

Greenhouse Gas Emissions Trading: Improved Compliance at Reduced Cost

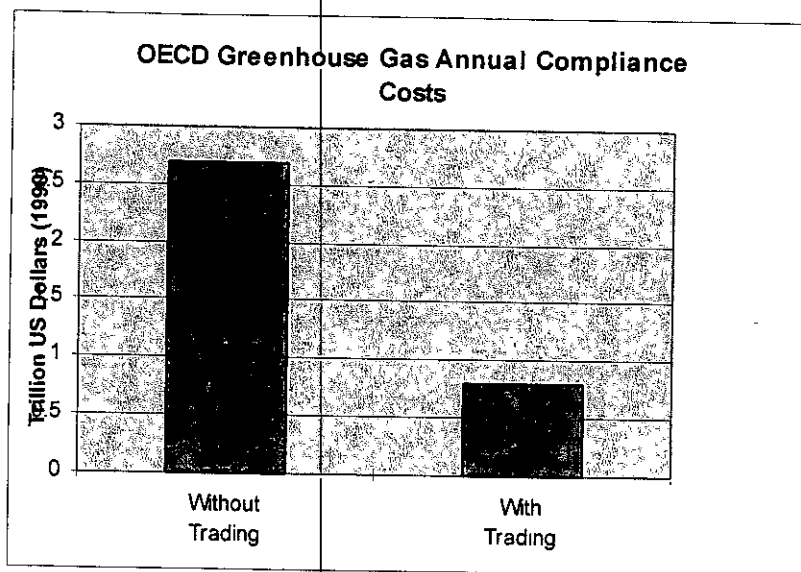
Emissions Trading: An Effective, Proven Tool

Emissions trading is an effective, commonly-used tool for solving air pollution problems. The approach has been used to address the problems of smog and acid rain in the U.S. and throughout Europe. Trading has become popular because it has worked well, providing the following advantages:

- ***Less pollution.*** Trading programs have been very successful in achieving their environmental goals. For example, the US sulfur dioxide trading program has achieved 100 percent compliance, the best performance of any air quality program in the US.
- ***Lower costs than traditional regulations.*** By allowing companies to seek out the cheapest emissions reductions regardless of where they are located, trading reduces the cost of controlling pollution.
- ***Development of new technology.*** Trading creates competition among fuel producers and equipment manufacturers to develop clean new products.

An international greenhouse gas trading system could help the community of nations to combat global climate change by directing investment capital to where it can do the most good. In fact, economic modeling has shown that trading could reduce the cost to Annex I countries of meeting greenhouse gas emissions targets by over 70 percent, or more than USD 1 trillion per year. By comparison, total annual global economic output is approximately USD 20 trillion per year.

Further, trading makes sense precisely because climate change is a global problem. Carbon dioxide emissions have no local effects, and the release of CO₂ from one place in the world has the same effect as a release from any other place. With respect to the global climate, each ton of carbon dioxide has the same radiative forcing effect regardless of where on the globe it is emitted initially. Thus, reductions of carbon dioxide or methane offer the same climate benefits regardless of where they occur. Trading ensures that reductions are made as efficiently as possible.



