U.S. POLICY

OPTIONS AND CONSIDERATIONS FOR A FEDERAL CARBON TAX

CENTER FOR CLIMATE AND ENERGY SOLUTIONS

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Greenhouse gas emissions can be reduced most cost-effectively through market-based approaches that put a price on carbon. The two most commonly discussed approaches are a cap-and-trade system and a carbon tax. By establishing a price for greenhouse gas emissions, either instrument can help correct the market failure that exists when the value of environmental damages is not included in the market price of fossil fuels. A fundamental difference between the two is that a cap-and-trade system sets the maximum level of emissions so the environmental outcome is known but the resulting price is unknown, while a carbon tax sets the price and lets the market determine the environmental outcome. This brief outlines broad considerations in weighing a carbon tax, such as environmental integrity, cost-effectiveness, and distributional equity, as well as fundamental design issues, including who might pay the tax and how to set an appropriate tax rate. The brief also reviews existing carbon taxes abroad and in localities in the United States, along with several recent U.S. legislative carbon tax proposals.

WHAT IS A CARBON TAX?

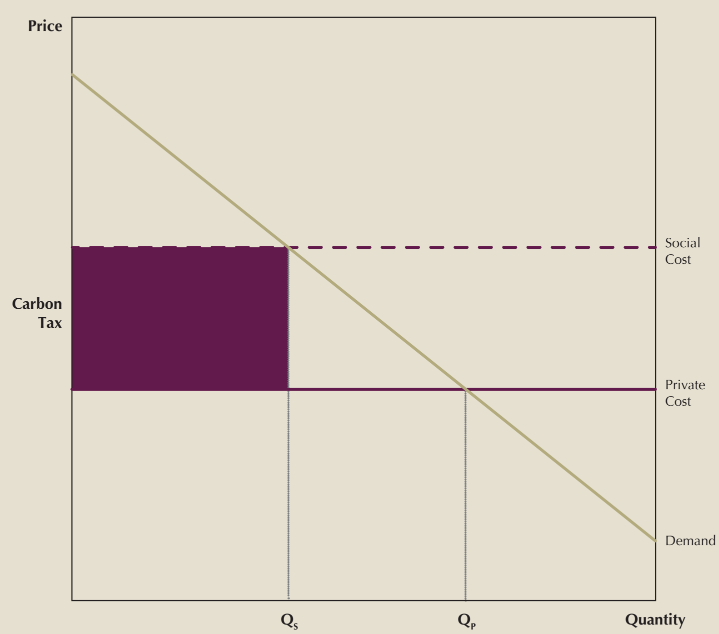
A tax on greenhouse gases, often called a carbon tax, is a market-based policy instrument that can be used to achieve a cost-effective reduction in emissions.[1] For this brief, carbon will be used as shorthand for greenhouse gas emissions because carbon dioxide comprises the overwhelming majority of overall greenhouse gas emissions. (For an in-depth overview of market-based policies to address climate change, see the Center's brief on *Market Mechanisms: Understanding the Options*).

A carbon tax uses the power of market price signals to encourage greenhouse gas emission reductions from a variety of sources. The predominant greenhouse gas produced by humans is carbon dioxide (CO_2), which results largely from burning fossil fuels. An upstream carbon tax, for example, would impose a charge on coal, oil, and natural gas in proportion to the amount of carbon they contain. This tax would be passed forward into the price of electricity, petroleum products, and energy-intensive goods. A more broad-based carbon tax could also be designed to apply to non-energy sources of CO_2 emissions and on other greenhouse gases based on their global warming potential relative to CO_2.

The economic rationale for creating a price on greenhouse gas emissions is multifold. First, it would correct an underlying market failure that has led to increasing concentrations of greenhouse gases in the atmosphere. The burning of fossil fuels and other activities that release greenhouse gases are associated with warming global temperatures and adverse climate impacts. The costs of these impacts, including an increase in extreme and damaging weather events, rising sea levels, loss of biodiversity and other effects, will be borne by society as a whole, including future generations. However, these costs are not currently included in the market prices of goods that emit greenhouse gases, leading to an inefficient use of resources and excessive emissions from a societal perspective (see **Box 1** for a discussion). A carbon tax would attempt to include these costs in market prices. Second, use of a market-based policy instrument can achieve greenhouse gas emission reductions at lower cost to regulated sectors than a command-and-control approach, which emphasizes source- and sector-based mandates for particular technologies or processes. As technologies that reduce CO_2 emissions during or post-combustion are not yet widely available, the primary way to reduce CO_2 emissions is to switch to fuel sources with lower carbon content or reduce consumption of fossil fuels. Use of a market-based policy to establish a common price on greenhouse gas emissions is necessary to provide incentives for a broad range of emission reduction options across firms, households, and activities. Some emission reductions will be achieved by firms as they switch from higher- to lower-carbon fuels and invest in energy-saving technologies. Other reductions will come from consumers, who will respond to higher energy prices by purchasing less energy-intensive goods and changing their behavior in ways that use energy more efficiently. Greenhouse gas pricing policies also provide incentives to develop new technologies, such as carbon capture and geological storage and zero-carbon energy sources, and encourage biological sequestration of greenhouse gas emissions in forestry and agriculture.

