

European Union Greenhouse Gas Emission Trading Scheme

The primary purpose of the European Union Greenhouse Gas Emission Trading Scheme (EU ETS) is to meet the EU's Kyoto Protocol obligations. The trading system is one of several mechanisms that the EU can use to reduce carbon dioxide emissions by 2012. The EU ETS has supplied several lessons for other trading systems, including how to price carbon and provide incentives that avoid unintended impacts.

The European Union (EU) is considered the most important trading bloc in the world. Twenty-seven member countries transferred some of their lawmaking power to a central authority and created an economic powerhouse representing over 500 million citizens with a total gross domestic product (GDP) of over \$16.45 trillion—about 30 percent of the world's economy. (Compare this figure to the United States' GDP of \$14.59 trillion in 2008.) As of 2010, three more countries have applied for EU membership: Croatia, Turkey, and the former Yugoslav Republic of Macedonia.

The European Union was established with the purpose of preventing wars between neighbors like the ones that culminated in the Second World War. In 1950, the European Coal and Steel Community united European countries both economically and politically to secure lasting peace. The six founders were Belgium, France, Germany, Italy, Luxembourg, and the Netherlands. Denmark, Ireland, and the United Kingdom joined the European Union in January 1973, raising the number of member states to nine.

With the collapse of communism across central and Eastern Europe, Europeans emphasized the four freedoms: movement of goods, services, people, and money (Europa n.d.). The EU enacted two significant treaties: the Maastricht Treaty on European Union in 1993 and the Treaty of Amsterdam in 1999. The Maastricht Treaty created the

European Union and led to the creation of the single European currency, the euro. The Treaty of Amsterdam made significant changes to the Maastricht Treaty by emphasizing rights of individuals and democratic solutions to EU challenges. These legal treaties marked the first time EU citizens actively showed concern with how to protect the environment and also how they could act together for matters of security and defense. In December 2001 the euro (€) became the new currency for many Europeans, and more than ten new countries, including several from central Europe, joined the EU in 2004. A major EU effort in the 1990s was the aggressive stance on environmental sustainability, including signing the Kyoto Protocol.

Kyoto Protocol and the EU

The Kyoto Protocol is the means by which the U.N. Framework Convention on Climate Change (UNFCCC) aims to fight global warming. It was a treaty named after the place it was signed by representatives of various nations. Signatories to the Kyoto Protocol agreed to four main actions:

- They would monitor domestic carbon emissions.
- They would maintain registries to track emissions permits (a mandate for industrialized countries, called Annex I countries, as the U.N. maintained the registry for the nonindustrialized countries).
- They agreed upon penalties.
- They set up flexible mechanisms that might be used to achieve carbon reductions in addition to country-specific reductions.

The flexible mechanisms were emissions trading, joint implementation, and clean development mechanisms. Emissions trading, the focus on this article, allowed industrialized Annex I signatories to buy and sell permits to

emit greenhouse gases (GHGs). Under a trading scheme, Annex I countries were issued emissions permits called assigned amount units (AAUs), each equal to one metric ton of carbon dioxide, that correspond to their Kyoto emissions commitments. The designers' expectation was that countries with higher marginal abatement costs would purchase additional permits from countries with lower marginal abatement costs.

Marginal abatement costs are the cost of eliminating an additional unit of emissions. Total abatement costs are simply the sum of all marginal costs. Marginal abatement costs are expressed in cost curves that show the relationship between tons of emissions and the carbon dioxide (or GHG) price.

These three flexible mechanisms could satisfy the Kyoto commitments. Yet the UNFCCC issued the Marrakesh Accords, "affirming that the use of the mechanisms shall be supplemental to domestic action and that domestic action shall thus constitute a significant element of the effort made by each Party" (UNFCCC 2002, Decision 15/COP.7).

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The designers of the European Union Greenhouse Gas Emission Trading System (EU ETS) intended the plan to meet some of the EU's obligations to reduce greenhouse gas concentrations under the Kyoto Protocol. Proposed in October 2001, the EU ETS was up and running just over three years later. The plan was modeled in part after the U.S. sulfur dioxide program (Ellerman et al. 2000). The U.S. program started in 1995 with electricity generating units, and in 2000 the EPA expanded the units to all companies that were over 25 megawatts in generating capacity. As of 2010, the legislation placed a cap of 9.95 million metric tons/year. Research on the program shows that it achieved 100 percent compliance in reducing sulfur dioxide emissions (Environmental Defense Fund 2010).

In fact, power plants took advantage of the various program provisions and reduced sulfur dioxide emissions 22 percent (7.3 million metric tons) below mandated levels for the first program phase. On the eve of legislation, the U.S. Environmental Protection Agency (EPA) estimated that the program would cost \$6 billion annually (in 2000 dollars) once it was fully implemented. The Office of Management and Budget has estimated actual costs to be \$1.1 billion to \$1.8 billion—just 20–30 percent of the forecasts (Environmental Defense Fund 2010).