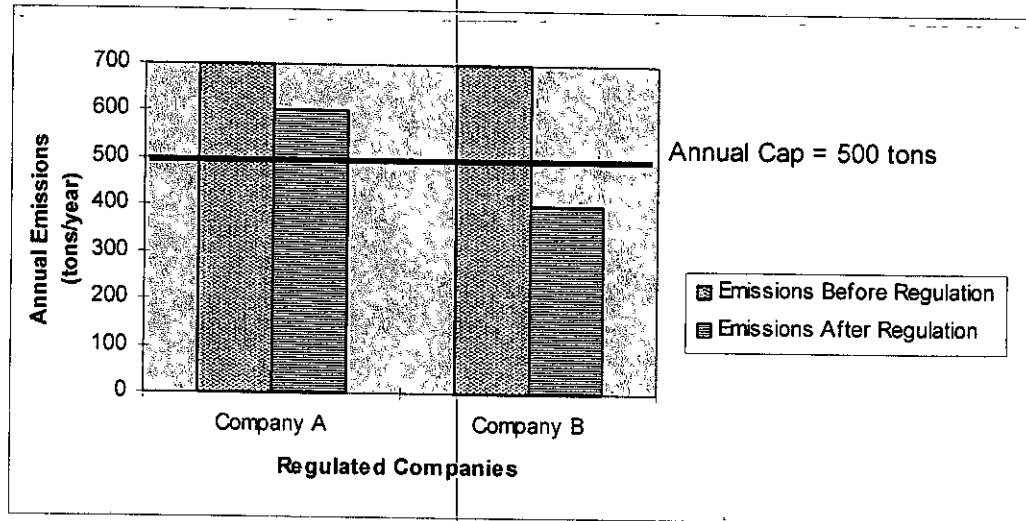
How Does Trading Work?

The driving force behind trading is that some companies -- and countries -- can reduce their emissions more cheaply than others. Normally a “cap” or budget is set which limits the total level of emissions over a specified period of time, and companies are then allotted emissions allowances, each one representing the right to emit a certain amount of pollution over that time period. Companies that can reduce their emissions at little or no cost will make reductions to below allowed levels and then sell the allowances they do not need, while companies that would have to spend a lot of money to reduce their emissions will buy extra pollution allowances for less than they would have spent making emissions reductions at their own plants. Both companies are thus better off. In addition, *society as a whole is better off* because it meets its objective of reducing pollution to a certain amount, while also spending less in total than it otherwise would to comply with the cap or budget. Money that would have been spent on pollution control can now be invested elsewhere.

Trading is not only efficient; it is also fair. Under trading, *all companies take responsibility for reducing emissions*; some, however, do so by purchasing some of their emissions reductions elsewhere rather than making them at their own facilities.

A simple example demonstrates these concepts. Imagine a country with two electric power plants. Both use coal, both emit 700 tonnes of pollutant X per year, and both will be allowed to emit only 500 tonnes per year in the future. This is because the government has determined that 1,000 tonnes of pollutant X per year is the acceptable level of total

emissions for its electric utilities. Assume that Company 1 can reduce its emissions of pollutant X down to 400 tonnes per year simply by making efficiency improvements at its plant, which will cost very little. Company 2, on the other hand, can reduce its emissions to 600 tonnes per year through cheap efficiency improvements, but to get down to 500 tonnes it would have to invest in expensive new equipment.



The companies would be better off by making a trade, instead of both reducing their emissions to 500 tonnes. Company 1 could reduce its emissions down to 400 tonnes and then sell the 100 pollution allowances it does not need to Company 2, which would then be allowed to emit 600 tonnes. Company 1 would be better off because it would sell the allowances it does not need for more than the cost of reducing its emissions from 500 to 400 tonnes; Company 2 would be better off because it would buy the allowances from Company 1 for less than it would have spent on reducing its emissions from 600 to 500 tonnes. *Most importantly, the country would meet its objective of holding emissions of pollutant X to 1,000 tonnes per year.*

Why Trading?

Emissions trading programs offer numerous advantages over traditional regulatory approaches.

Achievement of Environmental Goals

Trading often results in fewer violations of pollution laws and greater achievement of policy goals. This is because trading gives companies flexibility in deciding how to

reduce emissions and decrease costs (see below). In addition, trading programs normally include careful monitoring and reporting of actual emissions, rigorous government verification of reported emissions, and strict penalties when emissions exceed allowed amounts.

Trading probably would result in greater accomplishment of greenhouse gas emissions goals than carbon taxes. Carbon taxes reduce greenhouse gas emissions by making fossil fuels more expensive, causing businesses and households to switch to cleaner alternatives. However, if the tax needed to achieve the emissions target has been underestimated, then fewer changes in behavior will take place and the target will not be met. In contrast, under a trading system a cap on total emissions is set, and the price of emissions allowances moves based on supply and demand. Unlike the carbon tax option, the cap or budget approach offers certainty regarding the level of future emissions.