BOX 1: Economic Rationale for Taxing Carbon

The figure below depicts the market for a good which uses fossil fuel in its production, such as electricity. Consumers determine their demand for electricity in part based on the market price, which reflects the private cost of production—including extraction, processing, and distribution costs that transform fuels like coal and natural gas into electricity—and purchase the amount Q_P. The market price, however, does not account for the social cost of the environmental damage associated with climate change induced by burning these fuels. A carbon tax would attempt to correct for this divergence between private and social cost by imposing a carbon tax on each unit of fossil fuel sold. For example, a carbon tax applied to coal would require consumers of electricity (and consumers of coal) to pay a price closer to the full social cost. This could cause them to lower their consumption to the amount Q_S (and their consumption of coal). Another possible response is they might use carbon capture and storage. Either way, they would reduce total greenhouse gas emissions to a level more in line with the socially desirable level.



BROAD CONSIDERATIONS

By establishing a price on greenhouse gas emissions embedded in fuels and energy-intensive goods, a carbon tax can deliver cost-effective emission reductions across firms and households. In principle, a carbon tax could be designed to produce the same overall level of emissions, distribution of emission reductions across sources and sectors, and aggregate costs as a cap-and-trade system. However, achieving this level could require adjusting the tax rate several times because of the uncertainty surrounding consumers' response rates.

Understanding the effects of uncertainty can help inform a well-designed carbon tax to better meet key objectives by which any domestic climate policy should be assessed. These include environmental integrity, cost-effectiveness, and distributional equity, each of which will inevitably involve political considerations. Nevertheless, like cap-and-trade programs, a carbon tax can be designed and implemented in ways that increase the likelihood of meeting these objectives.

ENVIRONMENTAL INTEGRITY

Emissions integrity or "certainty" is an important consideration for climate policy advocates. Climate models indicate that substantially different futures are possible depending on the path of future greenhouse gas concentrations. Scientists believe that surpassing critical concentration thresholds may trigger large-scale, irreversible changes in climate-sensitive systems that would have catastrophic effects on the planet.[2] These include extensive melting of the Greenland and West Antarctic ice sheets, breakdown of the thermohaline circulation (also known as the ocean conveyor belt), and abrupt changes in the Asian monsoon.[3] Although our ability to predict when these tipping points might be crossed (or if they have already been crossed) is currently limited, the chances of crossing potential tipping points rises with increases in greenhouse gas concentration.[4] (For an in-depth overview of science of climate change and projected impacts, see the Center's *Climate Change 101: Science and Impacts*).

A carbon tax, however, does not provide emissions certainty. Firms will reduce, or abate, their emissions up to the point where it is cheaper to pay the tax than to reduce emissions further. However, firms' abatement cost curves are not well known and will depend on characteristics specific to firms, including their fuel mix and their available abatement opportunities. As such, it is difficult for policy makers to know the level of reductions that will be achieved by a carbon tax. In addition, changes in conditions external to firms, such as fuel prices, weather patterns, and the development of new low-cost abatement technologies are unpredictable. It is also unclear how the overall economy will adjust to higher prices of energy and energy-intensive goods, which will feed back into the markets in which these firms operate. For all these reasons, the total amount of emissions abatement that will result from a particular carbon tax rate is uncertain at the time the tax is set. Achieving a long-run emission target may require periodic adjustments in the tax rate. As most proposals assume that the tax rate increases at a fixed but gradual rate over time, this would likely imply that changes would need to be made to the rate of growth—either increasing or decreasing how fast the tax increases over time. The extent to which tax rates may have to be adjusted would reduce the amount of compliance cost certainty a carbon tax could otherwise provide—detracting somewhat from one of the principal arguments in favor of a tax—compliance cost certainty.

COST-EFFECTIVENESS

Most greenhouse gases are a stock pollutants, meaning once emitted, they are very long-lived in the atmosphere and their build-up has consequences over the course of centuries. Ultimately, it is the stock, or concentration, of greenhouse gases that contributes to climate change and its attendant damages. Any given year's emissions will have a relatively small impact on the overall stock, which has been building up over the course of the industrial age. This affords a certain degree of flexibility in terms of the timing of emission reductions, provided that cumulative emission targets over time are attained and that critical greenhouse gas concentration thresholds are avoided. However, the longer implementation is delayed, the greater the aggregate costs will be in achieving a given stabilization target or the more likely it is that greenhouse gas concentrations will be higher with greater attendant damages.

A carbon tax allows firms to adjust their emissions according to current conditions, increasing emissions and paying more taxes when abatement costs are high (due to extreme weather patterns, for example) and reducing emissions when abatement costs are low (following the introduction of low carbon technologies or fuel sources, for example). This built-in flexibility of a tax helps firms to minimize their compliance costs over time.

Most carbon tax programs provide price certainty by specifying a tax rate for a given year. However, a carbon tax could be designed to meet a long-run emissions target—such as reducing emissions 80 percent below 1990 levels. Such a program would require periodic updates to the tax rate. The more certainty and advance notice policymakers provide in the tax design, the more cost-effectively firms and households can adapt to the price changes. To provide long-run certainty, policymakers could implement cost containment mechanisms, like price ceilings and price floors, which are found in some cap-and-trade systems. These mechanisms can reduce the uncertainty by providing a tax range for firms while meeting an environmental objective. Policymakers could then establish tax rates within this range at least a decade in advance, for example with a rolling schedule of announcements.

