Brookings Policy Brief

Greenhouse Gas Emissions

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Many difficulties plague the effort to implement the Kyoto Protocol negotiated in November 1997, and the other steps necessary to reduce global emissions of greenhouse gases in an effort to check global climate change. Probably the most difficult chasm that needs to be bridged is between the United States and developing countries regarding the necessity of participation by the latter in any worldwide global climate change plan.

The Viewpoint from the North

We cannot solve the climate change problem without participation by developing countries. For starters, the U.S. Senate strongly opposes any agreement that omits targets for them. The Senate passed by a vote of 95-0 the Byrd-Hagel resolution, which made commitment by developing countries to emission targets a prerequisite for ratifying the Kyoto treaty.

Meaningful participation by developing countries is essential for several reasons:

First, a global problem requires a global solution. The problem is inherently one on which an individual country can make little progress on its own. An effective solution requires that all countries agree to participate together.

Emissions in developing countries are increasing the most rapidly, and will pass those from the industrialized countries early in the next century, assuming emissions in both groups of countries continue as expected in the absence of an agreement, i.e. assuming they continue with business-as-usual. The *International Energy Outlook 1999*, released by the U.S. Energy Information Agency, projects that the crossover may occur by 2010. China is projected to surpass the United States as the biggest emitter by around 2020. Thus, without the participation of developing economies, emissions cuts by the industrialized countries will not do much to avert climate change.

If developing countries do not participate in the international regime, their emissions might rise by even more than anticipated under a continuation of global business as usual (BAU). This is the problem of "leakage." Emissions in developing countries might increase by

a quarter ton for every ton of cuts in carbon emissions from the industrialized countries. The relocation of carbon-intensive industries from participating to nonparticipating countries is one possible channel of leakage, an unintended consequence of the Kyoto agreement. Similarly, reduced petroleum use in the industrialized countries will result in a drop in world oil prices, encouraging increased use and carbon emissions in the developing countries.

Finally, developing country participation is crucial because it would permit relatively low-cost reductions in emissions in place of high-cost reductions in the industrialized countries. Cuts in greenhouse gas emissions in developing countries have the same global environmental benefit as reductions in industrialized countries, even though the reductions in developing countries are often much less costly. It thus makes sense to incorporate emissions reductions in developing countries into the international system.

The Viewpoint from the South

Developing countries make several counter arguments:

First, their duty is to their citizens. Specifically, their priority must be raising their own economic standards of living. To do so, they must raise incomes as reflected in market transactions, while also controlling local air and water pollution. Such pollution already is visible and is taking a large toll on health. Controlling local pollution must take precedence over controlling greenhouse gases, which are not visible, and which may not have serious health effects until a century into the future.

Second, the developing countries should not be required to take any step that entails economic sacrifice until the industrialized countries have done so. The industrialized countries created the problem; and they are richer and can more readily afford to make sacrifices.

It is hard to disagree with these arguments. But I do not believe that the Clinton administration is asking poor countries to forego their economic development. *Meaningful participation during the period 2008-2012 need not entail economic sacrifice by developing countries.*

The Gains from Trade

Industrial countries should pay developing countries for emissions reductions. Under such a system—called targets-with-trading—the developing countries would commit to binding targets for greenhouse gas emissions and then participate in an international system in which permits for emissions are bought and sold. A country or corporation would be able to pay for a permit to exceed its target while other countries receive payment for emissions that fall below their targets. If developing countries were to join a system such as targets-with-trading, it would not only have environmental and economic advantages for the rest of the world; it would also have important environmental and economic benefits for the developing countries themselves. Let us consider a

plan under which developing countries do no more than commit to their business-as-usual emission paths in the 2008-2012 budget period and join the trading system.

The first thing to notice is that this system is not going to hurt the developing countries. They have the right in this budget period to emit whatever amount they would have emitted anyway. They need not undertake emission reductions unless a developed-country government or corporation offers to pay them enough to persuade them voluntarily to do so. (The Clinton administration proposes that U.S. participation in international trading of emission permits be undertaken solely by private entities acting voluntarily, not by the government with taxpayer money.)