Lower Costs

Emissions trading programs often cost less than traditional regulatory approaches and most likely would reduce the global cost of addressing climate change. By giving companies flexibility rather than requiring them to use particular technologies, trading provides an incentive to find the cheapest ways of reducing emissions.

Under greenhouse gas emissions trading, some countries would be able to reduce their emissions to allowed levels relatively cheaply; if these countries were to emit fewer greenhouse gases than they were allowed, they would have unused allowances that they then could sell. They would do this if they could sell the unused allowances for more than the cost of making extra reductions. On the other side, countries that could buy allowances more cheaply than they could make reductions would do so. Thus the most cost-effective reductions would be made regardless of where they were located, and the overall cost of making global reductions would be reduced.

Technology Stimulation

A trading system would lead to greater technological innovation than a system that mandated particular technologies. Trading lets companies decide how to meet targets rather than telling them how to, allowing them to use their creativity to find innovative solutions. This search for low-cost solutions creates competition, giving fuel suppliers and equipment vendors an incentive to develop cleaner fuels and more efficient equipment. In essence, trading focuses creative energy on the development of clean fuels and technologies.

Capital Flows and Technology Transfer

Because the use of clean technologies would enable countries to reduce their emissions and sell allowances, trading would provide an incentive for the adoption of renewable, energy efficiency, cogeneration and high-efficiency natural gas technologies. In general, countries that already have undertaken some of these measures will be purchasers of greenhouse gas emissions allowances, while countries that have adopted them only sparingly will be sellers. This is because the countries that have undertaken them will no longer have the least-cost greenhouse gas emissions reduction opportunities available to them. They will therefore be better off economically by buying allowances than by undertaking more expensive actions. Trading thus will result in the flow of capital and technology from countries that have already invested in cleaner technologies to those that have not.

Does Trading Give Companies the Right to Pollute?

Critics have suggested that trading is inherently flawed because it gives companies the right to pollute. It is true that trading does give companies the right to pollute; in this respect, however, trading is no different than other regulatory approaches. Any regulatory program that sets maximum emissions rates or pollution levels or requires "best available" combustion technologies also gives companies the right to pollute. Trading just does so more explicitly. *The main difference between trading and traditional approaches is that trading rewards companies that are able to do better than the minimum standard.*

A Successful Trading Program: The U.S. Acid Rain Example

The U.S. program to address the problem of acid rain is an excellent example of a successful emissions trading program. Under this program, U.S. electricity companies are allocated a fixed number of allowances, each giving the company the right to emit one short ton of sulfur dioxide (SO₂) annually. The total amount of allowances for participating companies is currently 8.9 million tons per year; these same companies emitted almost 19 million tonnes in 1980. Companies keep their SO₂ emissions at or below allowed levels either by reducing their emissions themselves or by increasing the amount they are allowed to emit by purchasing allowances.

At the end of each year, companies must compare their actual emissions to allowed emissions (see the formula below); those that pollute more than they are allowed must pay a penalty of USD 2,000 for every short ton of sulfur dioxide above allowed amounts. This amount far exceeds the cost of reducing emissions by one ton or buying an allowance.

Allowed Emissions	=	Initial Allocation of Allowances	+	Allowances Purchased	--	Allowances Sold
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So far the program has worked very well. Overall SO₂ emissions are below allowed levels, and compliance has been 100 percent -- no company has yet emitted more than allowed. Further, the cost of reducing emissions has been much lower than expected, in good part because of the development of markets for cleaner fuels as well as technological innovations. Before the start of the program, the cost of making reductions was expected to be at least USD 500 per ton and as much as USD 1500; currently the cost is approximately USD 87. The Acid Rain trading program thus has successfully reduced sulfur dioxide emissions, while at a much lower cost than a typical air pollution program and with far greater compliance.

