non-Annex I investment projects are likely to increase total generation, while a larger share of Annex I investments will likely replace existing power plants. When a power company in an OECD country considers building a new plant to replace a plant that is not near the end of its useful life, it weighs the total cost of building a new natural gas plant against the variable cost of continuing to operate its existing coal plant. Unless coal prices jump, or the existing plant is in poor repair, only a large rise in coal prices will justify scrapping the old coal plant. In contrast, when a power company considers building a new plant in a developing country it weighs the total cost of building a new natural gas plant against the total cost of building a new coal plant. Here, a small rise in coal prices would be sufficient to justify the decision to build a gas plant.

Figure 18. Cumulative Projected Electric Power Investments, 1995-2010



Source: Energy Information Administration 1998a.

Market Distortions

Eliminating energy subsidies

Many developing countries and economies in transition continue to subsidize energy consumption. Elimination of such subsidies would represent opportunities to reduce government outlays and possibly taxes, while at the same time reducing carbon emissions and enhancing energy efficiency. Reduced reliance on fossil fuels would also reduce local air pollution, to the benefit of local public health and the local environment.

- Over 1995-1996, fossil fuel subsidy rates were 31 percent in Russia, 20 percent in China, and 19 percent in India (The World Bank 1997b). Eliminating these subsidies would substantially improve energy efficiency.

- Removing energy subsidies in Russia, China, India, Eastern Europe, Egypt, and Mexico and other non-OECD countries could decrease carbon emissions by 10 to 12 percent by 2010 (Larsen and Shah 1995). Removing these subsidies would also reduce SO_2 and particulate emissions significantly.

Management reforms

Another important opportunity for reducing carbon emissions lies in deregulation and reform of the energy sector. Reducing transmission losses for electricity, improving power quality, and better coordinating supply and demand in electric and gas systems can reduce private costs and carbon emissions at the same time. Individual customer metering, uncommon in many developing countries and economies in transition, would reduce needless energy consumption by providing an incentive for efficient use.

Opportunities for Cost-Savings through the Clean Development Mechanism and Joint Implementation

As noted, the Clean Development Mechanism (CDM) will allow companies in industrial countries to enter into cooperative projects to reduce emissions in developing countries -- such as the construction of high-tech, environmentally sound power plants -- for the benefit of both the companies and the developing countries (Kyoto Protocol, Article 12). The companies will be able to reduce emissions at lower costs than they could at home, while companies in 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. This market-based mechanism provides opportunities for U.S. companies to meet emissions targets at lower costs and increases the opportunities to export energy and environmental protection technology to the emerging markets in developing countries. The CDM would build on the growing U.S. energy efficiency and environmental protection export industry (Berg and Ferrier 1997).

Joint Implementation (JI) will allow for companies in countries with emissions targets (Annex B countries) to invest in projects that reduce greenhouse gas emissions in other Annex B countries (Kyoto Protocol, Article 6). Like the CDM, this is a voluntary program that provides companies the flexibility and the opportunities to make good business decisions that result in emissions reductions at least-cost.

The CDM and JI will likely reflect many components of the existing Activities Implemented Jointly pilot program (AIJ). Under the 1992 Framework Convention on Climate Change, the U.S. government and others have commenced projects with characteristics similar to those that might be expected through the Clean Development Mechanism and Joint Implementation.

U.S. Efforts

To implement the pilot phase of the AIJ component of the Framework Convention, the Administration initiated the U.S. Initiative on Joint Implementation (USIJI) in 1993. The USIJI program supports the development and implementation of voluntary projects between U.S. and non-U.S. partners that reduce, avoid, or sequester greenhouse gas emissions. Projects are assessed based on a set of criteria that ensures proposed projects provide greenhouse gas reduction benefits and support the development goals of the host country.

As of June 30, 1997, the USIJI program had accepted 25 project proposals in 11 countries, helping U.S. firms tap the potential outside the OECD for low-cost

greenhouse gas reductions while contributing to development goals in host countries (Environmental Protection Agency 1997). These projects include fuel switching, energy efficiency improvements, renewable energy, afforestation, reforestation, and improved agricultural management. A brief summary of a sample of these projects follows.

- In the Czech Republic, the District Heating Project converted the Bynov District Heating Plant from a lignite coal burning facility to a natural gas-fired plant. In addition, a cogeneration facility for steam and electricity generation have been constructed. The project developers have estimated that this activity implemented jointly will achieve total carbon emissions reductions of about 166,000 tons of carbon equivalent (Environmental Protection Agency 1997).

