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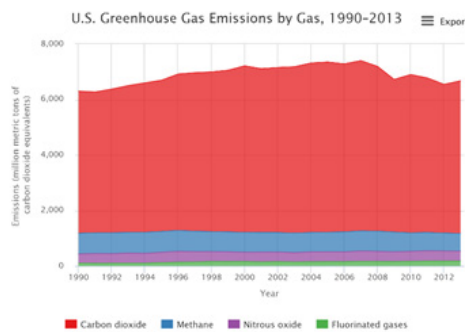
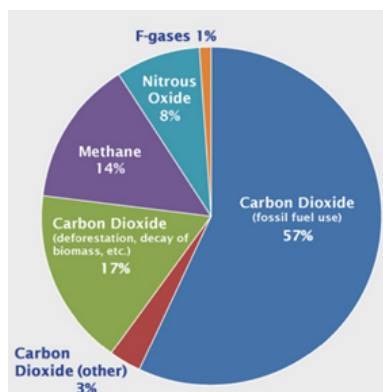
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7. Center for Climate and Energy Solutions. (n.d.). Midwest Greenhouse Gas Reduction Accord. Retrieved from <http://www.czes.org/us-states-regions/regional-climate-initiatives/mggra>

Proposed by Bush, championed by Gore, and promoted by Reagan’s financial advisor, the capitalistic cap-and-trade system for cutting greenhouse gas emissions has garnered support between environmentalists and across political parties in the United States¹. Ironically, China has embraced this free market response to cutting carbon dioxide emissions while the United States has turned to the Clean Power plan, which is regulatory rather than capitalist in nature. Why is this the case? Which system will be ultimately more effective?

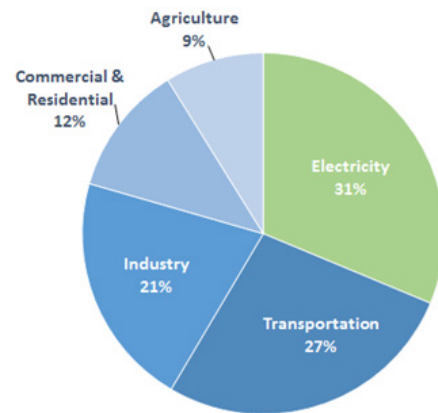
THE CARBON PROBLEM

It is not breaking news that carbon dioxide is a major greenhouse gas that facilitates climate change and global warming. Carbon dioxide (CO₂) accounts for 77% of greenhouse gas emissions around the world, and about 82% of greenhouse gas emissions in the U.S. To demonstrate its pervasiveness, carbon dioxide accounts for a larger fraction of greenhouse gases than methane, nitrous oxide, and fluorinated gases combined. Major sources of CO₂ include consumption of fossil fuels and deforestation of plants that naturally consume CO₂.



Cap-and-trade systems target emissions by companies in two sectors, electricity and industry, which are two

of the largest emitters of carbon dioxide, accounting for over half of total carbon emissions. In the U.S. alone, electricity comprises 1,562 million metric tons of the approximately 5,500 million metric tons of carbon emissions.¹² However, it is important to note that cap-and-trade does not address several additional sources of carbon emissions, such as domestic heating and transportation.¹¹



Countries, regional jurisdictions, and international organizations have turned away from legislation and towards market-based cap and trade systems in order to curb greenhouse gas (GHG) emissions. These emissions trading schemes provide economic incentives for reducing emissions of pollutants. Many cap and trade systems focus on carbon emissions, and as a result, there are several large, lucrative carbon markets around the globe. Since the first carbon emissions trading system began in the European Union in 2005, national emissions trading systems exist in Australia, Switzerland, New Zealand, Australia, South Korea, China, and Kazakhstan, and some sub-national schemes are legislated in the U.S., Canada, and Japan.⁴

WHAT IS A CAP AND TRADE SYSTEM?