How Would International Greenhouse Gas Emissions Trading Work?

The Parties to the Framework Convention on Climate Change have not yet agreed that trading will be an element of future international climate change policy, so it is impossible to say with certainty how an international carbon trading system would work. However, it is possible to describe basic features of the system that would likely be present.

- Allowances probably would be allocated to participating countries based on the legally binding targets they adopted. For example, if the Kyoto protocol established a target of stabilization of emissions at 1990 levels in the year 2005, a country that emitted 500 million tonnes of carbon in 1990 would receive 500 million allowances for the year 2005. (This simple example assumes that carbon dioxide would be the only gas regulated under the protocol and that budget periods were only one year in length.)
- The trading system likely would initially include Annex I countries only, because for the most part it is these countries that will have the well-developed greenhouse

gas regulatory systems needed to guarantee that trading will function smoothly and effectively.

- Participating countries that reduced their emissions to below allowed levels would have unused allowances that they could then sell to countries that did not meet their targets through domestic activities.
- At first, trading would occur only among countries. Trading would be even more effective, though, if it also took place among companies in participating countries. The advantage of company-level trading is that the people responsible for emissions and most knowledgeable about emissions reduction opportunities would have a direct incentive to reduce their emissions. In order to initiate company to company trading, each nation would need to divide up its national budget between its emitting companies and establish a domestic monitoring system.

Who Would Regulate the Greenhouse Gas Trading System?

The success of greenhouse gas emissions trading ultimately would depend on ensuring that allowances sold represented real emissions reductions below the selling country's emissions cap. If this integrity were not maintained, then some countries might rightly believe that others were meeting their emissions targets by purchasing bogus or false allowances.

Again, because the Parties to the FCCC have not yet discussed how a trading system would work, it is impossible to say what safeguards would be built into the trading system to ensure its integrity. Based on our knowledge of existing programs, we recommend that the community of nations take several steps:

- First, limit trading to only those countries that have demonstrated that they have strong domestic systems for monitoring, reporting and verifying emissions, as well as tough domestic penalties on companies that violate local greenhouse gas emissions caps.
- Establish international teams led by the FCCC Secretariat to conduct reviews of domestic greenhouse gas emissions calculations and compliance systems. These teams would review country records annually and make in-country, detailed reviews every few years.

- Create an international trading authority to issue allowances, record trades, track all trading activity and maintain the allowance "account balances" for all participating countries.

What Would Countries Be Required to Do?

International greenhouse gas emissions trading would require little institutional infrastructure beyond that already needed to meet emissions caps. (This would include national measuring, monitoring, reporting, verification, and enforcement mechanisms.) The only additional feature needed to accommodate country-to-country international trading would be an allowance accounting system. A country would be allowed to emit carbon dioxide equal to its initial allocation, plus the allowances it purchased, minus the allowances it sold. Each country must therefore keep track of its international trades. If it elected to allow company to company international trading, similar verification, monitoring, reporting, measuring and enforcement activity would be required.

Is Greenhouse Gas Trading Different than Joint Implementation?

International greenhouse gas emissions trading is different than joint implementation (JI) in a number of ways. First, trading activity would take place in the context of the strong international compliance regime described above, and it would involve only countries that had both legally binding emissions targets and strong greenhouse gas administrative systems. For these reasons there would be greater certainty that traded allowances represented real reductions.

Second, trading would take place among countries on the basis of allowances rather than project by project. Therefore many of the difficult issues now surrounding JI, such as whether or not a project is "additional", and how to determine a project's proper emissions baseline, would not be associated with emissions trading. In a trading regime, all emissions are monitored and baselines maintained for all sources. Any reduction below the allowance level for a company can be traded or banked without any need for a project by project review. One result of this is that the volume of activity under trading would be much greater, meaning greater revenues and cost savings to participating countries.

If a trading system were adopted, JI might still exist; however, JI projects would take place only in countries that were not in the trading system. Countries in the trading system might be able to purchase JI credits, but rules would need to be established to ensure that the credits produced by JI projects were backed by real reductions.

