

Cities and Carbon-Emissions Pricing
A Report to the Summit Foundation

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Executive Summary

This project examined the potential use by cities in the United States of mechanisms for pricing carbon emissions. Worldwide there has been little municipal-level use of emissions taxation or trading schemes; pricing has occurred almost exclusively at “higher” levels of government: national, multi-national, state/provincial, or multi-state/provincial scales. Nonetheless, as more U.S. cities adopt ambitious long-term goals and strategies for deep reductions in carbon emissions, there is growing interest in understanding the feasibility and potential impact of city-based pricing and in how the design and implementation of pricing mechanisms at scales that encompass cities might impact cities’ carbon-reduction efforts.

The project’s research, interviews, and survey of 26 cities in the U.S. identified a set of Background Items, Findings, and Implications.

Background Items

Governments use four basic carbon-pricing mechanisms, often in combination with each other, at multi-national, national, state/province, and local scales:

- Taxes/fees on emissions or emitting behaviors
- Emissions trading schemes
- Regulations

A fourth mechanism that indirectly affects carbon-emissions pricing is government subsidies, financial and other incentives, for no- or low-carbon fuels, technologies, and behaviors. This method is widely pursued by cities; for example, they may subsidize the purchase of electric vehicles or the conversion of building heating systems from gas to electric power. This report, however, focuses only on taxation and emissions trading schemes, which directly put a price on carbon emissions or carbon-emitting behaviors.)

These mechanisms may be used in pursuit of quite different goals:

- To reduce emissions by affecting behavior and investment
- To generate revenue for the government, which then can be used to fund a variety of purposes including to fund carbon-emissions reduction efforts, offset carbon pricing’s impacts on targeted families and businesses, reduce other taxes, and/or cover the cost of government’s regulatory activities focused on carbon reduction
- To pilot pricing models for other levels of government

A number of design elements and choices are involved in developing and implementing taxation and trading schemes, most prominently:

- How the price will be set—by government mandate, by a market—and what the price will be
- Which emissions sources and emitting entities will be affected
- What will happen with revenue collected through the pricing mechanism

Although some U.S. cities have committed themselves to reducing carbon emissions and some are implementing ambitious plans, cities’ decisions about pricing carbon emissions are made in a broader and

dynamic context that continues to evolve. For instance, nation-states will be gathering in Paris in December 2015 as the next step in negotiations over their commitments to carbon-emissions reduction. Recently, the G7 nation leaders supported a worldwide reduction in emissions at the top end of a 40-70 percent range by 2050, committing to “play our part in achieving a low-carbon economy in the long-term, including ... a restructuring of the energy sector by 2050.” At about the same time, the CEOs of major oil companies, including Shell, BP, Total, Statoil, Eni and the BG Group, asked, in a publicly released letter to Christiana Figueres, the United Nations climate chief, for national and regional governments to set a price on carbon. Meanwhile, some large organizations, including Microsoft and Yale University, have begun to establish an internal price on carbon emissions for their operations.

For U.S. cities, this context can be confusing, especially when added to seemingly interminable conflict within the federal government over national pricing policies and the emergence of state- and regional emissions trading schemes.

Findings

1. **Only a very small number of cities worldwide have attempted to price carbon emissions using either a tax or emissions trading scheme—and these have been driven by different purposes and different designs.** There are at least four reasons for the low amount of municipal activity in carbon-emissions pricing, and these pose barriers to expanding the use of local pricing mechanisms:
 - Some cities lack legal authority to enact a pricing mechanism.
 - Pricing of emissions by a higher level of government appears to reduce the need for local pricing.
 - Cities can use other, potentially less politically contentious approaches, such as subsidies or campaigns for voluntary behavior change, to achieve some degree of short-to-intermediate reductions in local carbon emissions.
 - There are important challenges and uncertainties involved in designing effective *local* pricing mechanisms for carbon emissions. A majority of the 26 U.S. cities surveyed reported uncertainty, lack of knowledge, or disagreements among local government decision makers about the feasibility and effectiveness of local carbon-pricing mechanisms.
2. **Only a few U.S. cities have actively explored or are exploring the potential of enacting carbon-pricing mechanisms, but there is a strong correlation between a city having already adopted a long-term goal for deep carbon-emissions reduction (e.g., 80 percent reduction by 2050) and having an interest in local pricing mechanisms.** Each of the 11 cities that have considered using local carbon pricing has also adopted a goal of long-term deep carbon reduction—a strong correlation between bold ambition and a search for relevant strategies.
3. **Cities appear to have substantial uncertainty and little knowledge about how the potential implementation of pricing mechanisms at other levels of government in the U.S. might affect their own efforts to reduce carbon emissions.** A leading example of such a potential impact is the federal Environmental Protection Agency’s (EPA) proposed rule 111(d) to reduce carbon emissions by existing fossil-fuel plants in each state. States have many options for designing plans to submit to the EPA, including the use of pricing mechanisms. These may impact utilities and communities differently in terms of which energy-generating assets, including municipally

owned plants, are affected, if and where investment in renewable energy occurs, and how prices/affordability for consumers will change.

Implications

Local carbon pricing for the purpose of emissions reduction is not a well-proven and readily scalable practice. Given the dearth of design and implementation of local carbon-pricing mechanisms and the significant barriers to adopting them, there is little potential *in the short term* for U.S. cities to achieve significant reductions in carbon emissions by implementing local carbon-pricing mechanisms. Nor is it likely that the number of cities actually implementing local pricing will grow large enough in the same time frame to strongly influence the prospect for national adoption of carbon-emissions pricing policy.

However, U.S. cities have compelling interests in understanding more about the design and implementation of carbon-pricing mechanisms:

- Cities that have committed themselves to deep, *long-term* carbon reduction may want to use *local* pricing mechanisms as a part of strategies to achieve the transformation of targeted emissions sectors.
- Cities may want to use pricing mechanisms to generate local revenue to support carbon-reduction strategies or other goals.
- As cities aggressively pursue carbon reduction, they are likely to conclude that the establishment of carbon-pricing mechanisms at national and/or state/regional levels will be necessary to complement local strategies and achieve deep reductions.
- Finally, as policy developments occur at state, national, and international scales, more and more cities are likely to recognize that the particular design of higher-level pricing mechanisms may affect their own ability to achieve reduction targets.

Accordingly, an initiative focused on increasing U.S. city interest, understanding, and capacity around carbon-emissions pricing at various levels of government might incorporate three elements:

1. **Investment in strategies to increase the number of U.S. cities that have adopted deep, long-term reduction goals.** For cities, as well as other levels of government, it appears that an important, perhaps indispensable, “gateway” to considering carbon-emissions pricing is the adoption of deep, long-term reduction goals. At this time, only several score U.S. cities have made such commitments. A 2015 survey of the 130 members of the Urban Sustainability Directors Network (USDN) identified 35 U.S. urban jurisdictions¹ that have adopted long-term reduction goals.

What will it take to get more cities to commit to transformative goals? Momentum in this direction could be strengthened and accelerated. Eight of the committed USDN cities are also members of the Carbon Neutral Cities Alliance, an international and expanding network of 17 cities that has been developing an extensive framework and checklist for deep, long-term reduction planning for use by other cities, based on practices of leading-edge Alliance cities.² The Alliance is also planning a workshop in fall 2015 for “next wave” cities. At the same time, other city-focused organizations, such as C40, ICLEI, and the Institute for Sustainable Communities, have provided various types of

¹ Several of the respondents to the USDN survey were urban counties.

² The Alliance framework and checklist are being drafted by the Innovation Network for Communities.

support—e.g., technical assistance, peer networks, leadership academies—to cities seeking deep cuts in carbon emissions.

An effort to get more U.S. cities to “pass through the gateway” could involve providing them with an integrated suite of tools, such as the Alliance framework and more, to get started with confidence on the long-term road, and to have committed city leaders engage with uncommitted cities’ decision makers—elected officials and top city management—to expand the national community of local climate-action leadership.

- 2. Investment in research, dissemination, education, and support to ensure that city leaders have the knowledge, tools, and technical assistance they need to understand and advocate for the adoption and design of carbon-pricing mechanisms at any level of government.** Cities need to be able to assess the potential impacts of different carbon-pricing mechanisms and their designs, as well as the ways that mechanisms enacted at different levels might interact with each other. Although a number of books and reports describe and analyze pricing mechanisms, most advocate one choice over another and none is tailored to the interests and questions a city might have. Information is plentiful, but guidance is not. This sort of knowledge and support could be generalized and provided to a wide range of cities, rather than having each city find its own way.

One way to ensure that the research is not just an academic exercise is to use EPA’s proposed rule 111(d) as a “teachable moment” for cities.

- 3. Investment in strengthening the “voice of the cities” in the U.S. for carbon reduction.** A number of organizations and funders are working to elevate cities as visible, influential players in the nation-state global negotiations over reducing carbon emissions. For instance, the U.S. State Department and Bloomberg Philanthropies are internationally highlighting the efforts of leading-edge U.S. cities. Although these efforts focus mostly on an upcoming event, the Paris Conference of Parties (COP) in December 2015, they also recognize the need to sustain and expand this work with cities. In the U.S., as more cities adopt deep reduction goals and recognize their interests in the adoption and design of state- and federal-level pricing policies, there is the potential to develop an extensive “community of practice” of cities—a focused and sustainable infrastructure—that aligns around ideas, research, and policy development and advocacy for pricing mechanisms at different levels of government.

Project Purpose & Processes

This project was undertaken to inform the Summit Foundation about if and how U.S. cities are thinking about/acting on the possibility of enacting municipal-level carbon pricing, either taxation or emissions trading schemes, and to provide interested cities with information, analysis, and examples that examine the feasibility, experiences, and design of municipal-level carbon pricing.

The project team consisted of:

- [Innovation Network for Communities](#): John Cleveland and Peter Plastrik
- [Meister Consulting Group](#): Andy Belden and Jon Crowe
- [Sutherland & Associates](#): Susanna Sutherland

The project team's activities included:

- A literature review of carbon pricing mechanisms at all levels of government. This included instances of municipal-level pricing in North America and (based on World Bank 2014 report) in Australia, China, Japan, and South America. The Advanced Energy Economy's online "Powersuite Billboard Legislation" database of U.S. state legislation was also assessed.
- A survey of 29 city-members of the Urban Sustainability Directors Network (USDN), 26 of them in the U.S., three in Canada. A summary of survey results can be found in Appendix A.
- A review of findings and implications with staff at [Resources for the Future](#), at the Summit Foundation's request.
- A draft Executive Summary of this report, shared with the Summit Foundation for review and feedback.
- A final report to the Summit Foundation. The Foundation will decide what, if any, further distribution the report should have.

Background

Since the early 1990s governments worldwide have considered, and in many cases enacted, mechanisms for pricing carbon emissions. Three basic pricing mechanisms are in use, often in combination with each other.

- **Taxation.** The government levies and collects a specified tax or fee on specified carbon-emissions amounts³ from specified sources, and/or on specified carbon-emitting behaviors (rather than on emissions amounts). An example of targeting behaviors is levying a “congestion tax” on driving gas-powered vehicles in certain places.
- **Emissions Trading Scheme (ETS).** The government creates a market in which it places a cap on total carbon emissions that declines over time. It provides each specified emitter with an allowance or permit to emit its “share” of carbon, and establish rules and administrative capacity to allow emitters to sell allowances to each other.
- **Regulation.** The government mandates reduced levels of carbon emissions by specific emitters. This forces them to meet stated reductions by investing in and implementing reduction technologies and other measures.

A fourth mechanism that indirectly affects carbon-emissions pricing is government subsidies, financial and other incentives, for no- or low-carbon fuels, technologies, and behaviors. This method is widely pursued by cities; for example, they may subsidize the purchase of electric vehicles or the conversion of building heating systems from gas to electric power. This report, however, focuses only on taxation and emissions trading schemes, which directly put a price on carbon emissions or carbon-emitting behaviors.