All cap-and-trade proposals have three elements in common: (1) a cap, or phase-out schedule (i.e., limits on maximum total emissions across all polluters per year); (2) tradable “emission allowances” (entities with excess emission permits can sell their excess allowances to entities with a deficit of allowances); and (3) a formula for initially distributing the emission allowances based on previous levels. Alternately, a tax on carbon emissions imposes a fee that each polluter must pay on every unit

of carbon dioxide (or any other GHG) that is emitted into the atmosphere, which in turn provides an incentive for entities to reduce emissions. Both policies aim to reduce emissions by making it costly for firms and individuals to engage in activities that result in GHG being released into the atmosphere

Emissions trading systems are typically organized by a central authority, which sets a limit on the amount of a pollutant that can be emitted. This limit is then translated to emissions permits that allow the permit-holder to release a certain amount of a particular GHG, such as CO₂. For example, the European Union Emissions Trading System (EU ETS) defines one allowance as one metric ton of CO₂ or its equivalent in nitrous oxide or perfluorocarbons.

There is tension between the economically efficient method of distributing carbon and what is considered politically feasible. A popular method of free allocation provides companies a grandfathered percentage of carbon usage based on consumption from the previous year. A common alternative is by using the percentage quantile of the industry benchmark. Variations from their pre-allocated use make up the ‘trading’ component of the system. However, in an ideal economic system that generates the most revenue for the government, all credits for a given fiscal year are auctioned off by the regulatory agency in one large sale. Paradoxically, some of the free allocation schemes can give perverse incentives for companies to emit more in a previous year; if a company foresees that it will exceed its GHG emissions credits, it can purchase extra allowances from other companies.

Large fines are imposed on companies that exceed their credits at the end of a compliance period. Thus, with only a finite number of emissions allowances distributed at the beginning of a compliance period, the carbon market is very active among carbon emitters. Over time, the cap for each year will decrease to slowly phase out emission of GHGs. The cap and trade system motivates companies to invest in clean, low-carbon technology in order to meet allowance limits.

CARBON LEAKAGE

Carbon leakage is a potential problem and constitutes a loophole that companies take advantage of in order to avoid cutting emissions. Carbon leakage is not about

holes in pipelines — rather, it occurs when companies take advantage of neighboring jurisdictions with less stringent regulation. For example, some companies can outsource their production to other countries with fewer constraints on GHG emissions, thereby “leaking” carbon. The potential job losses raises concern for some labor groups, and potentially destructive environmental effects raise concern for activist groups.²⁵ Company intervention in foreign countries has been approached cautiously. Many emissions trading systems openly encourage the adoption of energy-efficient technology abroad.

U.S. CLEAN POWER PLAN

In contrast with the free-market-based cap-and-trade system, the United States uses the Clean Power Plan, which establishes the first national standards to limit carbon pollution from power plants. While previous EPA regulations have limited emissions of soot, SO_x, lead and certain chemicals, there have not been restrictions on carbon until this point. This plan hopes to reduce carbon dioxide levels by 32% below 2005 levels by 2030.³ To achieve this goal, the Clean Power Plan will establish a “trading ready” emission credit trading market between other states that do not design their own implementation plans by 2016. States that wish to participate in carbon trading have the option of engaging in their own regional groups or partaking in the proposed EPA-administered group.

The Clean Energy Incentive Program, a component of the Clean Power Plan, will award companies electricity credits for using renewable energy sources and for investment in energy efficiency projects in low-income communities.