One anticipates that the governments and corporations of developed countries would indeed offer to pay participating countries enough in the budget period to persuade them voluntarily to reduce emissions below their BAU levels. Otherwise, it could get expensive for the United States, Europe, and Japan to reduce domestic emissions to less than the 1990 levels over the next ten to fourteen years, because it would require major structural changes in these economies in a short span. But the cost of reductions is far lower in developing countries. Thus governments and corporations in industrialized countries will be able to offer terms that make emission reductions economically attractive to developing countries. The economic theory behind the gains from trading emission rights is analogous to the economic theory behind the gains from trading commodities. By doing what they each do most cheaply, both developing and industrialized countries win. In British Economist David Ricardo's classic trade example, Portugal specialized in producing wine and England in producing textiles. In the current context, developing countries specialize, for example, in installing clean new-technology power-generation capacity, while industrialized countries specialize in producing the capital goods that go into those plants.

Why are emissions reductions so much cheaper in developing countries than in rich countries? One major reason is that, in industrialized countries, one would have to scrap coal-fired power plants far in advance of the end of their forty-year useful life, in order to replace them with natural-gas facilities or other cleaner technologies. This would be very expensive to do, because it would mean wasting a huge existing capital stock. In rapidly growing developing countries, on the other hand, it is more a matter of choosing to build cleaner power-generating plants to begin with, instead of building coal-fired plants. In general, when contemplating large increases in future demand for energy, it is good to be able to plan ahead. This includes learning from the mistakes of others that have gone before and taking advantage of their technological advances.

Fossil-Fuel Subsidies

An extreme example of how measures to reduce carbon emissions cost less in developing countries is the case of existing subsidies to fossil fuels, especially coal, which is the most carbon-emitting form of fuel. Eliminating such subsidies would create substantial immediate benefits—fiscal, economic, and environmental—even before counting any benefits under a global climate change agreement. Coal provides the majority of energy in China, for example. A major reason for the heavy use of coal is that it has historically been heavily subsidized. Estimates are

that coal subsidies outside the Organization for Economic Cooperation and Development (OECD) totaled from $37 to $51 billion from 1991 to 1992. Total fossil fuel subsidies have been much greater—well over $200 billion in the early 1990s, though smaller now. A 1994 study estimated that removing them would reduce global emissions by 7 percent. A 1995 study estimated that energy subsidies currently act as a negative carbon tax of about $40 per ton and that global carbon dioxide emissions would be reduced by 4 to 5 percent if all energy subsidies were removed.

China and other Asian countries, Argentina, Brazil, South Africa, and some oil-producing countries reportedly already have reduced the dollar value of such subsidies substantially in recent years. Non-OECD countries cut fossil-fuel subsidies by half from the period 1990-91 to 1995-96. But more progress is needed. Subsidy cuts within a target-and-trade system would pay developing-country governments twice over—once in the form of the money that is saved by eliminating wasteful expenditure and then again in the form of the money that is paid by a developed country for the resulting emission reductions.

Summary of Arguments for Target-and-Trade

It would be useful to get developing countries to agree to binding limits on emissions, even if the targets involved only small (or no) cuts below the level expected were countries to continue with business as usual in the first budget period. Such targets, with trading, imply gains for developed economies, gains for the United States, and gains for the environment. The targets-and-trade system has several advantages:

The United States wants to prevent leakage—increases over business-as-usual levels—that would occur in response to industrialized country reductions if other countries did not take on targets.

Industrialized-country purchases of emissions reductions from developing countries would dramatically diminish the costs of meeting the Kyoto targets. In particular, the Council of Economic Advisers has estimated that the U.S. costs of achieving the targets would decrease by more than 80 percent through trading with developing countries, as opposed to reducing only domestic emissions. (These decreases compare to a 57-percent savings achieved from trading solely among industrialized countries. These are moderate estimates among the range of leading economic models. The models assume accurate monitoring, successful enforcement, and efficient markets.)

If targets are set at or slightly below business as usual, the developing countries would profit from their ability to sell emission permits in world markets where the price of permits is higher than the cost of reductions. This actually gives them a genuine economic incentive to join the targets-and-trade system.

Further, when permits are sold, reductions in carbon-dioxide emissions produce additional air quality improvements in the developing countries through reducing particulates, sulfur dioxide, and nitrogen-oxides emissions.

If the United States succeeds in committing developing countries to targets now, it will meet the requirements of the Byrd-Hagel resolution. Agreement on moderate targets can help draw developing countries into the system, where larger cuts relative to BAU might be possible in later budget periods.