CARBON TAX REVENUES

A carbon tax has the potential to raise significant revenues for the government. The revenue raised could be tens or hundreds of billions of dollars each year, depending on the carbon price. For example, a carbon tax starting at about $16 per ton of CO_2 in 2014 and rising four percent over inflation would raise more than $1.1 trillion in the first ten years, and more than $2.7 trillion over a 20 year period.[5]

While there are many possible ways these revenues could be used, a large body of research suggests that using these revenues to reduce existing taxes on labor and capital—also known as a tax swap—can help lower the economy-wide costs of the program.[6] These costs include the direct compliance costs that firms, such as electric power producers and oil refineries, will incur in order to reduce their emissions. They also include the indirect costs brought about through price changes that take place throughout the rest of the economy and which can further affect labor supply and investment and lower long-run economic growth. Imposing a carbon tax will impose costs on the economy but the magnitude of those costs is directly related to how the revenue is used.

Of course, how the revenue is used will ultimately be a political decision. Using the revenue to reduce taxes on things we want to encourage, like labor and capital investment, maximizes the economic benefits (and minimizes the cost) from the tax. The experience of other countries has been mixed on this front. Sweden and British Columbia provide two examples of carbon taxes being used to specifically offset taxes on, respectively, labor and individuals/businesses.[7] Using the revenue for other government spending programs or simply rebating the revenue in lump sums to all households would be more costly than using it to reduce or remove distortionary taxes on labor and capital.[8]

DISTRIBUTIONAL EQUITY

Carbon tax revenues could be used in other ways that do not necessarily lower the overall costs of climate policy but may help achieve other socially desirable objectives. Even with a market-based approach, climate policy will bring about adverse impacts on affected firms and sectors, which will desire compensation for the loss of profitability and premature turnover in their capital stock and assistance in addressing competitiveness concerns. However, it is anticipated that the overwhelming economic impact of any climate policy will be borne by energy end-users and households in the form of higher prices for energy and other goods. Furthermore, unless accommodations are made, the impact of a carbon tax or cap-and-trade program is likely to disproportionately affect low-income households—which generally spend a higher percentage of their income on energy—and certain regions and communities that are heavily dependent on fossil energy.

Some tax-shifting options could lessen the burden on low-income households while still helping to lower economy-wide costs, though by a smaller amount than options aimed at lowering these aggregate costs alone.[9] These include raising existing threshold exemptions for personal income taxes and introducing similar threshold exemptions for payroll taxes. Other options, including lump-sum rebates to households or targeted energy assistance, could be implemented with the sole objective of providing greater relief to the lowest income families and the elderly or unemployed.

Additionally, funds could be created to facilitate adaptation to climate change and to provide transition relief for particular industries or communities whose local economies are more dependent on fossil fuel-based industries. Previous cap-and-trade congressional proposals included the provision of free allowances to local electric and gas distribution companies on the condition that they use the allowance value to fund efficiency programs to help lower their customers' bills without diluting the greenhouse gas price signal.

POLITICAL CONSIDERATIONS

A carbon tax could be subject to political compromises that can dilute the effectiveness of the policy. Some have argued that political pressure from powerful interest groups will push for reductions in or exemptions/rebates from the tax. If decision-makers yield to these pressures, the scope of the program under a tax will be reduced, compromising the environmental objective and reducing the availability of potentially lower cost emission reductions.

The experience of Norway illustrates the potential difficulties of implementing a carbon tax. Norway set a high nominal carbon tax in 1991 but under political pressure ended up exempting the majority of its industries, with the effect that only about 55 percent of its CO_2 emissions are taxed.[10] Emissions not covered by a carbon tax are included in their emissions trading scheme (ETS), which was linked to the European ETS in 2008. Instead of implementing dual carbon pricing programs or blanket exemptions, "inframarginal" exemptions are typically recommended by economists. In other words, the carbon tax would apply only to emissions in excess of some given percentage of a firm's historical emissions. Like a free allocation of allowances in a cap-and-trade system, this would provide targeted compensation to the firm while still preserving the marginal incentive to reduce emissions.[11]

One must also consider the likelihood that a carbon tax will actually be adopted. In the United States, cap-and-trade initially had more support across the political spectrum, given enormous political resistance to new taxes. In 2009, the House of Representatives passed comprehensive national climate and energy legislation that would establish an economy-wide greenhouse gas cap-and-trade program. However, citing a lack of bipartisan support, the Senate did not vote on any companion legislation. The stand-alone climate legislative effort died because the U.S. economy was still in a recession and opponents successfully dubbed it a "job killing energy tax."[12] Attention has more recently turned to the possibility of a carbon tax as an element of a broader package addressing tax or budgetary issues.

CARBON TAX DESIGN ISSUES

WHO PAYS THE TAX

A carbon tax can be levied at any point in the energy supply chain. Measuring the carbon content of fuels is a straightforward task. For administrative simplicity, one should levy the tax at a point where there are relatively few entities subject to the tax; this point varies by fuel type. To be fully inclusive, a downstream tax would potentially have to fall on millions of users, increasing the likelihood that the scope of the program would be more limited with higher aggregate and administrative costs. As a consequence, most proposals suggest a tax might be best applied to upstream suppliers of coal, at natural gas processing facilities, and at oil refineries as opposed to at "midstream" (electric utilities) or downstream at energy-using industries, households, or vehicles. The Congressional Research Service estimates a carbon tax could be levied on fewer than 2,300 entities and cover 80 percent of U.S. greenhouse gas emissions.[13]

Wherever the tax is imposed, the price signal it creates will theoretically be passed backwards and forwards through the energy supply chain in the same way. This price signal should in principle bring about the same behavioral response and result in the same economic burden to firms and consumers (prior to any potential decisions about how to compensate them with tax revenues). This might not be the case, however, if downstream consumers are sluggish to respond to price increases unless faced with a more visible tax.[14] For firms, their ultimate burden will depend on their ability to pass through abatement and tax costs to their customers and on the ensuing reductions in demand they experience in response to higher product prices. End-use consumers, of course, cannot pass on their increased costs and it is expected that much of the ultimate burden of a carbon tax, like a cap-and-trade program, will fall on them.