Opponents suggest that the Clean Power Plan and cap-and-trade systems in general are regressive policies that disproportionately affect lower-income communities; lower-income households generally spend a larger fraction of their income on energy. Currently, the average household generating under \$50k annual household income has an estimated average of \$22,390 in post-tax income. These households spend about 21.4% of their post-tax income, at \$4,799, on energy costs from residential energy and transportation fuel. In comparison, households generating over \$50k in annual income hold an estimated average of \$84,263 in post-tax income, and spend only 8.9% of it for energy costs.¹⁵

8. Hibbard, P., Okie, A., Tierney, S., & Darling, P. (2015, July 14). The economic impacts of the Regional Greenhouse Gas Initiative on nine northeast and mid-Atlantic states [PDF document]. Retrieved from http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf

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18. The White House Office of the Press Secretary. (2015, August 3). Fact sheet: President Obama to announce historic carbon pollution standards for power plants. Retrieved from <https://www.whitehouse.gov/the-press-office/2015/08/03/fact-sheet-president-obama-announce-historic-carbon-pollution-standards>

Companies that are forced to participate in emissions trading can pass the costs of allowance trading onto their customers, which can potentially exacerbate the energy margin. According to the Congressional Budget Office, a cap on carbon dioxide emissions would cause the lowest income bracket to spend 3.3% more of their total household income in energy costs, in comparison to the wealthiest income bracket, which will experience less than a 1.7% increase, which would be less than half of that of the lowest income bracket.¹⁶

Proponents of cap-and-trade suggest that alternatives to a market based system would have a higher cost, and therefore a larger impact on low income communities. Legislated mandate approaches would not find all the same least cost solutions that come out of a free market solution. Alternatively, governmental revenue gained by the purchase of allowances could be used to reduce individual income taxes, which bipartisan researchers suggest could offset the income disparity. This idea actually has been supported by both Al Gore and many Republicans. This revenue could also be used to fund environmental projects around the country or to offset other taxes.

Table 1.
Annual Increase in Households' Costs from a 15 Percent Cut in Carbon Dioxide Emissions

	Average for Income Quintile				
	Lowest	Second	Middle	Fourth	Highest
Cost Increase in 2000 Dollars	560	730	960	1,240	1,800
Cost Increase as a Percentage of Income ⁹	3.3	2.9	2.8	2.7	1.7

Source: Congressional Budget Office.

While carbon emission permits are allocated at the beginning of a cap-and-trade program based solely on previous annual emissions, this conversion factor is lost in the market, as companies trading carbon permits across state borders do not factor in the amount of carbon dioxide being emitted per unit of electricity created. The distribution and trade of credits will depend on the type and cost of the good. The credits will vary from state to state; energy costs and requirements for heating in Northern States and air conditioning in Southern States may be higher than those in Pacific States where the climate is relatively mild. This would incur disproportionate effects on the economies of cap-and-trade systems, where certain companies could capitalize on the greater relative need of carbon permits in more highly-affected states.⁹

Thus, nationwide cap-and-trade system may be unable to normalize and provide for regional needs. The U.S. Clean Power Plan encourages states to independently form their own emissions trading programs. In designing regional cap-and-trade systems, states must be aware of current energy distribution among local communities and how the price of energy will affect trading throughout the year.

PENNSYLVANIA'S DECISION

In September of this year, the Pennsylvania Department of Environmental Protection committed to a state-centric plan to comply with the national Clean Power Plan. The Clean Power Plan specified that Pennsylvania would reduce greenhouse gases created by industries and municipalities by 33% by 2030, with a compliance period starting in 2022.⁵

In 2012, 117 million tons of CO2 was released at the standard emission rate of 1,642 pounds CO2 per megawatt-hour. Under the Clean Power Plan, the 2030 target for a mass-based system is 90 million metric tons of emission, and the target for a rate-based system is 1,642 pounds CO2 per megawatt-hour.

Pennsylvania's economic role as one of the country's largest power producers and exporters complicates the state's decision. In 2013, PA was the third largest energy-producing state, following Texas and Wyoming. Coal production alone accounts for 39,000 direct and indirect jobs and \$7.7 billion of state gross domestic output.¹⁰

Pennsylvania chose not to join a multi-state cap and trade program so the state could balance its own state-centric plan with its unique energy economy and market. The state must consider how it can maintain its net exporter status with the new system, or even if it should allow out-of-state trading. The state must balance economic impacts on industry while making sure vulnerable communities do not face high costs for their own electricity. Pennsylvania wants to prioritize indigenous resources while maintaining a diverse fuel mix, while complying with emissions standards. Many economists believe the most cost efficient way to achieve these goals is through a cap and trade system.