Nearly all government enactment of carbon-pricing mechanisms has occurred at the national, multi-national, and state/provincial levels of government, but there are a few examples of city-initiated carbon taxes or emissions trading schemes in the U.S., Europe, and Asia. The cities have variously pursued the following goals:

- **Carbon-Emissions Reduction.** The city’s tax or ETS increases the cost of emitting carbon, presumably to a price that makes it much more attractive to invest in production and purchase of alternative fuels, adopt low-carbon emitting behaviors, or reduce use of energy. This could target any emissions or particular emissions sectors/sources, such as electricity, commercial buildings, or vehicles. Or, it can target emissions-causing behaviors, but not the actual emissions.
- **Revenue Generation.** The city’s tax or ETS raises revenue for a variety of purposes. It can fund carbon-emissions reduction efforts, offset carbon pricing’s impacts on targeted families and businesses, reduce other taxes, and/or cover the cost of government’s regulatory activities focused on carbon reduction.
- **Pricing Pilots In Advance of Pricing By a Higher Level of Government.** The city’s tax or ETS serves as a prototype test for a national pricing mechanism. In China, for instance, seven cities have designed and are implementing emissions trading schemes as a forerunner to a national trading scheme.

³ Emissions amounts are not actual emissions, but are estimated emissions based on measured emissions for each type of fossil fuel.

A great deal has been written about the differences, similarities, and comparative pros and cons of the two direct pricing mechanisms, taxation and emissions trading schemes. Nonetheless, both approaches have similar elements of design and choices that must be made:

- **Emissions Pricing.** Government taxation sets a definite price for actual emissions or emitting behaviors, while an emissions trading scheme establishes a market price on emissions that varies due to transactions among emitters. The market model combines a high potential for price volatility with a firm emissions-reduction target, while taxation tightly controls the price but leaves uncertain the amount of emissions reduction that will be achieved.
- **Emissions Sources and Entities.** The government must decide which emissions sources and entities will be covered by the tax or trading scheme, and at what point in the “emissions stream” pricing will be applied.
- **Disposition of Proceeds.** The government must decide what will happen to revenue it collects through a pricing mechanism. Will it be spent on government programs (e.g., for energy efficiency), distributed to households and businesses to address inequitable burdens created by the increased cost, used to reduce other taxes? Will it be a combination of these and other possibilities?

Finally, cities’ decisions about putting a price on carbon are made in a broader and dynamic context. For instance, nation-states will be gathering in Paris in December as the next step in negotiations over their commitments to carbon-emissions reduction. Recently, the G7 nation leaders supported a worldwide reduction in emissions at the top end of a 40-70 percent range by 2050, committing to “play our part in achieving a low-carbon economy in the long-term, including ... a restructuring of the energy sector by 2050.”⁴ At about the same time, the CEOs of major oil companies (Shell, BP, Total, Statoil, Eni and the BG Group) asked, in a publicly released letter to Christiana Figueres, the United Nations climate chief, for national and regional governments to set a price on carbon:

“Our companies are already exposed to a price on carbon emissions by participating in existing carbon markets and applying ‘shadow’ carbon prices in our own businesses to test whether investments will be viable in a world where carbon has a higher price. Yet, whatever we do to implement carbon pricing ourselves will not be sufficient or commercially sustainable unless national governments introduce carbon pricing even-handedly and eventually enable global linkage between national systems.”⁵

Meanwhile, some large organizations, including Microsoft⁶ and Yale University⁷, have begun to establish an internal price on carbon emissions for their operations.

⁴ Reuters, [“G7 Leaders Vow to Wean Their Economies Off Carbon Fuels.”](#) June 8, 2015.

⁵ Brian Kahn, “In Stunning Reversal, ‘Big Oil’ Asks for Carbon Price,” Climate Central, June 1, 2015, <http://www.climatecentral.org/news/oil-companies-carbon-price-19054>.

⁶ Advanced Energy Economy, [“Not Taking ‘No’ For An Answer: How Microsoft and Walmart Overcame Barriers and Got the Renewable Energy They Wanted.”](#) webinar.

⁷ Yale President Peter Salovey, “Report of the Presidential Carbon Charge Task Force,” April 20, 2015 e-mail to faculty, students, and staff.

For U.S. cities, this context can be confusing, especially when added to interminable conflict within the federal government over national pricing policies and the emergence of state- and regional emissions trading schemes.

Findings

- 1) Only a very small number of cities worldwide have attempted to price carbon emissions using either with a tax or emissions trading scheme—and these have been driven by different purposes and different designs.
- 2) Only a few U.S. cities have actively explored or are exploring the potential of enacting carbon-pricing mechanisms, but there is a strong correlation between a city having already adopted a long-term goal for deep carbon-emissions reduction (e.g., 80 percent reduction by 2050) and having an interest in local pricing mechanisms.
- 3) Cities appear to have substantial uncertainty and little knowledge about how the potential implementation of pricing mechanisms at other levels of government in the U.S. might affect their own efforts to reduce carbon emissions.

1) Only a very small number of cities worldwide have attempted to price carbon emissions using either a tax or emissions trading scheme—and these have been driven by different purposes and different designs.

The examples of local carbon-emissions pricing include:

Location	Pricing Mechanism	Year Enacted
U.S. Jurisdictions:		
Boulder, Colorado	Local tax on electricity consumption (an emitting behavior)	2006, renewed in 2012
Montgomery County, Maryland	Excise tax on stationary emitters producing more than 1 million tons of carbon dioxide a year (1 coal-fired plant in the county). Fee of \$5 per ton emitted; revenue to be used to fund energy efficiency programs	2010, repealed in 2012
San Francisco, California (Bay Area Air Quality Management District – 9 counties)	To recover costs of regulating stationary sources, a carbon fee for emissions from 500 facilities permitted by BAAQMD (fee: 4.4 cents per metric ton)	2008
3 Japanese Cities:		
Kyoto, Saitama, Tokyo	Tokyo: Cap & Trade for 1,400 large commercial and industrial buildings (covers 20% of emissions in the city)	2010
7 Chinese Cities:		
Beijing, Chong-Qing, Guangdong, Hubei, Shanghai, Shenzhen, Tianjin	Variouly designed emissions trading schemes, piloting development of a national program (under China’s 12 th Five-Year Plan)	2013

(Details about each of these examples can be found in Appendices B and C.)

In addition, a number of cities have levied a price on certain carbon-emitting behaviors, such as driving a gas-powered vehicle, but not on actual emissions that occur. For example, a “congestion tax” on vehicles, such as those implemented in London, Stockholm, and other cities, levies a fee or charge (e.g., per vehicle per day or between specified hours of the day) on carbon-emitting vehicles driving on certain roads or in certain designated districts, while waiving or reducing the fee for no- or low-carbon-

emitting vehicles.⁸ It is a tax on the behavior that results in carbon emissions, not on the emissions produced.

There are at least four reasons for the low amount of municipal activity/interest in carbon-emissions pricing in the U.S. and elsewhere, and these pose significant barriers to expanding the use of local pricing mechanisms:

- **Lack of Legal Authority.** Lack of legal authority to enact a pricing mechanism; some U.S. cities would need permission from state government.
 - In states with “home rule,” cities may have such authority. According to a 2004 analysis, 11 of the 50 U.S. states did not have home rule for cities and eight states had “limited” home rule.
 - Some cities have authority to *propose* a tax, but it would be subject to approval by local voters or would be subject to certain state-level restrictions on tax increases.
 - In some states, cities have broad authority to levy a local tax, but there are specific restrictions that could apply to targets for a carbon-emissions tax. One survey respondent noted:

“At a general level, we do have broad taxing authority. However, there are some specific state restrictions around taxing natural gas, for example, that complicate how a carbon pricing mechanism would be implemented. It’s possible that the actual mechanism would look more like a franchise fee that is adjusted on the basis of the carbon content of energy delivered, rather than on the fuel (electricity, natural gas, etc.) itself.”

Another respondent described other complications:

“Doing it via sales tax (on fuels, for example) would require state approval and involve the PUC. Emissions tax would rely on self reporting. We think that would probably be a total mess. Air emissions we have authority over through delegated authority (though this would require an ordinance).”

- **Pricing By a Higher Level of Government.** Existence of a carbon pricing mechanism at a “higher” level of government—state/province, regional (multi-state/province), national, or multi-national—that encompasses municipalities. By one estimate, when China establishes its national trading scheme, about 25% of *global* GHG emissions will have a price tag.
 - **Europe:** The European Union Emissions Trading Scheme, launched in 2005, regulates about 45% of the EU’s GHG emissions. Eight European countries (Denmark, Finland, France, Iceland, Ireland, Norway, Sweden, and the United Kingdom) have implemented national carbon taxes, and a ninth—Switzerland—has an independent trading scheme and tax.
 - **Canada:** The province of British Columbia enacted a carbon tax, while provinces of Alberta and Quebec have carbon trading schemes or programs. Quebec and California have linked

⁸ Stockholm’s congestion tax exempted vehicles propelled entirely or partly by electricity or with a fuel mixture predominantly consisting of alcohol. [London’s Ultra Low Emission Discount](#) allows all-electric and some plug-in hybrid vehicles to have free access to the city’s congestion zone.

their markets (2014) as the Western Climate Initiative, and Manitoba and Ontario have considered joining this market.

- **United States:** Nine states formed the Regional Greenhouse Gas Initiative (Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New York, Rhode Island, and Vermont), an emissions trading scheme (New Jersey dropped out, Pennsylvania considering joining); California has a cap-and-trade program (covers 85% of emissions); Washington and Oregon are considering carbon-pricing mechanisms.

Of 22 U.S. cities that have publicly committed to deep carbon reductions (e.g., 80% reduction by 2050), 12 are located in an area covered by a state-level trading scheme or prospective scheme/tax. The uncovered cities concentrate in the Midwest and South. (Also, 23 of the 29 respondents to the USDN survey said their state/province had already adopted renewable energy portfolio standards.)

Cities Covered	Cities Not Covered
Berkeley, CA	Ann Arbor, MI
Boston, MA	Aspen, CO
Burlington, VT	Atlanta, GA
Cambridge, MA	Austin, TX
Issaquah, WA	Boulder, CO
New York, NY	Chicago, IL
Portland, OR	Cleveland, OH
Sacramento, CA	Ft Collins, CO
San Diego, CA	Madison, WI
San Francisco, CA	Minneapolis, MN
San Jose, CA	Washington, DC
Santa Monica, CA	
Seattle, WA	

- **Alternative Approaches.** Use of other, less potentially politically contentious approaches to local carbon reduction, including:
 - Use of financial incentives/subsidies for voluntary implementation of low-carbon systems and behaviors (e.g., loans/grants for energy efficiency improvements in buildings).
 - Investments in infrastructure that enable low-carbon consumption (e.g., citywide bike-path networks; purchasing electric vehicles for municipal fleet).
 - Use of marketing campaigns to change targeted behaviors of individuals (e.g., promoting recycling, walking).
- **Design Challenges.** Like pricing mechanisms at state and national levels, cities face challenges in designing an effective *local* pricing mechanism for carbon, most notably:
 - **Possibility of “Geographic Leakage.”** When a city prices carbon but neighboring communities don’t, it is possible that activities that are taxed will shift—leak—into the uncovered areas. For instance, drivers may choose to purchase cheaper gasoline outside of the city or businesses—particularly energy-intensive manufacturers—may choose to locate outside of the city. As a result, *overall* carbon emissions would not be reduced; however, emissions

produced within the city's geography (and the associated economic activity) would be affected. There are ways for cities to mitigate leakage: by providing businesses with financial support to increase their energy efficiency and thereby reduce the impact on them associated with the cost increases. They can also exempt certain businesses or sectors from a tax or emissions cap, but this reduces the emissions-reduction impact the pricing mechanism seeks to effect.