SETTING THE TAX RATE

Economic theory suggests that a carbon tax should be set equal to the social cost of carbon, which is the present value of estimated environmental damages over time caused by an additional ton of CO_2 emitted today. Theory also suggests that the tax rate should rise over time with the growth rate of the marginal damages from emissions. There are many estimates of the social cost of carbon and they vary widely. The Interagency Panel on the Social Cost of Carbon estimates costs from $5 to $65 per ton of CO_2 (2007 dollars).[15] Their central value estimate was $24 per ton of CO_2 in 2015, however they noted that this dollar figure does not completely capture non-market impacts (like the loss of species), the costs of catastrophic impacts or the cost of adaptation. Under conventional discounting, and without incorporating the risks of catastrophic climate change, most estimates fall between $5 and $20 per ton.[16] These estimates are highly uncertain because the impacts of climate change, including non-market impacts and catastrophic effects, are very hard to pin down.

Using the above social cost of carbon to set the initial tax rate suggests that the initial tax rate would be set at a relatively low level and then ramp up over time in order to minimize economic disruption. While an initial low tax rate may not satisfy some climate policy advocates wanting greater action, it is important to remember that many capital investment decisions will not be made on the basis of near-term costs and instead will be based on expected costs over the life of the project—and many energy projects have lifetimes greater than 30 years. Furthermore, it is also important to remember that while determining the social cost of carbon is difficult and imprecise, any carbon tax rate would likely be closer to the social cost than what currently exists.

Other options for setting the tax rate include setting it according to what would be needed to achieve a specific emissions outcome (e.g. 80% reduction by 2050) or setting it to achieve a revenue goal. Economic modeling could suggest an appropriate starting tax and escalation rate to achieve either of these goals. Likely an approach designed to achieve an aggressive emissions goal would require higher starting tax rates and a more aggressive escalation rate. At the very least, in either case, a steady increase in the tax rate will be necessary to offset emission increases and economic growth.

A complicating issue for a carbon tax is that many other energy taxes, tax credits and subsidies exist and these could reduce the effectiveness of a carbon tax. To the extent possible, energy policy should be scrutinized for conflicting tax policies and it may be possible to eliminate some tax credits and tax subsides. For example, subsidies for certain clean energy technologies may be redundant with a carbon tax. Ideally, an accounting of the effects of existing energy taxes and subsidies should be determined when computing the carbon tax rate. Examples of existing pricing policies towards energy include gasoline taxes, production and investment tax incentives for electricity generation, and subsidies for fossil energy and energy-efficient investments in housing.

NON-ENERGY CO_2, OTHER GREENHOUSE GASES, AND SEQUESTRATION

A truly comprehensive and cost-effective carbon tax would target greenhouse gas emissions beyond CO_2 from energy-related activities. There are non-energy sources of CO_2 emissions, including land-use emissions from agriculture and forestry and industrial process emissions. Emissions of other greenhouse gases like methane and nitrous oxide arise in the agricultural, energy production and waste processing sectors as well as from land-use activities and can be measured and taxed in terms of their CO_2 equivalence. Inclusion of these and other high global-warming-potential greenhouse gases under the carbon tax policy as a means of reaching the same target reductions is estimated to offer a significant source of cost savings, particularly in the early years of a program.[17] However, while such an approach would be cost-effective, it could be more difficult. The difficulty arises because of the larger number of sources, difficulty with monitoring, and even assessing the greenhouse gas ratios (and the resulting social cost) are more uncertain. Taxing greenhouse gas emissions rather than simply CO_2 should also be accompanied by provisions that extend tax credits to activities that sequester carbon or greenhouse gases as they become available, such as carbon capture and storage, forestry conservation, and feedstock uses of fossil fuels in manufacturing activities.

ADMINISTRATION, MONITORING, AND ENFORCEMENT

The administrative tax functions already exist within firms and government offices to handle existing tax requirements, like the black lung excise tax, the oil spill response tax and the natural gas production tax (Texas) consequently, a carbon tax could easily be accommodated within this existing administrative structure. Although incentives for tax evasion exist on the part of firms (e.g., through underreporting their emissions), the government has an incentive to document and verify reports because revenues are at stake.

EXISTING CARBON TAXES

A number of countries have existing carbon taxes or are considering them. **Table 1** below lists the regions that have implemented a carbon tax.

In 1990, Finland became the first country to enact a tax based on carbon content. As of January 2010, the tax per ton of CO_2, levied based on the carbon content of fossil fuels, was €30 –about $8.18 per ton CO_2 (in US$). In January 2011, Finland revised its energy taxation to take into account both the energy content and carbon dioxide emissions. Sweden and Norway enacted carbon taxes in 1991, followed by Denmark in 1992. In 2013, Norway nearly doubled the carbon tax for its offshore oil and gas production to $74 per metric ton. Much of the newly generated tax revenue will go into a governmental fund devoted to investing in clean energy, the environment and public transportation.[18] While not strictly a carbon tax, Great Britain introduced a "climate change levy" in 2001 on electricity, coal, and natural gas.

As of 2013, several countries—China, Mexico, South Africa, and South Korea—are considering implementing a carbon tax.