CAP AND TRADE SYSTEMS IN THE U.S.

Many believe that the Clean Power Plan will perpetuate the creation of a larger cap-and-trade system in the U.S. There are currently three major cap-and-trade systems in the U.S.: the Regional Greenhouse Gas Initiative (RGGI) in the Northeast, the Midwest Greenhouse Gas Reduction Accord (MGGRA), and the Western Climate Initiative (WCI). The RGGI was the first cap-and-trade system in the U.S., encompassing Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The RGGI, which focuses specifically on carbon dioxide emissions from the power sector, held its first auction in 2008. In 2014, it had a cap of 91 million short tons of emissions, a carbon dioxide cap that will decline 2.5% each year from 2015 to 2020. Tentatively, 15,274,274 carbon dioxide allowances will be distributed for the next compliance period.¹⁷

CHINA'S CAP AND TRADE PROGRAM

In comparison, China has taken a different approach to reducing GHG emissions. The Chinese President Xi Jinping will launch a Chinese cap and trade system to create a national market for GHGs in 2017. This national system will be based upon the seven regional and provincial pilot programs, which have successfully reduced emissions.

Under China's plans, China would not have a hard cap on the amount of CO₂ emissions.²⁰ Instead, it would give each sector or large company their own allowance allocation and allow companies to continue trading.

Scientists predict that carbon dioxide emissions could feasibly stop rising by 2025 due to China's slowing economy and weakening dependence on heavy industry for growth. China will be following a "green dispatch approach," with a goal of producing 20% of its electricity from renewables by 2030.²¹

EU ETS

The European Trading System launched in 2005 as the world's first and largest carbon market and is composed of 28 EU member states, Iceland, Liechtenstein, and Norway, as well as all aviation operators flying over or in the EU. The European Trading System covers about 45% of total EU emissions; it addresses CO₂ emissions from oil refineries and heat generation; nitrous oxide emissions from acid production; and perfluorocarbon emissions from aluminum production.

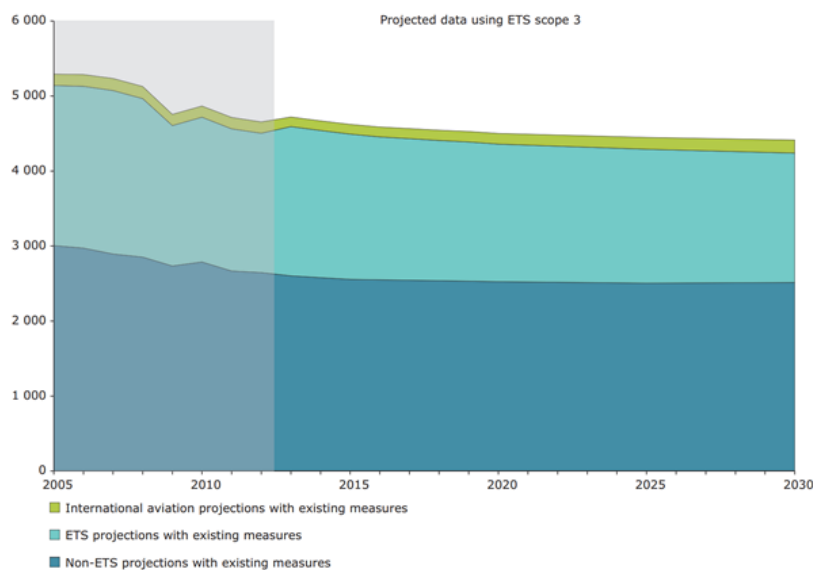
The goal of the EU ETS is to stop the growth in emissions of GHGs by 2020. In order to achieve this goal, the cap on emissions must be reduced by 1.74% each year from 2013 onwards. Thus, by 2020, GHG emissions will be 21% lower than in 2005 and approximately 20% lower than 1990 lev-

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Figure 7.2 GHG trends and projections for ETS and non-ETS emissions, 2005–2030



Source: EEA, 2013a; EEA, 2013b; EEA, 2013d; EEA, 2013f.