- Addressing Equity Issues. As a recent report on carbon taxation notes, "Broadly applied, a carbon tax could also be 'regressive,' with disproportionate effects on lower-income segments of the affected population."⁹ This is due to the fact that energy expenditures represent a higher proportion of income for low-income households as compared with higher-income households. Cities would have the option of returning collected revenue in the form of tax credits and other supports, targeting to affected populations.
- Pricing Difficulties. To influence emitting behaviors, the price set on carbon, whether by tax or trading market, has to be fairly high. According to a 2015 report by the National Association of Clean Air Agencies, "Modeling studies show that global carbon prices rising \$20 to \$80 per metric ton of carbon dioxide-equivalent are consistent with" GHG stabilization levels in the atmosphere set by scientists.¹⁰ Many of the existing pricing schemes have shied away from creating a sufficiently high price. For example the British Columbia carbon tax, the most comprehensive tax in North America, has been capped at \$30 per metric ton.

2) Only a few U.S. cities have actively explored or are exploring the potential of enacting carbon-pricing mechanisms, but there is a strong correlation between a city having already adopted a long-term goal for deep carbon-emissions reduction (e.g., 80 percent reduction by 2050) and having an interest in local pricing mechanisms.

- **Eleven Cities.** In a May 2015 survey of 29 cities' sustainability directors (including three from Canadian cities), nine cities reported they had "considered enacting city-based carbon emissions pricing." Seven of these cities reported they had "included a strategy for carbon pricing in the city's climate action plan."
 - The nine surveyed cities were Ann Arbor, Aspen, Berkeley, Boulder, Eugene, New York City, Palo Alto, Portland (OR), and Somerville (MA). Seven of these cities have included consideration of carbon pricing in their Climate Action Plan. For example, Portland's 2015 plan states that if the state of Oregon does not implement a carbon tax then the city/county should consider adoption of a pricing mechanism.
 - In addition, two other cities have been active in considering carbon pricing:
 - Boston, MA. An element in Boston's plan is the exploration of carbon taxes and fees. The plan does not recommend implementation of a carbon tax, but does recommend exploring its potential role in greenhouse gas reductions. Specific language includes: "Evaluate the potential for a municipal or regional carbon tax or fee" and "Work with the Commonwealth and other government bodies and stakeholders to explore a citywide or regional carbon tax."

⁹ National Association of Clean Air Agencies, "[Implementing EPA's Clean Power Plan: A Menu of Options.](#)" p. 25-6.

¹⁰ Ibid., p. 25-1.

- Washington, D.C. In 2015 the city’s Green Building Fund commissioned a project for research and analysis of “innovating funding mechanisms that will increase public and private investment to offset first costs for deep green building design and construction approaching net-zero energy use... This includes the establishment of a District of Columbia green bank, revenue neutral carbon pricing and financial or development incentives.”
- **Correlation to Deep Reduction Goals.** Every one of the 11 cities above that has considered using local carbon pricing also has adopted a goal of long-term deep carbon reduction—a strong correlation between bold ambition and a search for relevant strategies.

City	Carbon Emissions Reduction Goal	Baseline Year
Ann Arbor, MI	90% Reduction by 2050	2010
Aspen, CO	80% Reduction by 2050	2004
Berkeley, CA	80% Reduction by 2050	2000
Boulder, CO	80% Reduction by 2050	2005
Eugene, OR	75% Reduction by 2050	1990
New York, NY	80% Reduction by 2050	2005
Palo Alto, CA	Currently revising plans to meet new CA guidelines, considering three options: 1. An 80% reduction by 2050 (CA State Standard); 2. An 80% reduction by 2030; 3. 100% Carbon Neutral by 2025 (named “California Moonshot”)	1990
Portland, OR	80% Reduction by 2050	1990
Somerville, MA	100% Reduction by 2050	None listed
Boston, MA	80% Reduction by 2050	2005
Washington, D.C.	80% Reduction by 2050	2006

- **Targeting Emissions Sectors.** For cities seeking deep, long-term reductions, a pricing strategy may be used to reduce emissions in a targeted emissions sector, such as buildings or transportation, rather than as a broad strategy for reducing emissions across sectors. As noted earlier, Tokyo has been using a trading market to price carbon emissions for commercial buildings, while London and Stockholm, among others have used congestion fees to put a price on a carbon-emitting behavior. Washington D.C. is conducting research to examine the potential impact in the buildings sector of a revenue-neutral carbon tax in combination with financing and incentives for investing in deep reduction.

3) Cities appear to have substantial uncertainty and little knowledge about how the potential implementation of pricing mechanisms at other levels of government in the U.S. might affect their own efforts to reduce carbon emissions.

- **Gaps in Understanding/Agreement.** A majority or near-majority of the 29 surveyed cities reported uncertainty, lack of knowledge, or disagreements among local government decision makers (city/county elected officials, top management in city/county government) about the feasibility and effectiveness of local carbon pricing mechanisms. For instance:

- **Legal Authority.** Eleven respondents did not know if their city had the legal authority to establish a carbon tax or emissions trading scheme, while eight reported their city would need the permission of state government.
- **Disagreement and Uncertainty.** Asked the characterize the views of decision makers on a number of statements, most respondents who knew enough about what decision makers think to provide an answer reported that “some agree, some disagree” or that “most are uncertain/not knowledgeable about this.”

Statement	% of Respondents Who Said Decision Makers Are Uncertain, Not Knowledgeable, or “Some Agree, Some Disagree”
<i>Given the absence of national policies for pricing, cities should set prices on carbon emissions</i>	62%
<i>City-based carbon emissions pricing is likely to result in some businesses locating in/moving to another community to avoid the increased costs</i>	58%
<i>Setting a city-based price is unnecessary because state has or will soon establish a pricing mechanism</i>	44%
<i>A city-based pricing mechanism won't be effective enough in achieving carbon reductions; state/national pricing and/or regulations are needed</i>	44%
<i>The city should consider adopting a pricing mechanism so it can generate revenue to use for energy efficiency and other city program</i>	44%
<i>If the city did adopt a pricing mechanism, it should be "revenue neutral" because that would be more acceptable politically</i>	44%

- **EPA III(d).** A leading example of such a potential impact is the federal Environmental Protection Agency’s proposed rule III(d) to reduce carbon emissions by existing fossil-fuel plants in each state. States have many options for designing plans to submit to the EPA, including the use of pricing mechanisms. These may impact utilities and communities differently in terms of which energy-generating assets, including municipally owned plants, are affected, if and where investment in renewable energy occurs, and how prices/affordability for consumers will change.
- Majorities or near-majorities of the 26 surveyed U.S. cities’ sustainability directors indicated uncertainty or “I have not thought about this much” in response to each of the following questions:
 - State government would most likely establish or join a carbon emissions trading scheme, rather than enact a carbon tax.
 - State decisions are likely to jeopardize existing funding mechanisms through utilities that support energy efficiency programs.
 - State decisions could result in economic development outside of urban areas (e.g., development of solar and wind energy in rural areas).

- State decisions are likely to result in lower electricity prices over the long term.
 - State decisions could result in disproportionately higher energy prices for people living in cities--due to individual circumstances of the utility(ies) serving the city.
 - Cities may have to cope with loss of local property tax revenues and jobs due to retirement of local power plants that won't be replaced locally.
- **Other Drivers of Change.** Several other drivers of change are likely to affect cities' options and decisions when it comes to carbon-emissions reductions, and which cities should be able to assess, including:
 - On-going state-level efforts, independent of EPA 111(d), to adopt a tax or an emissions trading scheme (Massachusetts, Oregon, Vermont, and Washington are actively considering this).
 - The potential emergence of a federal/national pricing scheme linked to overall tax reform.
 - Prolonged and intensified turbulence in energy markets, driven by price volatility of fossil fuels, reduced cost of renewable energy, and increased investor and corporate concern about financial risks due to carbon.

Implications

Local carbon pricing for the purpose of emissions reduction is not a well-proven and readily scalable practice. Given the dearth of design and implementation of local carbon-pricing mechanisms and the significant barriers to adopting them, there is little potential *in the near term* for U.S. cities to achieve significant reductions in carbon emissions by implementing local carbon-pricing mechanisms. Nor is it likely that the number of cities actually implementing local pricing will grow large enough in the same time frame to strongly influence the prospect for national adoption of carbon-emissions pricing policy.

However, U.S. cities have compelling interests in understanding more about the design and implementation of carbon-pricing mechanisms:

- Cities that have committed themselves to deep, *long-term* carbon reduction (e.g., “80 x 50,” 100% renewable energy or fossil-fuel free) may want to use *local* pricing mechanisms as a part of strategies to achieve the transformation of targeted emissions sectors.
- Cities may want to use pricing mechanisms to generate local revenue to support carbon-reduction strategies or other goals.
- As cities aggressively pursue carbon reduction, they are likely to conclude that the establishment of carbon-pricing mechanisms at national and/or state/regional levels will be necessary to complement local strategies and achieve deep reductions.
- Finally, as policy developments occur at state, national, and international scales, more and more cities are likely to recognize that the particular design of higher-level pricing mechanisms may affect their own ability to achieve reduction targets. For instance, such policies could enhance or impede cities’ efforts to de-carbonize local energy supply, buildings, transportation, and waste systems; could enable or preclude cities from raising local revenues to fund their longer-term carbon-reduction efforts; or could impact city residents and businesses financially and in other ways that are disadvantageous and inequitable.

Accordingly, an initiative focused on increasing U.S. city interest in, understanding about, and capacity to embrace carbon-emissions pricing at various levels of government might incorporate three elements:

1) Investment in strategies to increase the number of U.S. cities that have adopted deep, long-term reduction goals. For cities, as well as other levels of government, it appears that an important, perhaps indispensable, “gateway” to considering carbon-emissions pricing is the adoption of deep, long-term reduction goals. At this time, only several score U.S. cities have made such commitments. A 2015 survey of the 130 members of the Urban Sustainability Directors Network (USDN) identified 35 U.S. urban jurisdictions¹¹ that have adopted long-term reduction goals.

What will it take to get more cities to commit to transformative goals? Momentum in this direction could be strengthened and accelerated. Eight of the committed USDN cities are also members of the Carbon Neutral Cities Alliance, an international and expanding network of 17 cities that has been developing an extensive framework and checklist for deep, long-term reduction planning for use by other cities, based on practices of leading-edge Alliance cities.¹² The Alliance is also planning a workshop in fall 2015 for “next wave” cities. At the same time, other city-focused organizations,

¹¹ Several of the respondents to the USDN survey were urban counties.

¹² The Alliance framework and checklist are being drafted by the Innovation Network for Communities.

such as C40, ICLEI, and the Institute for Sustainable Communities, have provided various types of support—e.g., technical assistance, peer networks, leadership academies—to cities seeking deep cuts in carbon emissions.

We're unaware of any research that analyzes the barriers to getting more cities to adopt deep, long-term reduction goals. Anecdotal reports suggest that an important impediment is concern about the technical, financial, and political feasibility of achieving such ambitious goals. But, as the Alliance's draft framework notes, making a city commitment like "80 x 50" depends more on aspirational leadership, a belief that cities must strive to do as much as they can to address climate change, rather than on assurances about precisely how the goal will be achieved.

In light of these conditions, an effort to get more U.S. cities to "pass through the gateway" could involve providing them with an integrated suite of tools, such as the Alliance framework and more, to get started with confidence on the long-term road, and to have committed city leaders engage with uncommitted cities' decision makers—elected officials and top city management—to expand the national community of local climate-action leadership.

- 2) **Investment in research, dissemination, education, and support to ensure that city leaders have the knowledge, tools, and technical assistance they need to understand and advocate for the adoption and design of carbon-pricing mechanisms at any level of government.** Cities need to be able to assess the potential impacts of different carbon-pricing mechanisms and their designs, as well as the ways that mechanisms enacted at different levels, might interact with each other. Although a number of books and reports describe and analyze pricing mechanisms, most advocate one choice over another, and none is tailored to the interests and questions a city might have. Information is plentiful, but guidance is not. This sort of knowledge and support could be generalized and provided to a wide range of cities, rather than having each city have to find its own way.