The Break-Even Level

If developing countries were prepared to countenance emission targets, how should the level be determined? A reasonable target for the countries themselves to propose would be the levels of emissions expected if they continued with business as usual. As noted, targets at that level have environmental and economic benefits for everyone involved. But the developed countries, and especially the environmentalists residing there, will respond by demanding targets that represent cuts in emissions, below the BAU emission level path. Such a demand could also be viewed as reasonable, unless the proposed cuts were so large as to inflict economic damage. BAU represents a ceiling. A floor that could sensibly be proposed is what I will call the break-even level, where the gains from permit sales are fully offset by the costs of meeting the target. Anything above BAU would not necessarily benefit industrialized countries economically, while anything below the break-even level will hurt the developing countries economically. Clearly the targets should fall in a middle range. For either side to propose a point outside this range would be equivalent to a rug-merchant in the bazaar asking a price higher than the customer can buy the same rug for back home, or else equivalent to the customer asking a price lower than the cost to the merchant. The gains from trade should be shared.

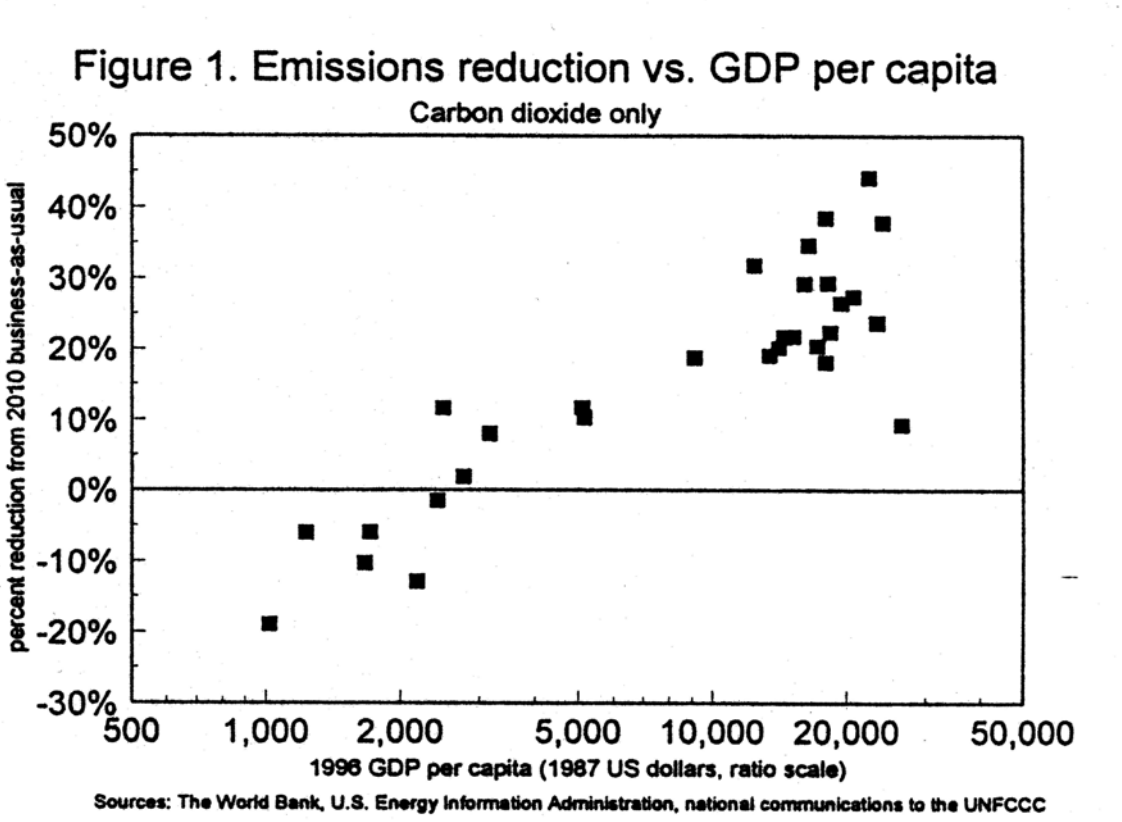
A Fair Allocation

If it is reasonable for poor countries to propose business-as-usual targets as their opening bid, and for rich countries to propose break-even targets as theirs, what would be a reasonable level where a negotiated compromise might converge? Even though the emission targets agreed at Kyoto reflect the outcome of political negotiations, it is possible to discern systematic economic patterns in them. A fair target for developing countries might be one that fits the pattern of emission reductions that prevails among existing targets. This approach would result in richer countries making larger reductions than would poor ones; yet it would not result in the massive redistribution of wealth that some poor-country representatives would like to see.