Canada does not have a national carbon tax, but several Canadian provinces have implemented carbon taxes. The province of Quebec began collecting a hydrocarbon fuels tax on coal, oil, and natural gas in 2007. However, Quebec's tax rates are low and most of the province's power is hydroelectric. Starting in July 2007, Alberta implemented a baseline and credit program that requires facilities emitting more than 100,000 metric tons of carbon dioxide equivalent to: reduce their emissions by 12 percent, buy emission reduction credits from other facilities in Alberta, or pay $15 per metric ton into a fund aimed at reducing GHG emissions in the province. Some have interpreted the $15 price ceiling as a tax in this credit and baseline program. British Columbia enacted a carbon tax in 2008. The tax rate started at US$9.55 per metric ton of CO_2, and rose by US$4.77 per ton annually to reach US$28.64 per ton in 2012. It is forecasted to raise 1.1 billion in 2012.[19] Carbon tax revenues are returned to taxpayers through cuts in personal and business income taxes.

In the United States, a few localities have implemented carbon taxes. The city of Boulder, Colorado, enacted a tax on carbon emissions from electricity generation. Though the tax rate varies by sector usage, it's expected to cost the average household about one dollar per month and generated about $1.8 million in 2010. In 2012, the city of Boulder voted to extend the tax through March 2013.[20] In 2008, Bay Area Air Quality Management District (BAAQMD) began charging more than 2,500 businesses in the San Francisco bay area 4.4 cents for every ton of CO_2 they emit. The fee was expected to raise $1.1 million in its first year.

TABLE 1: Regions with Carbon Taxes

COUNTRY / JURISDICTION	START DATE	TAX RATE	ANNUAL REVENUE	REVENUE DISTRIBUTION
Finland	1990	$30 per metric ton CO_2	$750 million	Government budget; accompanied by independent cuts in income taxes
Netherlands	1990	~$20 per metric ton CO_2 in 1996	$4.819 billion*	Reductions in other taxes; Climate mitigation programs
Norway	1991	$15.93 to $61.76 per metric ton CO_2	$900 million (1994 estimate)	Government budget
Sweden	1991	Standard rate: $104.83/ per metric ton CO_2 Industry rate: $23.04 per metric ton CO_2	$3.665 billion	Initially government budget; Starting in 2000, revenue used to offset labor taxes

COUNTRY / JURISDICTION	START DATE	TAX RATE	ANNUAL REVENUE	REVENUE DISTRIBUTION
Denmark	1992	\$16.41 per metric ton CO_2	\$905 million	Environmental subsidies and returned to industry
Costa Rica	1997	3.5% tax on hydrocarbon fossil fuels	n/a	A portion goes to program that incentivizes sustainable development and forest conservation.
United Kingdom	2001	\$0.0078/kWh for electricity; \$0.0027/kWh for natural gas provided by gas utility; \$0.0175/kg for liquefied petroleum gas or other gaseous hydrocarbons supplied in a liquid state; and \$0.0213/kg for solid fuel	\$1.191 billion	Reductions in other taxes
Boulder, Colorado	2007	\$12-13 per metric ton CO_2	\$846,885	Climate mitigation programs
Quebec, Canada	2007	\$3.20 per metric ton CO_2	\$191 million	Climate mitigation programs
Switzerland	2008	\$11.41/metric ton CO_2 in 2008, increased to \$34.20/ metric ton CO_2 in 2010.	\$209 million	One-third of revenues funds climate-friendly building renovations; remainder redistributed back through benefits system
British Columbia, Canada	2008	\$9.55 per metric ton CO_2 in 2008 increasing \$4.77 annually to \$28.64 in 2012.	\$292 million	Reductions in other taxes
Bay Area Air Quality Management District (BAAQMD), California	2008	\$0.045 per metric ton of CO_2-e.	\$1.1 million (expected)	Climate mitigation programs
Ireland	2010	\$19.60 per metric ton CO_2 in 2010 to \$26.17/ per metric ton CO_2 in 2012	\$523 million (in 2012)	Government budget
Australia	2012	\$23.78 per metric ton CO_2, increasing 2.5% annually. The fixed price will transition to a cap-and-trade system in July 2015.	\$24 billion (for the first three years)	Over 50% of the revenue will be used to assist households, reduction in other taxes, energy intensive trade exposed industries will receive assistance.

Revenue in the Netherlands is from all environmentally related taxes, of which carbon taxes are the clear majority. Australia has implemented a fixed price in the first three years of their program, which effectively acts like a carbon tax.

Source: Sumner, Jenny, Lori Bird, and Hillary Smith, "Carbon Taxes: A Review of Experience and Policy Design Considerations," United States National Renewable Energy Laboratory, December 2009. Updated figures from Patel, Sonal, "Gas Taxes: Carbon Taxes Around The World" POWER Magazine, December 27, 2011. Information of Ireland's carbon tax from Convery, Frank, "Budget 2013 – Three Cheers For The Carbon Tax" Irish Fiscal Policy Research Centre, September 2012.

PROPOSED U.S. CARBON TAX LEGISLATION

At the federal level, the last few Congresses saw the introduction of several carbon tax proposals. **Table 2** below highlights key policy design parameters of: Reps. Bob Inglis and Jeff Flake's Raise Wages, Cut Carbon Act of 2009 (H.R. 2380 of the 111th Congress), Reps. Pete Stark and John Larson's Save Our Climate Act of 2009 (H.R. 2380 of the 111th Congress), Rep. Jim McDermott's Managed Carbon Price Act of 2012 (H.R. 6338 of the 112th Congress), and Sens. Bernie Sanders and Barbara Boxer's Climate Protection Act of 2013 (S. 332 of the 113th Congress).