One way to ensure that the research is not just an academic exercise is to use EPA's proposed rule 111(d) as a "teachable moment" for cities. The rule would give state governments the first shot at developing a plan to reduce fossil-fuel emissions. (If states don't produce plans that the EPA finds acceptable, then the federal government will impose a plan.) An analysis by the National Association of Clean Air Agencies identified more than 20 different approaches that states might use, including variations of carbon-emissions pricing. Most cities don't have the expertise and tools to assess which state option would best enhance the city's own carbon-reduction efforts and not place excessive burdens on city residents and businesses. Research guided by cities could provide at least some of this general capacity and set the stage for more intensive assistance to cities that decide to press for their interests.

The question of how state or province level pricing mechanisms will affect cities' efforts was raised in Toronto by the CEO of Toronto Atmospheric Fund in a 2015 blog focused on the design of an emissions pricing mechanism for Ontario Province:

We've given some consideration to what tools will have the greatest ability to reduce urban GHG emissions and help Toronto achieve its carbon reductions targets. For example, a carbon tax approach would apply to 80-90 percent of urban GHG sources including emissions associated with transportation, space heating of buildings, and electricity use, not just those that come from large emitters.

On the other hand, a conventional cap & trade system for large-emitters would cover less than 10% of urban emissions; for example, in Toronto, there are only nine facilities which emit more than 25 thousand tonnes annually – the threshold cited by a previous provincial discussion paper...

Selecting the right flavour of carbon pricing for Ontario is a challenge, but one thing is clear: Ontario needs to ensure that its carbon pricing approach enables its cities to accelerate reduction of urban emissions sources. Without giving cities the tools to enable urban reductions, Ontario will not reach its overall carbon reduction targets, and that will leave a bad taste in our mouths.¹³

- 3) Investment in strengthening the “voice of the cities” in the U.S. for carbon reduction.** A number of organizations and funders are working to elevate cities as visible, influential players in the nation-state global negotiations over reducing carbon emissions. For instance, the U.S. State Department and Bloomberg Philanthropies are internationally highlighting the efforts of leading-edge U.S. cities. Although these efforts focus mostly on an upcoming event, the Paris COP in December 2015, they also recognize the need to sustain and expand this work with cities.

In the U.S., as more cities adopt deep reduction goals and recognize their interests in the adoption and design of state- and federal-level pricing policies, there is the potential to develop an extensive “community of practice” of cities—a focused and sustainable infrastructure—that aligns around ideas, research, and policy development and advocacy for pricing mechanisms at different levels of government.

¹³ Julia Langer, “The Many Different Flavours of Carbon Pricing,” Toronto Atmospheric Fund, March 4, 2015, <http://www.toatmosphericfund.ca/>.

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- From Main Page, Search Executive Regulation Carbon to see repeal of tax: <http://www.montgomerycountymd.gov/index.aspx>
- Montgomery County Climate Change Page (click Climate Protection Plan): <https://www.montgomerycountymd.gov/DEP/sustainability/climate-change.html>
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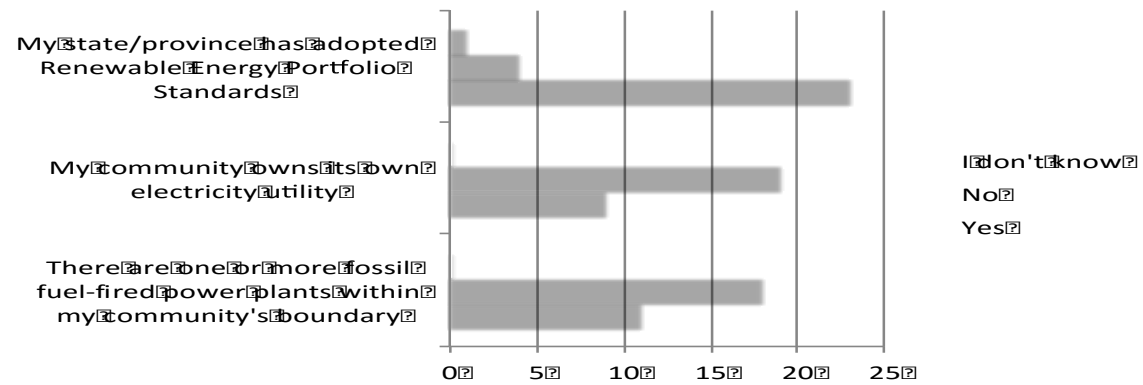
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USDN Survey Results: Local Carbon Pricing

May 2015
29 respondents
Prepared by Innovation Network for
Communities

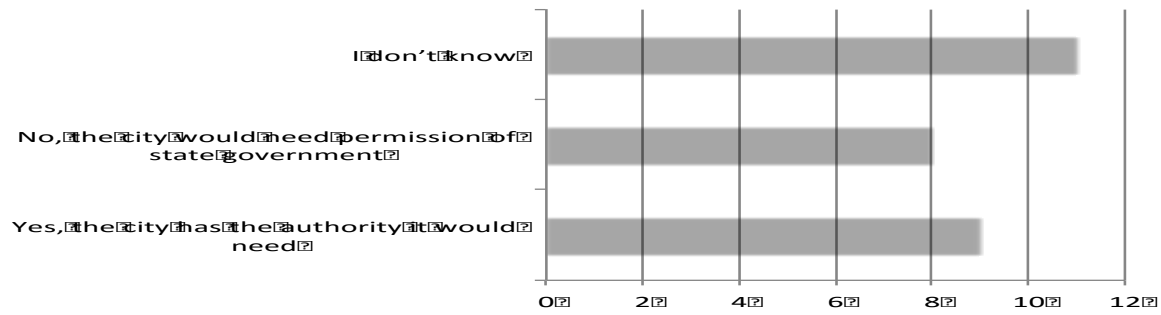
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City Energy Information



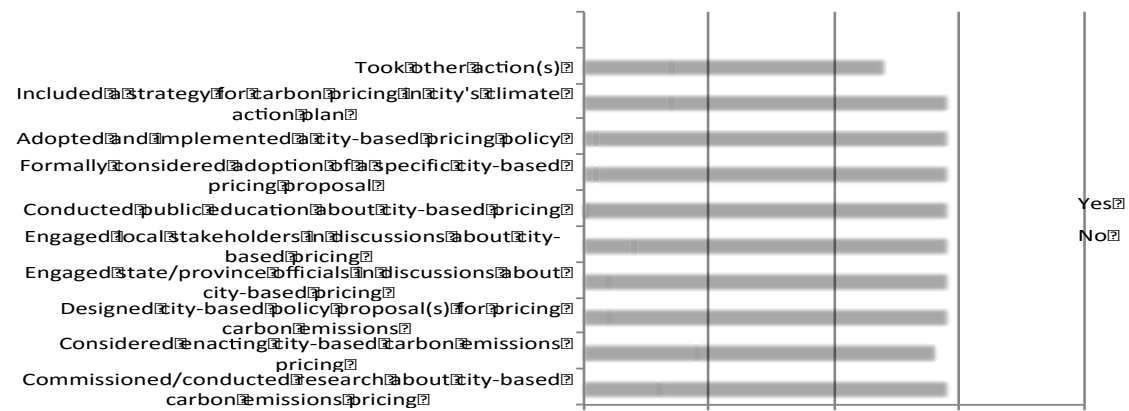
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If your city wanted to adopt a carbon pricing mechanism-- either a local tax on emissions or a cap-and-trade scheme, does it have the legal authority to do so?



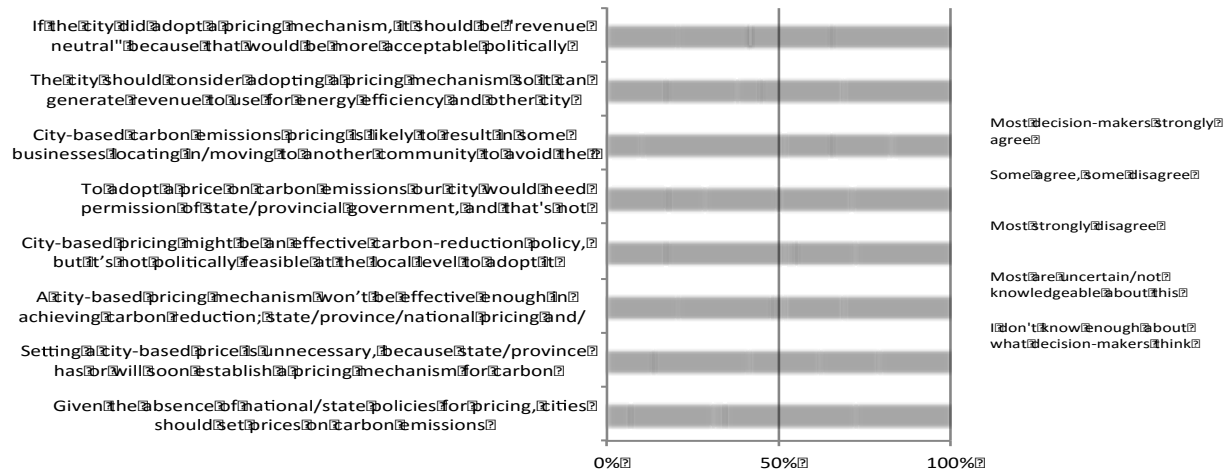
3

In the past 2-3 years, has your local government (council, mayor, and/or top executives) taken any of the following actions concerning putting a local (city-based) price on carbon emissions (e.g., a tax, fee, emissions-trading scheme)?



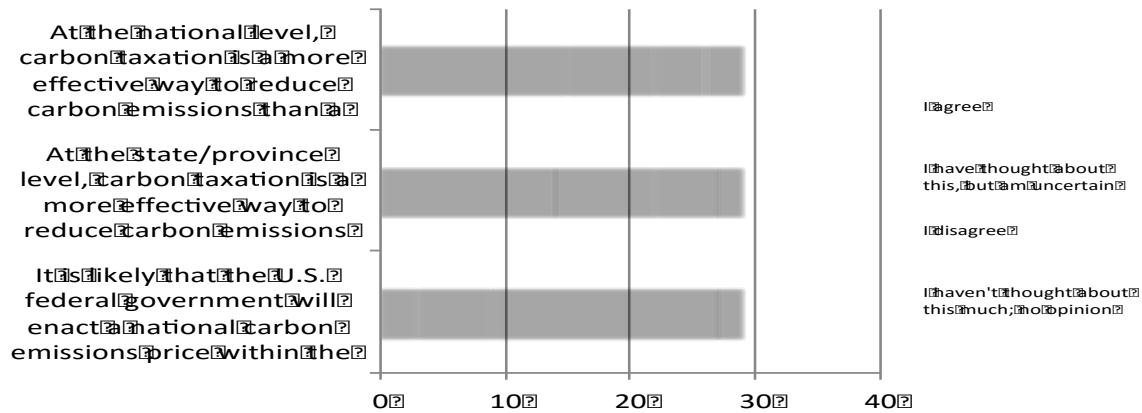
4

Choose the response below that best describes the composite point of view of PUBLIC DECISION-MAKERS IN YOUR COMMUNITY (city/county elected officials, top management in city/county government):



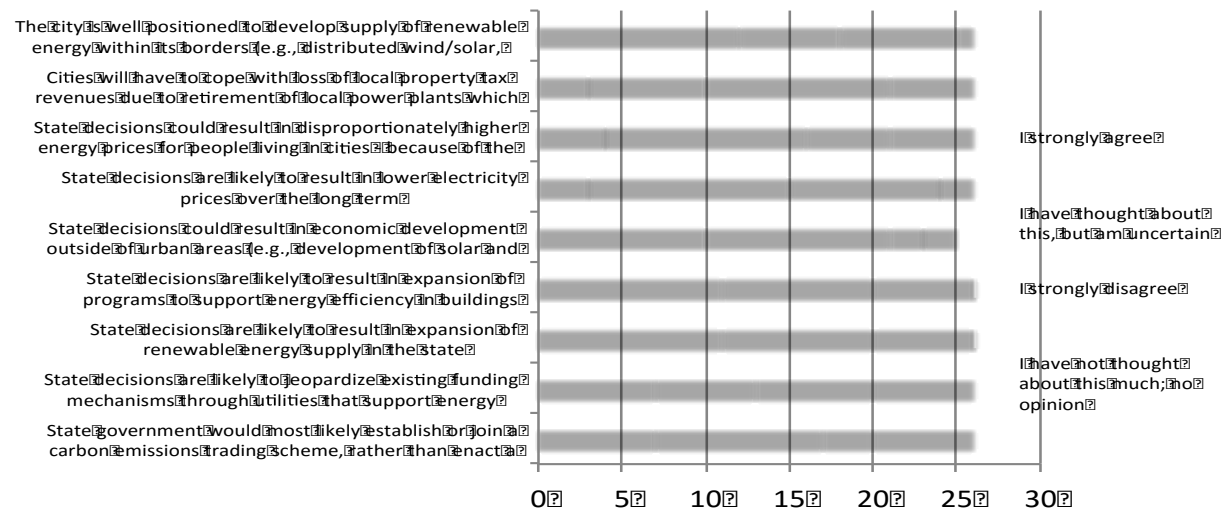
5

For each of the following statements about the potential for state/provincial and national carbon emissions pricing, describe YOUR point of view:



6

In light of the U.S. EPA's proposed regulations on fossil fuel-fired power plants (Clean Power Plan - rule 111(d)), please choose the responses below that best reflect YOUR point of view about what will happen if the rule is enacted.