The EU program was designed in two program periods: 2005–2007 and 2008–2012. The first three-year trading period served mostly as a testing period for the second period. The system covered approximately 10,500 installations across the twenty-seven member states of the

European Union plus Iceland, Liechtenstein, and Norway, which are required annually to surrender emission allowances equal to their emissions in the previous year. The ETS is currently one of the cornerstones of the EU's strategy for meeting its emission reduction targets cost-effectively.

The EU ETS covered approximately 45 percent of the total EU carbon dioxide emissions from large industrial and energy installations in a limited number of energy-intensive sectors such as cement, coke ovens, and power generation. EU policy makers envisioned that industrial firms in these sectors would make investment decisions based in part on reducing emissions and improving energy efficiency. The major incentive was the pricing of carbon, and they combined this pricing mechanism with a compliance system.

The total initial allowance was 2.1 billion tons per year, which yielded a market value of €30–€40 billion, roughly ten times the capitalization of the U.S. sulfur dioxide market. In 2005, investors and companies traded 322 million metric tons of carbon dioxide. Prices have dropped to about €15–€25 per metric ton for much of the time since then.

Governments of countries that fell short of their national plan targets would pay the European Commission about one-and-three-tenths the value of the shortfall in permits. Thus, the price of carbon started at €40 for each ton of carbon emissions above the ETS allowances along with the surrender of a corresponding number of permits in the next year. The value of the permits fluctuated widely. On 12 May 2006, the value of carbon permits traded on the European Climate Exchange dropped to €8.60 per metric ton of carbon dioxide, down from a high of more than €30 in April 2006. Critics of the system claimed that national governments had been too generous in allocating carbon permits to their domestic producers. The market is showing evidence of recovering slightly in phase two (2008–2012) under expectations of tighter caps in the future.

National Plans

The EU ETS introduced the national allocation of allowances that permitted particular segments of industry to emit certain amounts of carbon dioxide. Each member state of the EU first had to submit a national allocation plan (NAP). Based on the reduction of carbon dioxide emissions agreed to in Kyoto, each EU member established its own reduction target. In the NAP, member states could specify which industrial sectors would be covered, including how to handle new entrants, closures, and transfers. They also decided on their own allocation processes. Most national plans called for distributing allowances based on producers' historical output levels. The EU allowed each national government to auction permits, that is, have companies pay for the permits, up to 5 percent of allowances,

a ceiling that was raised for the 2008–2010 period. This freedom led to many variations in the system as countries took into account national competitiveness as much as carbon reductions.

As with any emissions-reduction system, the EU ETS had differential impacts among businesses. Energy- or carbon-intensive firms and those that could not pass costs through to consumers lost value; the energy providers, being able to increase prices as their costs increased, were the winners.

Recognizing their lack of experience with cap-and-trade, and the need to build knowledge and program architecture, EU leaders began by covering only one gas (carbon dioxide) and a limited number of sectors. Once the infrastructure was in place, other GHGs and sectors could be included in subsequent phases of the program, when more significant emissions reductions were needed.

In theory, the market price of carbon is driven by the marginal abatement costs of carbon dioxide emissions reduction, ensuring that the target reduction is achieved at the least cost. By creating a market price for carbon, investment would be made in energy efficiency and superior process technology. The EU ETS offered businesses the flexibility to achieve their objectives by low-cost abatement or by allowing credits from the Kyoto Protocol's flexible mechanisms to be used for compliance. This process meant that the principle drivers for using the flexible mechanisms were the price of carbon and the cost of abatement within the EU (or in other parts of the world) through investments in energy efficiency, or improved process technology in developing countries that were not subjected to emission-reduction commitments under the Kyoto Protocol.

Lessons Learned 2005–2008

The system has thus far worked as it was envisioned—a European-wide carbon price was established, businesses began incorporating this price into their decision making, and the market infrastructure for a multinational trading program was now in place (Ellerman and Joskow 2008). Moreover, despite the condensed time period of the trial phase, the covered sectors realized some reductions in emissions within the EU.

Yet the system would have worked better to the extent that allocation was more accurate, making the number of permits fewer than the carbon dioxide emissions reported in 1990. This proper allocation did not occur in phase one and probably should have been more closely controlled at the EU level, rather than allowing national organizations such freedom. Also, the allowances were allocated for free, which meant that markets had high volatility as they searched for an accurate carbon price. This volatility lessened the incentives to invest in energy efficiency or improved process technologies. Finally, most businesses did not need to buy credits in the first phase. This problem led to the use of auctioning credits in the second phase.

EU officials had many other concerns about the EU ETS. One was the perverse incentives it was creating for EU companies. Companies found that they had several choices dealing with cost increases due to carbon trading: invest in energy efficiency; buy allowances; reduce production or relocate production outside the EU. The first choice would enhance EU competitiveness while the other three would likely decrease competitiveness.