TABLE 2: Recent Congressional Carbon Tax Proposals

POLICY DESIGN	REP. INGLIS'S RAISE WAGES, CUT CARBON ACT OF 2009	REP. STARK AND LARSON'S SAVE OUR CLIMATE ACT OF 2011	REP. MCDERMOTT'S MANAGED CARBON PRICE ACT OF 2012	SENS. SANDERS AND BOXER'S CLIMATE PROTECTION ACT OF 2013
Start date	January 1, 2010	January 1, 2012	January 1, 2015	The earlier date of January 1, 2014, or the first calendar year beginning at least 180 days after enactment
Regulating Authority	Treasury	Treasury	Treasury	Environmental Protection Agency (EPA)
Point of Taxation (i.e, covered person)	Any taxable carbon substance sold by the manufacturer, producer, or importer of the substance.	Any taxable carbon substance sold by the manufacturer, producer, or importer of the substance.	Any taxable carbon substance sold by the manufacturer, producer, or importer of the substance.	Any taxable carbon substance sold by the manufacturer, producer, or importer of the substance.
Substances Covered Under a Carbon Tax Coverage	Combustible fossil fuels- defined as coal, petroleum and petroleum products, natural gas.	Taxable fuels defined as primary fossil fuels- defined as coal, petroleum and petroleum products, natural gas, qualified biomass determined to be sold for energy production. Fuel for the Strategic Petroleum Reserve is exempted.	Coal, petroleum, natural gas, methane, nitrous oxide, sulfur hexafluoride, perflourocarbon, hydroclurocarbon, and other substances determined by EPA to contribute to global warming.	Carbon polluting substance defined as: coal, petroleum and any petroleum product or natural gas that when used, will release greenhouse gas emissions.

POLICY DESIGN	REP. INGLIS'S RAISE WAGES, CUT CARBON ACT OF 2009	REP. STARK AND LARSON'S SAVE OUR CLIMATE ACT OF 2011	REP. MCDERMOTT'S MANAGED CARBON PRICE ACT OF 2012	SENS. SANDERS AND BOXER'S CLIMATE PROTECTION ACT OF 2013
Emission Targets and Timetables	N/A	Establishes a target of reducing U.S. carbon dioxide emissions 80% below 1990 levels by 2050.	Establishes a tax rate based on meeting the emission target for a given period: Year – Average Target 2025-2029 – 30% below 1990 levels. 2035-2039 – 50% below 1990 levels. 2045-2049 – 70% below 1990 levels. 2055-2059 – 80% below 1990 levels	Bill expresses the sense of Congress that the United States carry out activities to reduce emissions by at least 80% below 2005 levels by 2050.
Rate of Taxation	Tax imposed on full carbon content (including fractional amount)	Tax imposed on full carbon content (including fractional amount) The tax rate would start at $10 per short ton of carbon dioxide and increase by $10 per ton every year until targets are reached.	Tax imposed on the quantity of GHG emission substance (in one-quarter CO_2 eqiuvalent amount) By 2014, the Secretary of Treasury, in conjunction with the EPA Administrator and Secretary of Energy, must publish a carbon tax schedule based on dollar amount necessary to meet the emission targets for each of the 5-years from 2015-2019. After 2018, the Secretary must publish a carbon tax at least five years ahead.	Tax imposed on full carbon content (including fractional amount) The tax would start at $20 per ton of carbon dioxide content (including carbon dioxide equivalent content of methane) of a carbon polluting substance. In subsequent years, the tax is a product of 1.056 multiplied by the previous year (rounded to the nearest dollar).

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<tr><th>POLICY DESIGN</th><th>REP. INGLIS'S RAISE WAGES, CUT CARBON ACT OF 2009</th><th>REP. STARK AND LARSON'S SAVE OUR CLIMATE ACT OF 2011</th><th>REP. MCDERMOTT'S MANAGED CARBON PRICE ACT OF 2012</th><th>SENS. SANDERS AND BOXER'S CLIMATE PROTECTION ACT OF 2013</th></tr>
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<td>Rate of Taxation (continued)</td>
<td>The carbon tax schedule (price per ton)
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<tr><th>Calendar year</th><th>Applicable amount</th></tr>
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<td>If the Secretary determined that national GHG emissions are being met ahead of schedule and a reduced tax reduced rate will still meet the emission target for the year, the tax rate could be lowered for that year.

If the Secretary determined that national GHG emissions are not being met for a year in such a period, the tax rate could be raised at least two years after the determination.</td>
<td><table>
<tr><th>Year</th><th>Applicable Amount</th></tr>
<tr><td>1</td><td>$20</td></tr>
<tr><td>2</td><td>$21</td></tr>
<tr><td>3</td><td>$22</td></tr>
<tr><td>4</td><td>$23</td></tr>
<tr><td>5</td><td>$24</td></tr>
<tr><td>6</td><td>$25</td></tr>
<tr><td>7</td><td>$26</td></tr>
<tr><td>8</td><td>$27</td></tr>
<tr><td>9</td><td>$29</td></tr>
<tr><td>10</td><td>$31</td></tr>
<tr><td>11</td><td>$33</td></tr>
<tr><td>12 or thereafter</td><td>$35</td></tr>
</table></td>
</tr>
</table>