The Benefits of Greenhouse Gas Trading: An Example

The following example, which is hypothetical and provided for illustrative purposes only, demonstrates the economic benefits of greenhouse gas emissions allowance trading for both buying and selling countries. Assume that the trading system involves only two countries, A and B. Both emitted 100 million tonnes of carbon in 1990, both are expected to emit 150 million tonnes in 2010, and both will be required to stabilize their 2010 emissions at 1990 levels. The price of carbon allowances in the international trading market is USD 30 per tonne (C). The marginal costs of reducing greenhouse gas emissions from current levels back to 1990 levels in the two countries are as follows:

Emissions Reduction Option	Country A		Country B	
	Reductions Available (Mt(C))	Cost (USD/t(C))	Reductions Available (Mt(C))	Cost (USD/t(C))
“No Regrets”	10	0	50	0
cogeneration/efficiency improvements				
Other efficiency improvements	20	10	20	10
Renewable Energy	20	50	20	50

If trading were not allowed, the cost to country A of stabilizing its emissions at 1990 levels would be USD 1.2 billion. (This figure is calculated as follows: 20 million tonnes times USD 10 per tonne, which is the cost of “other efficiency improvements”, plus 20 million tonnes times USD 50 per tonne, the cost of renewable energy options.) The cost to Country B of meeting its target would be zero, as it could make all required reductions through “no regrets” efficiency improvements. The total cost of compliance for both countries together would be USD 1.2 billion.

If trading were allowed, both countries would benefit and overall costs would be much lower. By making efficiency improvements beyond those needed to meet its target, Country B could reduce its emissions to below required levels by 20 million tC; it would then have 20 million carbon allowances it could sell. Because the revenues from selling

these allowances (USD 30 per tonne) would be greater than the cost of the additional improvements (USD 10 per tonne), this would be a profitable strategy. The net benefit to Country B would equal USD 400 million (20 million tonnes times USD 20 per tonne).

On the other side of the transaction, Country A would have an incentive to purchase the allowances from Country B. This is because it could purchase the allowances for USD 30 per tonne from Country B rather than spend USD 50 per tonne to undertake renewable energy options that it otherwise would take to meet its emissions target. The cost savings to Country A would be 20 million tonnes x USD 20 per tonne equals USD 400 million.

Under this scenario, greenhouse gas emissions would be reduced to the same level that they would be if trading were not allowed -- 200 million tonnes per year for the two countries together. However, the total cost of compliance would be reduced by two-thirds from its original level, from USD 1.2 billion to USD 400 million (USD 200 million for "other efficiency improvements" in each country). Countries A and B would save USD 400 million each, and Country A would transfer USD 400 million to Country B. It is possible that the economic benefits would be even greater, because trading would give both countries an incentive to develop and commercialize new low-carbon technologies.

Conclusions

Emissions trading has proven to be an effective approach to solving air pollution problems, and emissions trading is a sensible way to address the issue of global climate change. The development of a trading system based on strict rules and tough penalties would offer many benefits, including the increased technical innovation, reduced costs, and the flow of capital to countries that have not yet invested in cleaner energy options.

About the Center for Clean Air Policy

The Center for Clean Air Policy is a U.S. nonprofit organization formed in 1985 to promote market-oriented, least-cost solutions to air pollution problems. The organization played a key role in the development of the sulfur dioxide allowance trading program in the U.S.

The Center has been active on the issue of global climate change since prior to the Rio Convention in 1992, participating as an NGO in the negotiations leading up to the Rio Convention and in the subsequent negotiations prior to the Berlin, Geneva and Kyoto Conferences of the Parties. At these meetings the Center has been a proponent of strong targets and timetables, international emissions trading and joint implementation. In addition, the Center developed the world's first energy sector joint implementation project, which involved fuel switching from coal to gas, cogeneration and efficiency improvements at a district heating plant in Decin in the Czech Republic. The new plant was commissioned in September, 1996 and is fully operational.