A series of studies showed that companies and governments avoided the adverse impacts through carbon leakage and use of a “bubble arrangement,” two outcomes that actually could increase carbon dioxide emissions. In brief, carbon leakage occurred when companies worked around the restrictions on carbon by locating facilities in other countries or importing goods rather than producing them. The bubble effect resulted when EU members met targets as a group; for example, Portugal could emit more than its base rate as long as Luxembourg agreed to offset its emissions by the same amount.

The sectors and subsectors deemed to be at significant risk of carbon leakage were estimated to account for approximately a quarter of total emissions covered by the EU ETS and around 77 percent of the total emissions from the manufacturing industry in the EU ETS. A large part of the emissions covered by the ETS come from the power sector.

EU carbon dioxide emissions reductions plans could impact the demand for fossil fuels with lower-demand



abatement countries and possible higher demand in countries not covered under the Kyoto plan, or market share could shift to these uncovered countries due to higher EU costs. For example, companies considered shifting production to developing nations to avoid being responsible for emissions under the Kyoto plan. International capital allocations could shift to emerging markets, for example, given this increase in prices for factors of production. Some EU industries are highly sensitive to energy costs. The World Trade Organization (WTO) was actively implementing policies and procedures to increase trade liberalization, which worried the EU that its companies would become uncompetitive in the global marketplace. The EU ETS could perversely increase energy-intensive production in noncovered countries through foreign direct investment.

Suppliers quickly factored the price of emissions allowances into their pricing and output behavior. Late in the trial phase, there were sharp declines in allowance prices because there were no provisions for banking emissions reductions to use in the second phase of the program. Improved data quality and provisions for unrestricted banking between compliance periods will help moderate price fluctuations in the future.

Most research on the EU ETS showed that the scheme's impact was dependent on energy costs, the ability of firms to pass on costs to consumers, and opportunities to abate carbon emissions at low costs. Power utilities were given an unfair advantage because they could pass their costs through to consumers and thus make windfall profits. For example, the pass-through rates in Germany and the Netherlands were 60–100 percent of carbon dioxide costs (Schreuder 2009).

In sum, the major change to the second period was recognition of the need to auction permits and to avoid perverse impacts among and within countries. How many allowances will each member state have for auctioning? The EU officials designed the current EU program with these lessons learned in mind. For example, in phase two, all allowances that are not allocated free of charge are to be auctioned. Eighty-eight percent of the allowances for auctioning were distributed to member states on the basis of EU ETS emissions in 2005–2007; 10 percent of the allowances were distributed to poorer member states to take account of the lower GDP per head and higher prospects for growth and emissions. Another 2 percent of the allowances were to be distributed to nine member states that in 2005 had achieved a reduction of at least 20 percent in greenhouse gas emissions compared with the 1990 reference year set by the Kyoto Protocol. Member states would be responsible for ensuring that the allowances assigned to them are brought into the EU-wide carbon market via auctions.

Global Implications

The European Commission (the EU executive body) established the European Climate Policy Programme and then wrote the Green Paper on Greenhouse Gas Emissions Trading in the European Union (2000). The European Commission is a founding member of the International Carbon Action Partnership, which is made up of countries and regions that are actively pursuing the development of carbon markets through implementation of mandatory cap-and-trade systems. The partnership provides a forum to share experiences and knowledge.

The EU ETS is also interesting because it provides some insights into the problems faced in constructing a global GHG emission trading system. This will be the next stage in global climate diplomacy, if and when the United States adopts a cap-and-trade system. In imagining a multinational system, it seems clear that participating nations will retain significant discretion in deciding tradable national emission caps albeit with some negotiation. Separate national registries will be maintained with some arrangement for international transfers. Monitoring, reporting, and verification procedures will be administered nationally although necessarily subject to some common standard; and it seems doubtful that internal allocations will be more equitable. These are lesson learned that will help other countries as they confront similar issues as the EU ETS.

The deeper significance of the trial period of the EU ETS may be that its explicit status as a work in progress is emblematic of all climate change programs. Even when not enacted in haste, climate change programs will surely be changed during the period in which they remain effective. The trial period demonstrates that everything does not need to be perfect at the beginning. This adage is likely to be especially applicable in an imperfect world where the income and wealth effects of proposed actions are significant and sovereign nations of widely varying economic circumstance and institutional development are involved (Ellerman and Joslow 2008). The initial challenge is simply to establish a system that demonstrates the societal decision that GHG emissions shall have a price, and to provide the signal of what constitutes appropriate short-term and long-term measures in limiting GHG emissions to the desired amounts. In this, the EU has done more with the ETS, despite all its faults, than any other nation or set of nations.

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See also Clean Air Act; Climate Change Disclosure—Legal Framework; Climate Change Mitigation; Convention on Long-Range Transboundary Air Pollution; Copenhagen

Climate Change Conference 2009; Environmental Law—Europe; Free Trade; Kyoto Protocol

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