Figure 1 shows the emissions targets that industrialized and transition countries agreed to (including those within the European Union), expressed in terms of reductions below the expected 2010 BAU. The average reduction overall is about 8 percent. A progressive pattern is evident—with richer countries agreeing to reduce their emissions at higher rates than poor countries.

Figure 1:

Emissions Reductions Implicit in Kyoto Targets vs. Countries' Incomes per Capita



Statistical analysis can make more precise the pattern of progressivity inherent in the targets already agreed upon for industrialized countries. Statistically, the existing Kyoto targets show this pattern of progressivity: each 1% increase in per capita income implies a 0.1% greater sacrifice, expressed as greater emissions reductions from BAU. In absolute terms, an increase in income is associated with an increase in the level of the emission target. But an increase in income is also known to imply an increase in the level expected if countries continue with business as usual, because emissions respond directly to economic output. When we ask richer countries to make greater sacrifices, we are suggesting that the increase in the assigned target should be less than the increase in BAU. By analogy, when an individual's pre-tax income increases, his after-tax income and the taxes he pays both go up.

The statistical approach certainly has limitations, and the results reported here are very preliminary. They are sensitive to decisions about the data used. Per capita income data can change depending on the year and exchange rate used to compare countries. Estimates of BAU emissions can vary too. But given that the question of any allocation of emissions targets seems inherently arbitrary, these results suggest a sensible approach. The proposal incorporates the principle of progressivity while avoiding impractical proposals by some developing country representatives that rich countries redistribute some of their wealth to poor ones.

Resolving Concerns about Target Stringency

Governments of developing countries worry that the uncertainty surrounding their forecasted economic performance is so great that they cannot risk adopting an emissions target in 1999 that would be binding in 2008. Even if a particular numerical target appears beneficial now, after a decade it might turn out to be something different. A response to this concern would be to structure international agreements on developing-country targets to reduce the risk of being inadvertently restrictive. Agreements should be designed to reduce the possibility of a target so stringent as to cause large economic losses to the developing countries or as to constrain economic development.

Environmentalists have also expressed a counter concern, that a target may be too lax. They fear that such a target might fail to result in actual emissions reductions relative to what would have happened in the absence of a treaty. Thus, it is desirable to mitigate the risk of inadvertent stringency while also mitigating the risk of inadvertent laxity—to narrow the variability of the effective restrictions without relaxing or tightening the intended target.

My proposal would be to index targets for developing countries. The international agreement would look like a contract under which the numerical emission target depends, in a defined manner, on future variables whose values are as yet undetermined. (An example is the cost-of-living adjustment agreements in a labor contract. It specifies certain wage increases for each increase in the Consumer Price Index, thus reducing uncertainty over real wages.) Future economic growth rates are probably the biggest source of uncertainty. Forecasts of GDP among East Asian countries, for example, are already very different now from what they were in 1997, and will again look different in 2007. A simple format would index a country's aggregate emissions to future income alone. (Other possible proposals include in the formula other variables like population or temperature.)

More specifically, for every percentage point in GDP growth that is higher or lower than forecast, the emissions target is raised or lowered by a corresponding amount. The specified adjustment in emissions could be a bit less than proportionate. This proposal would require countries that are doing a bit better than expected to contribute more than those that are not, again maintaining the principle of progressivity, without penalizing them unduly for their success.

Indexation is one possible approach to removing some of the economic uncertainty that holds back commitment to a quantitative emission target. Another possible idea, suitable for any country that is willing to implement its program for meeting its targets via a carbon tax or tradeable permit system, is an *escape clause* or *safety valve*, which eases the quantitative limit when the price of carbon threatens to rise above a pre-agreed threshold. These solutions to the uncertainty problem would make it more likely that the target will turn out to fall within the range intended, where it brings benefits—both environmental and economic—to developing countries and industrialized countries alike.