- In Costa Rica, the Klinki Forestry Project arranges with farmers to plant Klinki trees and other fast-growing, high-sequestration tree species on marginal farmland and pastures. Participating farmers, who sign a 40-year contract, receive tree seedlings, technical assistance, and a cash payment. The trees yield a high-grade industrial wood, suitable for utility poles and plywood, both of which continue to store carbon. Project sponsors estimate that this project will sequester nearly 2 MMTCE over its 46 year life (Environmental Protection Agency 1997).

- In Belize, the BEL/Maya Biomass Power Generation Project involves the construction of an 18 megawatt biomass waste-to-energy facility adjacent to a sugar mill. This facility will provide power to the mill, local orange processors, and an electricity distribution firm. The biomass power plant will displace diesel oil-fired power generation, and achieve total carbon emissions reductions of 1.2 MMTCE according to project sponsors (Environmental Protection Agency 1997).

- In Russia, the Fugitive Gas Capture Project involves the capturing of fugitive methane emissions from two natural gas compressor stations. Over the approximate 25 year lifetime of this project, sponsors indicate that sealing valves at the compressor stations could reduce methane emissions by more than 7 MMTCE (Environmental Protection Agency 1997).

Other Countries' Efforts

Several European countries have also embarked on AIJ projects (Zollinger and Dower 1996).

- In 1996, the Netherlands set aside $51 million for AIJ projects in 5 countries: Bhutan, the Czech Republic, Ecuador, Hungary, and Uganda.

- Norway funds a coal-to-gas conversion project in Poland, through the World Bank and the GEF. Norway has another AIJ project with Mexico.

- Germany has 7 AIJ projects, in the Czech Republic, Indonesia, Jordan, Latvia, Portugal, and the Russian Federation. These focus on fuel switching, energy efficiency, and renewable energy.

In addition, at least 6 other developed countries have included activities implemented jointly in their national action plans: Canada, Japan, Denmark, Finland, Iceland, and Sweden. The group of potential host countries continues to grow. Projects have been launched or proposed in 17 countries. Thirty-two projects have received approval from both host and sponsor governments (Zollinger and Dower 1996). Bolivia, all 7 countries of Central America, Chile, Pakistan, and South Africa have signed statements of their intent to launch cooperative projects with the United States.

Developing Countries

Clearly, the challenge of climate change cannot be addressed adequately unless developing countries take measures themselves to limit greenhouse gas emissions. Our third objective in the Kyoto negotiations was to secure meaningful participation by key developing countries. The Kyoto Protocol does include a down payment on developing country participation through the Clean Development Mechanism (see discussion above) and other provisions. However, developing countries will need to do more to participate meaningfully in the effort to combat global warming. The President will not submit the Kyoto Protocol to the U.S. Senate for its advice and consent unless key developing countries more fully participate in the international efforts to address climate change.

It should be noted that the term "developing country" encompasses a wide range of nations which are at various stages of industrialization and contribute differently to global emissions. Accordingly, there is no one-size-fits-all approach to measuring developing country participation. A country with a relatively high per capita GDP or one that emits a proportionally large share of global emissions should be expected to do more than one that is extremely poor or whose emissions are negligible.

Meaningful participation implies different actions for different kinds of countries. For example, a developing country could voluntarily adopt an emissions target. Many developing countries were opposed to emissions targets during the Kyoto negotiations on the grounds that such targets would slow their economic development. However, emissions targets and approaches that reflect developing countries' needs to grow could facilitate their development while lowering the global costs of achieving the objectives provided in the Kyoto Protocol.

If a developing country chooses to adopt a growth target and participates in international emissions trading, it could potentially enjoy substantial economic and environmental gains. Because developing countries can achieve emissions reductions relatively cost-effectively, they could reduce emissions below their target and sell their excess allowances to firms in other countries that find it in their best interest to comply with emissions targets at the lowest possible cost. Even with this participation, a country's emissions could continue to grow beyond current levels, as economic development continues. More importantly, such an approach provides both an incentive for firms to invest in energy efficient technologies in developing countries and the opportunity to export emissions allowances. While the Clean Development Mechanism can result in similar activity, it would likely occur on a smaller scale than what would be anticipated under an emissions target with effective international trading.

A world with broad-based participation in international emissions trading, including participation by Non-Annex I countries with growth targets slightly below their business as usual projections, would likely result in lower global greenhouse gas emissions relative to a world with more narrow participation. Moreover, reductions in greenhouse gas emissions would generate ancillary air quality benefits through reductions in sulfur dioxide, nitrogen oxides, and particulate matter emissions. In many large cities in developing countries the emissions of these air pollutants are a significant environmental health problem, and emissions reductions consistent with efforts to address climate change could assist in remedying this problem.

As noted earlier, trading, as a voluntary activity, benefits all parties involved. While developing countries may benefit from adopting a target and participating in trading, so would firms in developed countries.