Appendix B: International City Pricing Efforts - Details

China

In China's 12th Five-Year Plan, China committed to national carbon intensity reduction targets and the development of a national emissions trading program by 2015. As part of this effort, the National Development and Reform Commission (NDRC) designated seven provinces and major cities to develop mandatory ETS pilots. All seven pilots had begun to trade by 2014. More pilots are expected to proceed in 2016-2020. Some inter-regional coordination efforts have already begun, but integration is difficult as each ETS has different nuances. In general, the ETS pilots regulate carbon dioxide from major producers and consumers of electricity using trading with free allocation, and allow for offsets from Chinese-certified projects. Details on three of the seven pilots follow below.

Program Name: **Shanghai** ETS Pilot

Administering Jurisdiction / Regulatory Authority: Shanghai Development and Reform Commission

Location(s) / Geographic Reach: Shanghai, China

The Shanghai ETS Pilot began operation in November 2013. Its unique aspects include the regulation of domestic aviation emissions from Shanghai-based firms, and the acknowledgement and the provision of additional allowances for companies which achieved documented emissions reductions from the years 2006-2011 ([Source](#)). Shanghai's ETS pilot covers 50% of Shanghai's indirect and direct emissions.

Cap and Trade: Sets a cap on total emissions and issues allowances to polluters to permit them to emit a quantity of the pollutant; allowances may be bought and sold.	
Definitions of Carbon Sources being capped / traded. Which GHG emissions are covered/not covered?	<ul style="list-style-type: none"> • Carbon dioxide • Power and industry sector participants with over 20,000 t CO₂/year in direct and indirect emissions in either 2010 or 2011 are required to participate. For non-industry entities, the emission threshold for inclusion is 10,000 t CO₂/year (Source, Source). • The scheme covers emissions from the electricity, iron and steel, petrochemicals, chemicals, non-ferrous metals, building materials, textiles, paper, rubber, chemical fiber, aviation, ports, airports, railways, commercial, hotels, and financial sectors.
Cap and Trade Program Structure	
“Hardness/softness” of the cap on emissions. What is the flexibility of the cap?	<ul style="list-style-type: none"> • The Shanghai ETS uses an absolute cap of 160 Mt of CO₂ aligned with national and regional targets. • A penalty of 10,000-50,000 CNY can be assessed for non-compliance. For serious infractions, the government can prohibit access to funds for efficiency and conservation and enter the violation into a company's credit record. • Entities are allowed to bank credits, but borrowing is not allowed in the pilot phase.
Productivity Variability. Use of a cap that varies by productivity—the GHG “intensity” rather than absolute amount. Ex: A more productive emitter would receive more allowances.	<ul style="list-style-type: none"> • Shanghai allocated allowances freely based on historical emissions (grandfathering) and benchmarking data. • The industrial and manufacturing sectors as well as historic buildings received grandfathered allowances based on average emissions from 2009-2011. Early energy conservation actions are acknowledged through supplemental credit allocations which total 30% of the emissions reductions achieved over 2006-2011. • Shanghai allows regulated entities to adjust baseline years if emissions increased by over 50% between 2009 and 2011. • The power, aviation and port sector allowances are benchmarked based on an annual emissions factor and annual production volume numbers. The emissions factor is based on the 12th Five-Year Plan target, which includes a 19% carbon intensity reduction from 2010 levels by 2015 (Source). • Shanghai held a one-time auction for immediate compliance during before the 2013 compliance deadline. The price was set at 120% of the average market price for the preceding month.
Management of trading price volatility.	<ul style="list-style-type: none"> • If the price varies by more than 30% in a day, trading can be suspended or holding limits established.
Entity Eligible to Trade. Who pays to play?	<ul style="list-style-type: none"> • Participation from entities above the emissions thresholds is mandatory. As with all of the China ETS pilots, annual reporting of emissions is required to be verified by a third-party.

<p>Trade Structure. <i>How does the program work?</i></p>	<ul style="list-style-type: none"> • Obligations are set annually, and the pilot trading period is set for the years 2013-2015. All allowances for 2013-2015 were allocated upfront. • The Shanghai Development and Reform Commission is the regulatory authority for trading on the Shanghai Environment and Energy Exchange (Source).
<p>Trade Program Exemption(s). <i>Ex: Nations carve out exemptions for industries exposed to international competition.</i></p>	<ul style="list-style-type: none"> • Any entities in the regulated sectors which exceed the threshold must participate in the ETS. Currently, this is approximately 191 organizations. • Shanghai companies have raised concerns, and requested a recalculation for free allowances reflecting changes in output during the recession for the 2016 pilot year (Source).
<p>Impacts of Trade Schemes. <i>What effect(s) is the program having locally / regionally / nationally?</i></p>	<ul style="list-style-type: none"> • The use of domestic CCERs encourages low-carbon development within in China, but not necessarily within Shanghai. • Shanghai is still in the pilot phase, thus the economic implications are still being determined. It is also unclear if regulated organizations have improved their efficiency relative to the absolute cap. • Shanghai’s success in including aviation sector emissions should be looked upon as a model to scale for national implementation in China. Regulated organizations include China Eastern, Shanghai Airlines, China Cargo Airlines, Juneyao Airlines, Spring Airlines and Yangtze River Express.

Program Name: Tianjin ETS Pilot
Administering Jurisdiction / Regulatory Authority: Tianjin Development and Reform Commission
Location(s) / Geographic Reach: Tianjin, China

Tianjin, China was the fifth ETS to begin trading in 2013 under the Chinese ETS pilot programs. Tianjin saw the highest trading volume of the five operating pilots in the first quarter of 2014 ([Source](#)). This is in part because Tianjin allows non-regulated entities to participate in trading and has a price support mechanism.

Cap and Trade: Sets a cap on total emissions and issues allowances to polluters to permit them to emit a quantity of the pollutant; allowances may be bought and sold.

<p>Definitions of Carbon Sources being capped / traded. Which GHG emissions are covered/not covered?</p>	<ul style="list-style-type: none"> • Carbon dioxide from entities emitting over 20,000 t CO₂/year in direct and indirect emissions. • The scheme covers emissions from the heat and electricity production, iron, steel, petrochemical and oil and gas exploration sectors, which accounts for 60% of Tianjin’s total emissions. • Electricity prices are regulated in China, and thus limited carbon cost pass-through is available to the electric sector. The ETS thus accounts for electricity consumption and production.
<p>Cap and Trade Program Structure</p>	
<p>“Hardness/softness” of the cap on emissions. What is the flexibility of the cap?</p>	<ul style="list-style-type: none"> • The Tianjin ETS uses an absolute cap of 160 Mt of CO₂ aligned with national and regional targets. • Non-compliant entities are disqualified from government incentive and support programs for three years.
<p>Offsets. Credits awarded for projects that reduce or offset emissions that would otherwise occur</p>	<ul style="list-style-type: none"> • Tianjin allows participating organizations to offset up to 10% of their annual compliance using Chinese Certified Emissions Reductions Credits (CCERs) from projects around the country.
<p>Productivity Variability. Use of a cap that varies by productivity—the GHG “intensity” rather than absolute amount. Ex: A more productive emitter would receive more allowances.</p>	<ul style="list-style-type: none"> • Tianjin provides free allowances through grandfathering based on historical emissions data per unit of production based on data from 2009-2012. • New entrants and expanded capacity of existing facilities receive free allocations based on benchmarking. This benchmark is based on average emissions under standard working conditions for 2009-2012, and the amount is set to decline .2% for each compliance year. These allowances will account for 90% of the average emissions of facilities (Source).
<p>Management of trading price volatility.</p>	<ul style="list-style-type: none"> • The Tianjin Development and Reform Commission can buy or sell allowances into the market as a price stabilization mechanism.
<p>Entity Eligible to Trade. Who pays to play?</p>	<ul style="list-style-type: none"> • Participation from entities above the emissions threshold is mandatory. • Tianjin allows private entities and financial institutions to participate in trades. This has likely led to its higher trade volume, but larger price fluctuations (Source).
<p>Trade Structure. How does the program work?</p>	<ul style="list-style-type: none"> • Obligations are set annually, and the pilot trading period is set to occur from 2013-2015. • The Tianjin Development and Reform Commission regulates trading on the Tianjin Climate Exchange (Source). • Tianjin has signed an agreement with the cities of Beijing, and the provinces of Hubei, Shanxi and Inner Mongolia on regional collaboration (Source).
<p>Trade Program Exemption(s). Ex: Nations carve out exemptions for industries exposed to international competition.</p>	<ul style="list-style-type: none"> • Any entities in the regulated sectors which exceed the threshold must participate in the ETS. Currently, this is approximately 115 organizations. • There has been some concern about regional and municipal competition across the pilots due to the difference in carbon prices.
<p>Impacts of Trade Schemes. What effect(s) is the program having locally / regionally / nationally?</p>	<ul style="list-style-type: none"> • The use of domestic CCERs encourages low-carbon development within in China, but not necessarily within Tianjin. • Tianjin is still in the pilot phase, thus the economic implications are still being determined. It is also unclear if regulated organizations have improved their efficiency relative to the absolute cap.

Program Name: **Guangdong** ETS Pilot

Administering Jurisdiction / Regulatory Authority: The Guangdong Development and Reform Commission

Location(s) / Geographic Reach: Guangdong, China

The Guangdong Province ETS Pilot is a program which was developed to run from 2013-2015. The Guangdong ETS is the largest exchange in China, and covers an area that has seen rapid economic growth in the past decade. Currently, approximately 200 organizations participate in the ETS pilot. Prior to the launch of the first trading period in 2013, key stakeholders were engaged in dialogues ([Source](#)).