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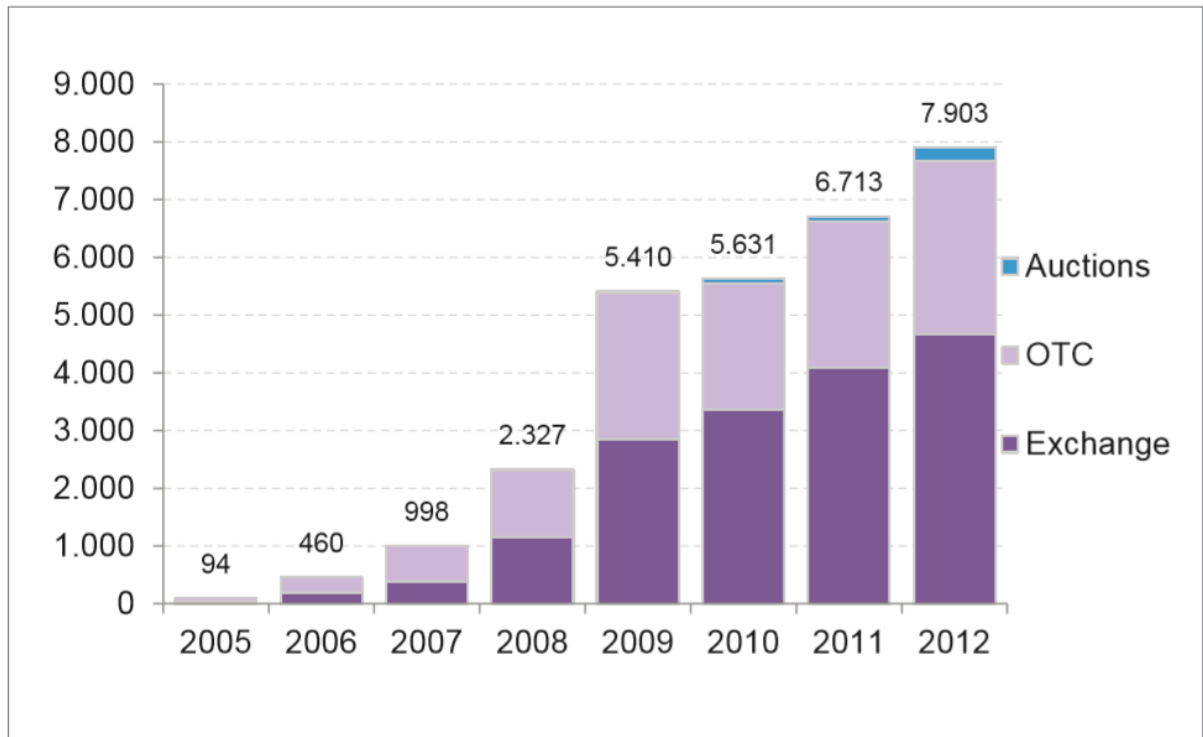
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27. European Environment Agency. (2013, October). Trends and projections in Europe 2013 [PDF document]. Retrieved from <http://www.eea.europa.eu/publications/trends-and-projections-2013/full-report-ghg-trends-and-1>

28. Carbon Neutral. (n.d.). Avis. Retrieved from <http://www.carbonneutral.com/our-clients/case-studies/avis>

Trading volumes in EU emission allowances (in millions of tonnes)



Source: Bloomberg New Energy Finance. Figures taken from Bloomberg, ICE, Bluenext, EEX, GreenX, Climex, CCX, Greenmarket, Nordpool. Other sources include UNFCCC and Bloomberg New Energy Finance estimations.

els. According to this plan, by 2050, GHG emissions will be 80-95% lower than 1990 levels.