<table>
<tr><th>POLICY DESIGN</th><th>REP. INGLIS'S RAISE WAGES, CUT CARBON ACT OF 2009</th><th>REP. STARK AND LARSON'S SAVE OUR CLIMATE ACT OF 2011</th><th>REP. MCDERMOTT'S MANAGED CARBON PRICE ACT OF 2012</th><th>SENS. SANDERS AND BOXER'S CLIMATE PROTECTION ACT OF 2013</th></tr>
<tr>
<td>Rate of Taxation (continued)</td>
<td><table>
<tr><td>Calendar year</td><td>Applicable amount</td></tr>
<tr><td>2026</td><td>$41.26</td></tr>
<tr><td>2027</td><td>$43.95</td></tr>
<tr><td>2028</td><td>$46.82</td></tr>
<tr><td>2029</td><td>$49.88</td></tr>
<tr><td>2030</td><td>$53.13</td></tr>
<tr><td>2031</td><td>$56.6</td></tr>
<tr><td>2032</td><td>$60.30</td></tr>
<tr><td>2033</td><td>$64.23</td></tr>
<tr><td>2034</td><td>$68.43</td></tr>
<tr><td>2035</td><td>$72.89</td></tr>
<tr><td>2036</td><td>$77.65</td></tr>
<tr><td>2037</td><td>$82.72</td></tr>
<tr><td>2038</td><td>$88.12</td></tr>
<tr><td>2039</td><td>$93.87</td></tr>
<tr><td>2040 or thereafter</td><td>$100.00</td></tr>
</table></td>
<td></td>
<td>The carbon tax rate (price per metric ton CO_2 equivalent) must be in the range for the calendar year:
<table>
<tr><td>Year</td><td>Range</td></tr>
<tr><td>2015</td><td>$6.25 - $18.75</td></tr>
<tr><td>2016</td><td>$18.75 - $31.25</td></tr>
<tr><td>2017</td><td>$31.25 - $43.75</td></tr>
<tr><td>2018</td><td>$43.75 - $56.25</td></tr>
<tr><td>2019</td><td>$56.25 - $68.75</td></tr>
<tr><td>2020</td><td>$68.75 - $82.25</td></tr>
<tr><td>2021</td><td>$81.25 - $93.75</td></tr>
<tr><td>2022</td><td>$93.75 - $106.25</td></tr>
<tr><td>2023</td><td>$106.25 - $118.75</td></tr>
<tr><td>2024</td><td>$118.75 - $131.25</td></tr>
</table>
Starting in 2021, and every 10 years thereafter, the Secretary of Energy should publish a 10-year minimum and maximum price schedule.

Adjusted for inflation.</td>
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POLICY DESIGN	REP. INGLIS'S RAISE WAGES, CUT CARBON ACT OF 2009	REP. STARK AND LARSON'S SAVE OUR CLIMATE ACT OF 2011	REP. MCDERMOTT'S MANAGED CARBON PRICE ACT OF 2012	SENS. SANDERS AND BOXER'S CLIMATE PROTECTION ACT OF 2013
Emission Allowance	N/A	N/A	A covered person must purchase an emission permit (pay a carbon tax) within 14 days after a covered substance is produced or imported. Emission permits are denominated in one-quarter carbon dioxide equivalents. Cannot be traded or sold.	N/A
Credits or Refunds	If a person uses a taxable carbon substance so that the carbon associated with the substance will not be emitted, then a credit or refund (without interest) for the calendar year would be issued.	Credit or refunds (without interest) will be allowed in two situations: a) if the taxable fuel is used by a manufacturer or producer of another taxable fuel (and that tax was paid for), and b) if the taxable fuel is used in the manufacture or production of non-taxable fuel, and in the process carbon is embedded or sequestered.	By determination, a refund (without interest) will be issued if the covered substance is used in such a way as to make a negligible or no contribution to climate change.	Not specified.
Energy Intensive, Trade Exposed (EITE)	Tax exempt.	Fuel export tax exempt. Exporter will be refunded (without interest) the tax, if they paid it. The Secretary of Energy will make "harmonization adjustments" (i.e., tax) on the importation of any product. If an importing country has a higher carbon price, then the difference would be refunded.	Equivalency fee imposed on imported carbon intensive goods. Reimbursement for permit equivalency fee paid on exports.	Equivalency fee imposed on fuels imported. This annual fee would be differentiated by classes of products and country of origin, taking into account the amount of greenhouse gas emissions released during the manufacture and transport of the carbon pollution-intensive good. This fee would expire when exporting countries adopt equivalent carbon tax measures, or the EPA Administrator deems it no longer appropriate.

POLICY DESIGN	REP. INGLIS'S RAISE WAGES, CUT CARBON ACT OF 2009	REP. STARK AND LARSON'S SAVE OUR CLIMATE ACT OF 2011	REP. MCDERMOTT'S MANAGED CARBON PRICE ACT OF 2012	SENS. SANDERS AND BOXER'S CLIMATE PROTECTION ACT OF 2013
Use of Revenue	Offset Social Security Taxes.	For deficit reduction. Any excess to pay consumer dividend through the establishment of a Healthy Climate Trust Fund	Three-quarters of the revenue will be used to facilitate economic and clean energy production through the establishment of a Climate Protection and Economic Security Trust Fund, which will issue a monthly dividend to each taxpayer. One-quarter of the revenues will be used for deficit reduction.	Equivalency fee would be evenly split between building/improving critical infrastructure and improving resiliency to climate change. 60% of the carbon tax revenues (not including the import fee) would be rebated to U.S. citizens and legal residents on a monthly basis. 40% of the carbon tax revenues will be allocated to a Pollution Reduction Trust. For the first ten years, this fund will allocate: $7.5 billion to mitigate impacts of the fee on energy intensive-trade exposed industries; $5 billion for weatherization for low income homes; $1 billion to clean energy job training; $2 billion for ARPA-E; and the balance would go towards deficit reduction.
Treatment of Existing State Programs	Not specified.	Not specified.	Not specified.	Not specified.