Cap and Trade: Sets a cap on total emissions and issues allowances to polluters to permit them to emit a quantity of the pollutant; allowances may be bought and sold.	
Definitions of Carbon Sources being capped / traded. Which GHG emissions are covered/not covered?	<ul style="list-style-type: none"> Carbon dioxide from entities emitting greater than 20,000 t CO₂/year in direct and indirect emissions from 2011-2014. This is equivalent to 55% of Guangdong's total emissions (Source). The power sector is covered by the scheme, but as electricity prices are regulated, power companies have limited ability to pass the cost of carbon onto customers. Thus, the ETS also regulates large electricity users (Source).
Cap and Trade Program Structure	
“Hardness/softness” of the cap on emissions. What is the flexibility of the cap?	<ul style="list-style-type: none"> The absolute cap is set by considering provincial and national emissions targets and was set at 388 Mt CO₂, with 350 Mt for existing entities and 38 Mt in reserve for new entrants 2013. In 2014, the cap was 408 Mt. Annual compliance targets are set for industry. The targets for 2015 are a 3.4% energy intensity reduction, a 2.32% in carbon intensity, and a 3.5% carbon dioxide emissions reduction. This will contribute to a total carbon intensity reduction goal of 19.5% by 2015 (2010 baseline), aligned with the 12th 5th Year Plan. (Source) Emissions must be reported and verified by a third-party annually. Punishment for non-compliance is 50,000 CNY and a reduction in future emissions allocations. (Source)
Offsets. Credits awarded for projects that reduce or offset emissions that would otherwise occur	<ul style="list-style-type: none"> Guangdong allows for the use Chinese Certified Emissions Reduction credits (CCERs) for offsets for domestic projects. These can only be used for up to 10% of an entity's annual obligation. Guangdong is considering restricting the use of CCERs from hydropower, waste heat or any project using fossil fuels. (Source) Guangdong has developed a special program to allow the use of Guangdong-CERs for forestry offsets within the province. These must account for 70% of an entity's offset usage.
Productivity Variability. Use of a cap that varies by productivity—the GHG “intensity” rather than absolute amount. Ex: A more productive emitter would receive more allowances.	<ul style="list-style-type: none"> Guangdong's ETS uses a mixture of grandfathering and benchmarking for free allocation depending on the industry. Grandfathering is used for the iron and steel processing, power and heat cogeneration, cement mining and petrochemical industries based on historical emissions multiplied by a percent reduction factor based on 2010-2012 production. Free allocation based on benchmarking is determined by industry intensity benchmarks multiplied by production and a control (or reduction) factor. This amount does not adjust based on production. All entities are required to purchase 10% of their allowances in 2015 in the Guangdong Emissions Exchange auction, or they will not receive access to their free allocation via grandfathering or benchmarking. (Source) The auction percentage is expected to increase.
Management of trading price volatility.	<ul style="list-style-type: none"> There is a price floor in the Guangdong auction which was initially set at 60 CNY, and lowered to 25 CNY after the first compliance year. It will increase to 40 CNY, and decrease in steps.
Entity Eligible to Trade. Who pays to play?	<ul style="list-style-type: none"> Participation for qualifying entities is mandatory. Entities can only access free allowances after participating in the auction. The auction is expected to generate at least \$101 million USD a year in funds for emissions reduction projects.
Trade Structure. How does the program work?	<ul style="list-style-type: none"> The Guangdong Development and Reform Commission is the authority which oversees trading on the China Emissions Exchange Guangdong. Trading occurs between regulated entities each year during the pilot from 2013-2015. As of April 2014, 126,000 t CO₂ had been traded. (Source) Guangdong begun to study interlinking with other regional schemes in 2014, and is expected to adopt the national protocol for CCERs and forestry after the pilot period ends.
Trade Program Exemption(s). Ex: Nations carve out exemptions for industries exposed to international competition.	<ul style="list-style-type: none"> The ETS is a mandatory scheme set at the accounting boundary for each regulated entity. Concerns have been raised by industry about differences in competitive advantage based on differing regional rules (Source).

Impacts of Trade Schemes. *What effect(s) is the program having locally / regionally / nationally?*

- Emissions reductions from improved efficiency of industrial processes remain to be seen as measurement and verification processes are refined. This is an ongoing pilot.
- The use of provincial credits encourages forest conservation within Guangdong province.
- Proceeds from the auction are used to fund emission reductions actions ([Source](#)).
- Data from the pilot can feed the development of the national ETS for China, and auctions for other regional or municipal schemes.

JAPAN

Program Name: Tokyo Metropolitan Government Cap and Trade Program
Administering Jurisdiction / Regulatory Authority: Tokyo Metropolitan Government
Location(s) / Geographic Reach: Tokyo Metropolitan Region (aka Tokyo Prefecture)

In 2010, the Tokyo Municipal Government began implementation of a cap and trade program for large buildings. The program was designed to reduce emission by 6% during the first five-year program period and another 15% during the second period. As of the second year of the program, buildings subject to the cap had, in aggregate, significantly reduced emissions below required levels. This rapid reduction in energy use was a result of energy market changes resulting from Fukushima nuclear accident. The scope of the Tokyo program includes the entirety of the Tokyo Metropolitan Region, a political subdivision which is more closely aligned with a U.S. state than a typical municipality.

Cap and Trade: Sets a cap on total emissions and issues allowances to polluters to permit them to emit a quantity of the pollutant; allowances may be bought and sold.

<p>Definitions of Carbon Sources being capped / traded. Which GHG emissions are covered/not covered?</p>	<ul style="list-style-type: none"> Commercial and industrial buildings with fuel consumption of at least 1,500 kiloliters per year crude oil equivalent (COE) Roughly 1,400 buildings are required to comply under the program representing around 20% of Tokyo’s total emissions Roughly 80% of buildings subject to the program are commercial buildings with the remainder industrial Target is energy-related CO2 (although other GHG emissions can be used as offsets)
<p align="center">Cap and Trade Program Structure</p>	
<p>“Hardness/softness” of the cap on emissions. What is the flexibility of the cap?</p>	<ul style="list-style-type: none"> Absolute emissions cap (ie. not an intensity cap) Set at 6% or 8% reduction from baseline first 5-year compliance period (2010-2015) (Source) Set at 15% below base-year emissions for second compliance period (2016-2020)(Source) Penalties for non-compliance include fines and government publication of non-compliant entities
<p>Offsets. Credits awarded for projects that reduce or offset emissions that would otherwise occur</p>	<ul style="list-style-type: none"> Offsets are available from a series of project types including efficiency projects for small and medium buildings in Tokyo that are not subject to the program, renewable energy certificates and, potentially, offsets from other trading schemes in Japan
<p>Productivity Variability. Use of a cap that varies by productivity—the GHG “intensity” rather than absolute amount. Ex: A more productive emitter would receive more allowances.</p>	<ul style="list-style-type: none"> Buildings are allocated a five-year allowance budget based on past emissions and required compliance reductions Allowances are allocated at no cost to building owners New entrants are provided allowances from a pre-defined reserve Facilities no longer participate in the program if their consumption drops below 1500 kiloliters COE per year for three consecutive years A fixed electricity emissions factor is used for the program to eliminate fluctuations resulting from changes in grid supply
<p>Management of trading price volatility.</p>	<ul style="list-style-type: none"> Program provides the Governor of Tokyo with the authority to adjust offset applicability rules in the event credit prices surge, increasing offset supply Has not been applicable to date as only a limited number of trade has occurred through the program
<p>Entity Eligible to Trade. Who pays to play?</p>	<ul style="list-style-type: none"> Obligated entities Other market players, potentially, although trading has been sporadic
<p>Trade Structure. How does the program work?</p>	<ul style="list-style-type: none"> Five-year compliance period allows obligated entities to bank emissions reductions in early years Credit borrowing is not allowed To date, trading has been limited as most obligated buildings met their obligations early (Source)
<p>Trade Program Exemption(s). Ex: Nations carve out exemptions for industries exposed to international competition.</p>	<ul style="list-style-type: none"> Program is limited to commercial and industrial building over 1,500 kiloliters per year COE energy consumption No exemptions available

Impacts of Trade Schemes. *What effect(s) is the program having locally / regionally / nationally?*

- Program has been cited as a model for other cities
- The degree to which energy reductions are attributable to policy vs. market changes from Fukushima aftermath is unknown
- Stakeholders originally argued that there was limited opportunity for further energy use reductions in many buildings, despite this, most properties have seen significant early compliance, with many exceeding 2020 targets

Appendix C: North American Pricing Efforts – Details

Program Name: Boulder Climate Action Plan

Administering Jurisdiction / Regulatory Authority: City of **Boulder, CO**

Location(s) / Geographic Reach: City of Boulder, CO USA

Taxation Programs: Taxes consumption, mostly of fossil fuels, that leads to emission of carbon dioxide.	
Program Overview	<p>“The Boulder Climate Action Plan (CAP) is an integrated, aggressive set of programs and strategies to reduce Boulder's greenhouse gas emissions and address the growing impact of human activity on global climate change. The City of Boulder residents and businesses are taxed based on the amount of electricity they consume. The City Council has the authority to set the rate for each user type within an approved range. The City of Boulder has programs in six strategy areas to help the community reduce greenhouse gas emissions. Most of them are funded by CAP tax or trash tax dollars.”</p> <p>https://bouldercolorado.gov/climate</p>
Definitions of Carbon Sources being taxed. Which GHG emissions are covered/not covered?	<ul style="list-style-type: none"> • GHG created by the generation of electricity is the only carbon source taxed in this program • Local electricity is fueled primarily by coal and natural gas
Year of Inception/Subsequent Renewal Years. How long has this program been active?	<ul style="list-style-type: none"> • Inception 2006 • Renewed 2012 • Active tax 2015
Carbon Tax Program Structure	
Entity Taxed. Who pays the tax?	<ul style="list-style-type: none"> • Consumers of electricity: residential, commercial, industrial
Taxation Structure. At what point is the tax levied? (When ownership of the fuel changes hands)	<ul style="list-style-type: none"> • CAP tax is levied on the end user of electrical power sources
Tax Exemption(s). Ex: Nations carve out tax exemptions for industries exposed to international competition.	<ul style="list-style-type: none"> • Unknown
Entity Taxing. Who collects the tax? Are they already collecting other taxes (e.g., gasoline retailers)?	<p>“Xcel Energy collects the tax for the city through its monthly customer utility billing. Customers who subscribe to wind-generated power through Xcel Energy's Windsource program are not taxed for that portion of their electricity use.” https://bouldercolorado.gov/climate</p>
Tax Amount. What amount is the tax? Are there rates or scales?	<p>The table below indicates the tax rate and average annual CAP tax per sector:</p> <ul style="list-style-type: none"> • RESIDENTIAL Tax Rate: \$0.0049/kWh, Average Annual Tax: \$21 • COMMERCIAL Tax Rate: \$0.0009/kWh, Average Annual Tax: \$94 • INDUSTRIAL Tax Rate: \$0.0003/kWh, Average Annual Tax: \$9,600

<p>Disposition of Proceeds. <i>What happens to the revenue collected by government?</i></p>	<p>“The CAP tax funds a majority of Boulder’s greenhouse gas reduction efforts, including significant energy and transportation initiatives. Since more than 97 percent of our GHG emissions can be attributed to energy and transportation, the CAP tax helps address these major areas for improvement, as well as waste reduction and urban forestry. There are currently six program focus areas that address our community’s greenhouse gas reduction goals: REDUCE USE, BUILD BETTER, RAMP UP RENEWABLES, TRAVEL WISE, WASTE NOT, GROW GREEN”</p> <p>Business programs offered include:</p> <ul style="list-style-type: none"> • LED Exit Sign Exchange / 2007, ClimateSmart at Work Audits / 2007-2009, Small-Building Tune-Ups / 2010, 10 for Change / 2008-present, Commercial EnergySmart / 2011-present • Residential programs offered include: • Weatherization / 2007, LED holiday light exchange / 2007-2008, Efficient Lighting Coupons / 2007-2008, Multifamily Performance Program / 2007-2009 , Neighborhood Sweeps / 2007-2010, Solar Thermal and Insulation rebates / 2008, CU’s Energy Green Teams and Greek Sustainability Program / 2010-present, ReNew Our Schools PTO Fundraiser / 2011, Residential Energy Action Program / 2008-2010 , Residential EnergySmart including support for SmartRegs compliance / 2011-present • https://bouldercolorado.gov/climate (See CAP Tax 101 PDF)
<p>Impacts of Taxation. <i>What effect(s) is the program having locally / regionally / nationally?</i></p>	<ul style="list-style-type: none"> • Economic – Boulder has reinvested the CAP tax money into energy efficient upgrades for the citizens/business in the area. No clear data on negative economic impacts. Voters renewed the tax in 2012. • Environmental – Boulder has stopped the growth of GHG emissions and is working toward reduction goals. • Social - Residents and businesses have access to multiple programs that assist in the implementation of energy efficient improvements to reduce GHG. • https://bouldercolorado.gov/climate (See CAP at a Glance PDF)

Program Name: Greenhouse Gas Reduction Program

Administering Jurisdiction / Regulatory Authority: Alberta Department of Environment and Sustainable Resource Development