Currently, the EU ETS is in its third phase. The first trading period was from 2005 to 2007, which served as a learning period in which the EU experimented with the allocation of credits. The EU ETS began with a highly inefficient system — grandfathered credits were passed down rewarding prior work on emission-saving projects.¹³ The initial system led to an excess of allowances, essentially bringing the marginal price of credits to zero. The second trading period, from 2008 to 2012, saw a surplus of credits despite a 6.5% reduction in emission cuts, due to the economic downturn, which decreased demand for energy-intensive oil and transportation. The third period, from 2013 to 2020, hopes to phase out cost-free allocation and allocate permits only using auctions.

The amount of trading occurring in the ETS has been steadily increasing. Currently, most of the emissions trading volume is through over-the-counter (OTC) transactions or financial exchanges, rather than auctions. At the

same time, emissions trading is a large yet highly volatile business, as prices for a ton of CO₂ are still fluctuating.

Opponents to pollution trading deem ETS as a “fraud-friendly system of credit swapping and market manipulation,” taking on an ethical stance opposing the idea that countries and companies are able to ‘buy the right to pollute.’ For example, the methodology certain companies use to gain credits is under increasing scrutiny. Investing in emission-saving projects halfway across the globe, such as Amazonian reforestation projects did, should not allow companies to continue emitting GHGs at their own leisure in a factory in Europe.²⁸

WESTERN CLIMATE INITIATIVE

The Western Climate Initiative (WCI), launched in 2013, is a regional emissions-trading system that currently includes British Columbia, California, Ontario, Quebec, and Manitoba. In terms of emissions cuts, this is the second largest emissions trading system, behind the EU ETS. Unlike the RGGI, the WCI covers six GHGs: CO₂, CH₄,

N₂O, HFCs, PFCs, and SF₆. In its first year, the system only applied to large electric power plants, and from 2015 onwards it extended to fuel distributors. GHG emission limits decreased by 2% each year until 2015, and should decrease by 3% each year from 2015 to 2020 if the plan is successful.²³

Within the WCI, California held its first auction of GHG allowances in November 2012, raising \$630 million by selling pollution allowances, each entitling the buyer to one metric ton of carbon dioxide pollution. Cross-regional trading took place in subsequent auctions that included Canadian provinces. In these cases of cross-regional trading, allowances were generally sold for about \$12 apiece, but prices for one metric ton of carbon emissions have been sold for as little as \$4.²⁴

Theoretically, this allowance trade would allow a power plant in Quebec to continue polluting without making energy-efficient changes as long as it invests in a California farm that is working to keep an equivalent amount of methane out of the air. Some scientists insist that these gases are not comparable in size to each other, making this emissions trading system difficult as it may increase heavy, localized pollution. To avoid these hot spots, all parts of the country should be required to comply with national health-based air quality standards separate from cap requirements to ensure that one area does not bear a disproportionate cost of pollution.

Eight other Western states initially joined as members of the coalition; however, some states, such as Arizona in 2010, dropped out in the early stages of the planning. In the case of Arizona, the former Governor Jan Brewer stated that a cap-and-trade system would cripple Arizona's economy. Instead, Arizona planned to expand its state-wide solar power initiative.¹⁴

CONCLUSION

Thus, the United States could, ironically, look to its ideological opponent, China, for policy guidance on the reduction of greenhouse gas emissions. Having a central authority control all GHG emissions perpetuates a bureaucratic bottleneck that stalls important advances that could be made to drastically decrease GHG emissions. In the cases of the United States and the European Union, experimenting with credit swaps and having different caps can potentially lead to an efficient and effective cap-and-trade system for decreasing GHG emissions. While China's complete success has yet to be seen, the U.S. could benefit from moving away from a highly regimented system of control to a more capitalist model with which many other countries are beginning to be successful.