ENDNOTES

1 Parry, Ian, Rick van der Ploeg, and Roberton Williams. “How to Design a Carbon Tax,” in *Fiscal Policy to Mitigate Climate Change: A Guide to Policymakers*, eds. Ian Parry, Ruud A. Mooij, and Michael Keen. Washington, DC: International Monetary Fund, 2012.

2 Committee on Abrupt Climate Change, National Research Council. *Abrupt climate change: Inevitable surprises.* Washington, DC: National Academy Press, 2002.

3 Lenton, Timothy M., Hermann Held, Elmar Kriegler, Jim W. Hall, Wolfgang Lucht, Stefan Rahmstorf, and Hans Joachim Schellnhuber. “Tipping Elements in the Earth’s Climate System”. *Proceedings of the National Academy of Sciences of the United States of America*. 105 (6), 1768 (2008): 1786-1793.

4 National Research Council. *America’s Climate Choices: Panel on Advancing the Science of Climate Change*. Washington, DC: National Academies Press, 2010.

5 Morris, Adele. “The Many Benefits of a Carbon Tax” in 15 Ways to Rethink the Federal Budget, eds. Michael Greenstone, Max Harris, Karen Li, Adam Looney, and Jeremy Patashnik. The Hamilton Project. Washington, DC: The Brookings Institute, 2013.

6 For a summary of the literature on this issue, see Goulder, Lawrence. H. “Environmental Policy Making in a Second-Best Setting,” in Economics of the Environment: Selected Readings, 5th ed. Ed. Robert N. Stavins. New York: W. W. Norton, 2005.

7 Aldy, Joseph E., Eduardo Ley, and Ian W. H. Parry. *A Tax-Based Approach to Slowing Global Climate Change*. Discussion Paper 08-26. Washington, DC: Resources for the Future, 2008.

8 Parry, Ian and Roberton Williams III. *Moving US Climate Policy Forward: Are Carbon Taxes the Only Good Alternative?*. Discussion Paper 11-02. Washington, DC: Resources for the Future, 2011.

9 See Mathur, Aparna and Adele C. Morris. *Distributional Effects of a Carbon Tax in Broader U.S. Fiscal Reform*. Washington, DC: The Brookings Institution, 2012. and Dinan, Terry. *Offsetting a Carbon Tax’s Costs on Low-Income Households*. Working Paper 2012-16. Washington, DC: Congressional Budget Office, 2012.

10 Norwegian Ministry of the Environment. *Norway`s Fifth National Communication under the Framework Convention on Climate Change*.T-1482. Oslo: Norwegian Ministry of the Environment, 2010.

11 Aldy et al. 2008.

12 For a detailed analysis of why climate legislation failed in the Senate, see Lizza, Ryan, “Inside the Senate’s Battle Over Climate Change,” *The New Yorker*, October 11, 2010.

13 Jonathan Ramseur, Jane Leggett, and Molly Sherlock. *Carbon Tax: Deficit Reduction and Other Considerations*. CRS Report for Congress R42731. Washington, DC: Congressional Research Service, 2012.

14 Chetty, Raj, Adam Looney, and Kory Kroft. *Salience and Taxation: Theory and Evidence*. Cambridge, MA: National Bureau of Economic Research, 2007.

15 Interagency Working Group on Social Cost of Carbon, & Council of Economic Advisers. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. Washington, DC: Interagency Working Group on Social Cost of Carbon; United States Government, 2010.

16 Tol, Richard. “The Social Cost of Carbon: Trends, Outliers and Catastrophes.” *Economics: The Open-Access, Open-Assessment EJournal*. Vol. 2, 2008-25, Aug. 12, 2008.

17 For an analysis of cost savings possible from inclusion of all GHGs relative to CO_2, see Metcalf, Gilbert E., Sergey Paltsev, John M. Reilly, Henry D. Jacoby, and Jennifer Holak. *Analysis of U.S. Greenhouse Gas Tax Proposals*. MIT Joint Program on the Science and Policy of Global Change, Report No. 160. Cambridge, MA: Massachusetts Institute of Technology, 2008.

18 “The Government is following up on the Climate Agreement,” Norwegian Ministry of the Environment, last modified August 10, 2012. http://www.regjeringen.no/en/dep/md/press-centre/Press-releases/2012/the-government-is-following-up-on-the-cl.html?id=704137.

19 British Columbia, *Budget and Fiscal Plan 2012/13 – 2014/15*, Victoria, B.C: Ministry of Finance, 2012.

20 “Boulder’s Climate Action Plan,” City of Boulder, last modified November 1, 2012. http://www.bouldercolorado.gov/index.php?option=com_content&id=15356&Itemid=2150.

C2ES CENTER FOR CLIMATE AND ENERGY SOLUTIONS

The Center for Climate and Energy Solutions (C2ES) is an independent nonprofit organization working to promote practical, effective policies and actions to address the twin challenges of energy and climate change.

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