Location(s) / Geographic Reach: Province of Alberta, Canada

Cap and Trade: Sets a cap on total emissions and issues allowances to polluters to permit them to emit a quantity of the pollutant; allowances may be bought and sold.	
Program Overview	<p>Alberta’s program incorporates concepts from both cap and trade and carbon tax models. There is a specific GHG reduction target, and participants may either pay the government directly for overages or buy offsets from other companies.</p> <p>http://esrd.alberta.ca/focus/alberta-and-climate-change/regulating-greenhouse-gas-emissions/default.aspx</p>
Definitions of Carbon Sources being capped / traded. Which GHG emissions are covered/not covered?	<ul style="list-style-type: none"> • GHG emitted from large scale industry emitting more than 100,000 tons of GHG per year
Year of Inception/Subsequent Renewal Years. How long has this program been active?	<ul style="list-style-type: none"> • Started in 2007 • Active in 2015
Cap and Trade Program Structure	
“Hardness/softness” of the cap on emissions. What is the flexibility of the cap?	<p>There is not a true cap in this system. Participants must reduce their emissions by 12 percent below a baseline that is established for each facility.</p>
Offsets. Credits awarded for projects that reduce or offset emissions that would otherwise occur.	<p>Offsets are available through Alberta Offset Registry for new GHG reducing projects and emission reductions above a facility’s target.</p> <p>http://esrd.alberta.ca/focus/alberta-and-climate-change/regulating-greenhouse-gas-emissions/alberta-based-offset-credit-system/default.aspx</p>
Productivity Variability. Use of a cap that varies by productivity—the GHG “intensity” rather than absolute amount. Ex: A more productive emitter would receive more allowances.	<p>Major industrial facilities must reduce their “emissions intensity” (i.e. emissions per unit of production) by up to 12 %, relative to their typical performance or “baseline” level. The target phases in over time, reaching the full 12 % requirement in a facility’s ninth year of operation, and remains at 12 % after that.</p> <p>http://www.pembina.org/blog/708</p>
Management of trading price volatility.	<ul style="list-style-type: none"> • Companies can use any combination of compliance options to meet their target so the fixed rate for paying into the Climate Change and Emissions Management Fund acts as a price cap, \$15 per ton. • Price floor unknown.
Entity Eligible to Trade. Who pays to play?	<ul style="list-style-type: none"> • Alberta requires facilities that emit more than 100,000 tonnes of greenhouse gases a year to reduce emissions intensity by 12 per cent through the Greenhouse Gas Reduction Program. • Offset credits are available to Alberta facilities, municipalities, agricultural producers and others that emit less than 100,000 tonnes of greenhouse gases. If these facilities choose to reduce their emissions and register these reductions with the Alberta Offset Registry they get one offset credit for every tonne of reduced emissions. • Once registered, the offsets can be sold to Alberta’s large emitters that have not met their provincially mandated reduction targets. The price facilities pay for the offsets is market driven, so they vary.

<p>Trade Structure. <i>How does the program work?</i></p>	<p>Alberta requires facilities that emit more than 100,000 tonnes of greenhouse gases a year to reduce emissions intensity by 12 %. There are four ways companies can comply:</p> <ul style="list-style-type: none"> • Make improvements to their operations • Purchase Alberta-based offset credits • Contribute to the Climate Change and Emissions Management Fund • Purchase or use Emission Performance Credits <p><u>Alberta-based offset credits:</u> Offset credits are available to Alberta facilities, municipalities, agricultural producers and others that emit less than 100,000 tonnes of greenhouse gases. If these facilities choose to reduce their emissions and register these reductions with the Alberta Offset Registry, they get one offset credit for every tonne of reduced emissions.</p> <p>Once registered, the offsets can be sold to Alberta’s large emitters that have not met their provincially mandated reduction targets. The price facilities pay for the offsets is market driven, so they vary.</p> <p><u>The Climate Change and Emissions Management Fund:</u> Companies that are required to meet the provincial reduction target for greenhouse gas emissions can choose to pay \$15 a tonne into the Fund for emissions over the target. The Alberta government is responsible for collecting this money for each compliance year.</p> <p><u>Emission performance credits:</u> Can be banked for future use or traded between facilities owned by the same company. They can also be registered with the Alberta Emission Performance Credit Registry. Once these credits are registered, they can then be purchased by other regulated companies that have not met their reduction target. Also like carbon offsets, the cost for emission performance credits vary - because it is market driven.</p>
<p>Trade Program Exemption(s). <i>Ex: Nations carve out exemptions for industries exposed to international competition.</i></p>	<p>The director may, on application, exempt the person responsible for a facility from the duties imposed by Parts 2 and 3 subject to any terms or conditions the director considers appropriate for a period not exceeding one year if the director is of the opinion that (a) for a prolonged period the facility was operated under unusual conditions or was shut down, and (b) the conditions or shutdown caused a material reduction in the specified gas emissions for the applicable period.</p> <p>(Google Search: <i>Climate Change and Emissions Management Act, Specified Gas Emitters Regulation</i>)</p>
<p>Disposition of Proceeds. <i>What happens to the revenue collected by government?</i></p>	<p>Through the \$15/tonne price on carbon, \$503 million has been collected for the Climate Change and Emissions Management Fund - \$249 million has been invested into 100 innovative and clean energy projects.</p> <p>Government of Alberta has invested \$1.3 billion in two carbon capture and storage projects, which will be operational in 2016/2017 (reducing about 2.76 Mt a year). http://esrd.alberta.ca/focus/alberta-and-climate-change/climate-change-and-emissions-management-fund.aspx</p>
<p>Impacts of Trade Schemes. <i>What effect(s) is the program having locally / regionally / nationally?</i></p>	<ul style="list-style-type: none"> • Economic – Unknown • Environmental – the program has low expectations of GHG reductions compared to neighboring programs so the environmental impact is not very strong. • Social - unknown

Program Name: The Carbon Market: Quebec Cap and Trade System

Administering Jurisdiction / Regulatory Authority: Ministry of Sustainable Development, Environment and the Fight against Climate Change

Location(s) / Geographic Reach: **Province of Quebec, Canada**

Note: Western Climate Initiative (WCI) is a group that facilitates carbon trading on the west coast/Canada. Like RGGI, it started strong around 10 years ago with many states interested in participating, but most of them dropped out before trading could begin. It now mainly consists of California and Canadian provinces (Manitoba and Ontario considering, for instance), with a newly established market between Quebec and California. This program has had very successful early trading with high carbon prices, and is being closely watched by surrounding states. Right now the only actives are Quebec and CA, which the below outlines.

Cap and Trade: Sets a cap on total emissions and issues allowances to polluters to permit them to emit a quantity of the pollutant; allowances may be bought and sold.	
Program Overview	<p>Quebec's Cap and Trade System is designed to regulate GHG emissions from companies emitting 25,000 metric tons or more of CO₂ equivalent annually in the industrial, electricity, and fossil fuel sectors. On Jan. 1, 2014, Quebec and California began trading through the Western Climate Initiative's (WCI) Cap and Trade Program.</p> <p>The primary objective of the C&T system is to reduce GHG emissions in the highest emitting sectors promoting energy efficiency as well as the use of energy from renewable sources. The carbon market therefore stimulates creativity as well as technological and business innovation by fostering the emergence of new low carbon drivers for economic development.</p> <ul style="list-style-type: none"> • http://www.mddelcc.gouv.qc.ca/changements/carbone/index-en.htm • https://icapcarbonaction.com/ets-map?etsid=73
Definitions of Carbon Sources being capped / traded. Which GHG emissions are covered/not covered?	The C&T system is intended for businesses that emit 25,000 metric tons or more of CO ₂ equivalent annually. For the first compliance period (2013–2014), only the industrial and electricity sectors are subject to the C&T system. However, with the start of the second compliance period (2015-2017) in January 2015, businesses that distribute fuel will also be subject to the C&T system. The third compliance period will run from 2018 to 2020.
Year of Inception/Subsequent Renewal Years. How long has this program been active?	<ul style="list-style-type: none"> • Started in 2013 • Entered into the WCI with Quebec, Canada Jan. 1 2014 • 2015 opened carbon trading with California through the Western Climate Initiative (WCI).
Cap and Trade Program Structure	
“Hardness/softness” of the cap on emissions. What is the flexibility of the cap?	<ul style="list-style-type: none"> • Absolute Cap • Quebec participates in the Western Climate Initiative Cap and Trade Program, and has modeled the program under WCI guidelines. <p>http://www.westernclimateinitiative.org/the-wci-cap-and-trade-program/program-design</p>
Offsets. Credits awarded for projects that reduce or offset emissions that would otherwise occur.	<p>Only offset credit projects that are voluntarily implemented by a promoter (individual, organization or company) wishing to reduce or sequester GHG emissions (in sectors of activity or sources other than those subject to the Regulation's compliance obligations) are eligible to receive offset credits. Offset credit projects that began on or after January 1, 2007, are also eligible if they meet the conditions described in Chapter IV of the Regulation and are covered by one of the protocols listed in Appendix D of the Regulation.</p> <p>http://www.mddelcc.gouv.qc.ca/changements/carbone/credits-compensatoires/index-en.htm</p>

<p>Productivity Variability. <i>Use of a cap that varies by productivity—the GHG “intensity” rather than absolute amount. Ex: A more productive emitter would receive more allowances.</i></p>	<ul style="list-style-type: none"> • Absolute Cap, no productivity variability • First compliance period: <ul style="list-style-type: none"> ○ For the year 2013/2014, 23.20 million emission units (Fuel distribution sector not yet taxed) • Second compliance period: <ul style="list-style-type: none"> ○ For the year 2015, 65.30 million emission units ○ For the year 2016, 63.19 million emission units ○ For the year 2017, 61.08 million emission units • Third compliance period: <ul style="list-style-type: none"> ○ For the year 2018, 58.96 million emission units ○ For the year 2019 56.85 million emission units ○ For the year 2020, 54.74 million emission units
<p>Management of trading price volatility.</p>	<p>In 2012, the minimum price per GHG emission at auction was \$10. This floor price increases annually by 5% plus inflation. There is no maximum price.</p> <p>Every year, California and Québec will announce their respective floor prices for the following year’s linked auctions. On linked auction days, the minimum joint GHG emission unit price will be announced prior to the start of bidding. That price will be the higher of the minimum Québec and California prices and is calculated on the basis of the U.S./Canadian dollar exchange rate on auction day, or if that rate is unavailable, the most recent published rate.</p> <p>http://www.mddelcc.gouv.qc.ca/changements/carbone/Systeme-plafonnement-droits-GES-en.htm (See Questions and Answers PDF)</p>
<p>Entity Eligible to Trade. <i>Who pays to play?</i></p>	<p>Emitters subject to Section 2 of the Regulation respecting a cap-and-trade system for greenhouse gas emission allowances (GHG) are required to register for the system. Any person who is domiciled or owns an establishment in Canada may voluntarily register as a participant in the cap-and-trade system in order to purchase, hold, sell or voluntarily withdraw emission allowances.</p>
<p>Trade Structure. <i>How does the program work?</i></p>	<ul style="list-style-type: none"> • All participants enroll in the Compliance Instruments Tracking System Service (CITSS) to own/exchange allowances • GHG emissions units are traded in four annual auctions • Joint auctions with California opened Feb. 2015 • The Minister holds a reserve of units that can be directly sold at a mutually agreed upon price
<p>Trade Program Exemption(s). <i>Ex: Nations carve out exemptions for industries exposed to international competition.</i></p>	<p>In 2013 and 2014, industrial emitters exposed to foreign competition receive most of the emission units they need free of charge in order to prevent what is called “carbon leakage”, that is, the offshoring of companies to places without a cap and trade system. Starting in 2015, however, the number of units allocated free of charge to these emitters generally drops about 1% to 2% a year, notably for combustion emissions, in order to encourage them to cut GHG emissions further. Electricity producers as well as fossil fuel distributors do not receive free allocations</p>
<p>Disposition of Proceeds. <i>What happens to the revenue collected by government?</i></p>	<p>Proceeds from the auctions and direct sales are put into a Green Fund for Climate Change Action Plan projects.</p>
<p>Impacts of Trade Schemes. <i>What effect(s) is the program having locally / regionally / nationally?</i></p>	<ul style="list-style-type: none"> • The newly included fuel sector will likely increase gas prices for consumers • The projected \$3.3 billion (to be raised by 2020) will be put back into green programs that reduce GHG emissions and sustainability programs. • This program is levied on industry so impact on a social level is mainly realized in fuel price increases.

Program Name: Regional Greenhouse Gas Initiative (RGGI)

Administering Jurisdiction / Regulatory Authority: Each state participating in the program independently regulates compliance within their jurisdiction with RGGI, Inc guidance and technical support.

Location(s) / Geographic Reach: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, Vermont

Notes on RGGI: *this program is very unique, so this table was slightly modified to accommodate the nuances. It was very rocky for the first few years, with states observing, signing on, dropping out, joining back in, etc. Losing New Jersey in 2011 was a blow to the program. From the reading, RGGI needs PA to participate to really be successful. NJ dropped out partly because of "carbon leakage" to PA. This last election did bring in a governor to PA that campaigned to join RGGI. Long-term success depends on this, as NJ will likely rejoin if PA signs on - making RGGI a solid geographic presence. Also, carbon prices were substantially lower in RGGI trading than in California/Quebec.*

Cap and Trade: Sets a cap on total emissions and issues allowances to polluters to permit them to emit a quantity of the pollutant; allowances may be bought and sold.

<p>Program Overview</p>	<p>Regional Greenhouse Gas Initiative, Inc. (RGGI, Inc.) is a 501(c)(3) non-profit corporation created to support development and implementation of the Regional Greenhouse Gas Initiative (RGGI). RGGI is a cooperative effort among nine states – CT, DE, MI, MD, MA, NH, NY, RI and VT– to reduce greenhouse gas emissions.</p> <p>Mission Statement RGGI, Inc.'s exclusive purpose is to provide administrative and technical services to support the development and implementation of each RGGI State's CO₂ Budget Trading Program. RGGI, Inc.'s activities include:</p> <ul style="list-style-type: none"> • Development / maintenance of a system to report data from emissions subject to RGGI; to track CO₂ • Implementation of a platform to auction CO₂ allowances • Monitoring the market related to the auction and trading of CO₂ allowances • Providing TA to the participating states in reviewing applications for emissions offset projects • Providing TA to the participating states to evaluate proposed changes to the States' RGGI programs <p>RGGI, Inc. has no regulatory or enforcement authority. All such sovereign authority is reserved within the States. To reduce emissions of greenhouse gases, the RGGI States use a market-based cap-and-trade approach that includes:</p> <ul style="list-style-type: none"> • A multi-state CO₂ emissions budget ("cap") • Requirements for fossil fuel-fired electric power generators with a capacity of 25 megawatts (MW) or greater ("regulated sources") to hold allowances equal to their CO₂ emissions over a three-year control period • Allocating CO₂ allowances through quarterly, regional CO₂ allowance auctions. • Investing proceeds from the CO₂ allowance auctions in consumer benefit programs to improve energy efficiency and accelerate the deployment of renewable energy technologies • Allowing offsets (greenhouse gas emissions reduction or carbon sequestration projects outside the electricity sector) to help companies meet their compliance obligations • An emissions and allowance tracking system to record and track RGGI market and program data, including CO₂ emissions from regulated power plants and CO₂ allowance transactions among market participants
<p>Definitions of Carbon Sources being capped / traded. Which GHG emissions are covered/not covered?</p>	<ul style="list-style-type: none"> • Carbon – Diesel Oil, Pipeline Natural Gas, Coal, Residual Oil, Other Oil • Non-fossil carbon dioxide emissions- Wood
<p>Year of Inception/Subsequent Renewal Years. How long has this program been active?</p>	<ul style="list-style-type: none"> • Program Inception in 2005 but very rocky for the first few years • Carbon auctions started in 2008 • Active trading between 9 participating states in 2014
<p>Program Successes</p>	<ul style="list-style-type: none"> • Active legislation in nine states for participation in RGGI that follow the RGGI Model Rule. • GHG emissions targets being hit – 2014 cap was reduced because GHG reductions were greater than expected • Recently elected PA Governor made campaign promise to join RGGI which would boost the program significantly • Recent EPA legislation in the Clean Power Plan requires states to regulate GHG emissions. This federal requirement creates a positive environment for the adoption/implementation of this program.

Program Problems	<ul style="list-style-type: none"> • Early volatility of the program: States signed on then MA and RI backed out, later rejoining the program • New Jersey withdrew from the program in 2011 under Governor Chris Christie • Early criticism of the program for not having opt-out features if prices exceeded a certain level • Allowance prices are well below similar trading on the in California and Quebec • Carbon leakage (industry moving from a regulated to non-regulated area) has been a problem for RGGI, a contributing factor to NJ withdrawing.
Cap and Trade Program Structure	
“Hardness/softness” of the cap on emissions. What is the flexibility of the cap?	Absolute Cap of 91 million short tons for 2014. Program reduces cap annually until 2020. The cap can be revised for upcoming years if GHG reductions are more than anticipated.
Offsets. Credits awarded for projects that reduce or offset emissions that would otherwise occur	In the RGGI program: A CO ₂ offset represents project-based greenhouse gas emissions reductions or carbon sequestration achieved outside of the capped electricity sector. RGGI States currently allow regulated power plants to use a carefully chosen group of qualifying offsets to meet up to 3.3 percent of their compliance obligations.
Productivity Variability. Use of a cap that varies by productivity—the GHG “intensity” rather than absolute amount. Ex: A more productive emitter would receive more allowances.	Regulations in each member state dictate compliance standards as enforced by RGGI member state environmental agencies.
Management of trading price volatility	<ul style="list-style-type: none"> • There is no price ceiling in this program • Price floor - Price Minimum: \$2.00 in 2014, rising 2.5% annually
Entity Eligible to Trade. Who pays to play?	At this time, all parties are eligible to participate in CO ₂ allowance auctions, including but not limited to: corporations, individuals, non-profit corporations, environmental organizations, brokers, and other interested parties.
Trade Structure. How does the program work?	<ul style="list-style-type: none"> • Each member state is assigned a state-level share of the overall RGGI Program CO₂ Budget as defined in the MOU. Together, individual member state CO₂ budgets compose the RGGI CO₂ cap. • Competitive allocation of allowances to electric power sources subject to 100% auction-based distribution. • Quarterly, single round, sealed bid, uniform price • Price Minimum: \$2.00 in 2014, rising 2.5% annually • Must be purchased at auction in multiples of 1,000 allowances (1 allowance = 1 ton of CO₂) • Compliance entities are prohibited from bidding on more than 25% of total CO₂ allowances offered at any auction <ul style="list-style-type: none"> ○ http://www.c2es.org/us-states-regions/regional-climate-initiatives/rggi (see table)
Trade Program Exemption(s). Ex: Nations carve out exemptions for industries exposed to international competition.	<ul style="list-style-type: none"> • Each state sets out specific regulations and enforcement based on the RGGI Model Rule.
Impacts of Trade Schemes. What effect(s) is the program having locally / regionally / nationally?	<ul style="list-style-type: none"> • Economic - while auction prices are still well below other C&T programs in North America, prices are increasing annually. • Environmental - GHG emissions reductions goals are being reached through the program. • Social - Each RGGI State has established a public plan for re-investing CO₂ allowance proceeds in consumer benefit programs: energy efficiency, renewable energy, direct energy bill payment assistance and other greenhouse gas reduction programs.
Useful Links	<ul style="list-style-type: none"> • Center for Climate and Energy Solutions: RGGI http://www.c2es.org/us-states-regions/regional-climate-initiatives/rggi • RGGI Website: http://www.rggi.org/rggi

Program Name: California Cap and Trade Program

Administering Jurisdiction / Regulatory Authority: California Environmental Protection Agency Air Resource Board

Location(s) / Geographic Reach: State of California, USA

Cap and Trade: Sets a cap on total emissions and issues allowances to polluters to permit them to emit a quantity of the pollutant; allowances may be bought and sold.

<p>Program Overview</p>	<p>The Cap-and-Trade Program is a key element of California’s climate plan. It sets a statewide limit on sources responsible for 85 percent of California’s greenhouse gas emissions, and establishes a price signal needed to drive long-term investment in cleaner fuels and more efficient use of energy. The program is designed to provide covered entities the flexibility to seek out and implement the lowest-cost options to reduce emissions.</p> <p>Scope</p> <ul style="list-style-type: none"> • Program covers about 450 entities • Starts in 2013 for electricity generators and large industrial facilities emitting 25,000 MTCO₂e or more annually • Starts in 2015 for distributors of transportation, natural gas, and other fuels • In 2014, California’s program linked with the Canadian province of Québec • Designed to link with similar trading programs in other states and regions <p>http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm (See Program Overview PDF)</p>
<p>Definitions of Carbon Sources being capped / traded. Which GHG emissions are covered/not covered?</p>	<p>Major GHG emitting sources producing more than 25,000 metric tons of carbon dioxide equivalent are required to participate in the program. Currently electricity producers, stationary industrial sites, and fossil fuel distributors meeting the emissions minimum must participate.</p> <p>Covered Gases:</p> <ul style="list-style-type: none"> • carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF₃), and other fluorinated greenhouse gases
<p>Year of Inception/Subsequent Renewal Years. How long has this program been active?</p>	<ul style="list-style-type: none"> • Took effect early 2012 • Enforceable compliance began in January of 2013 • Entered into the WCI with Quebec, Canada Jan. 1 2014 • First joint auction with Quebec in February of 2015
<p>Cap and Trade Program Structure</p>	
<p>“Hardness/softness” of the cap on emissions. What is the flexibility of the cap?</p>	<p>The cap is a firm percentage of emissions forecast, but there are many free allowances to ease industry into the program the first few years.</p> <p>The Cap</p> <ul style="list-style-type: none"> •Set in 2013 at about 2 percent below the emissions level forecast for 2012 •Declines about 2 percent in 2014 •Declines about 3 percent annually from 2015 to 2020
<p>Offsets. Credits awarded for projects that reduce or offset emissions that would otherwise occur</p>	<ul style="list-style-type: none"> • Allowed for up to 8 percent of a facility’s compliance obligation • Limited to emissions-reduction projects in U.S. • Restricted to projects in five areas: forestry, urban forestry, dairy digesters, destruction of ozone-depleting substances, and mine methane capture • Offsets must be independently verified • Currently analyzing rice cultivation protocol

<p>Productivity Variability. <i>Use of a cap that varies by productivity—the GHG “intensity” rather than absolute amount. Ex: A more productive emitter would receive more allowances.</i></p>	<p>Program participants can get free allowances for multiple reasons one being efficiency and productivity:</p> <p><u>Large industrial facilities</u></p> <ul style="list-style-type: none"> • Focus on free allocation early in the program, transitions to more auctions later in program • Allocation of allowances for most industrial sectors is set at about 90 percent of average emissions, based on benchmarks that reward efficient facilities • For most industrial sectors, distribution of allowances is updated annually according to the production at each facility <p><u>Electrical distribution and natural gas utilities</u></p> <ul style="list-style-type: none"> • Free distribution of allowances; with the requirement that the value of allowances must be used to benefit rate-payer and achieve greenhouse gas emissions reductions • For electrical distribution utilities, free allocation is set at about 90 percent of average emissions • For natural gas utilities, free allocation is based on natural gas supplied in 2011 to non-covered entities
<p>Management of trading price volatility</p>	<ul style="list-style-type: none"> • Price Ceiling and floor are built into the Allowance Price Containment Reserve (APCR) for the sale of allowances in three fixed-price, equal-sized tiers. • For Sept. 2014 Reserve Sale: Tier 1 - \$42.38 per allowance, Tier 2 - \$47.68 per allowance, Tier 3- \$52.98 per allowance • The Floor price for 2014 was \$11.34
<p>Entity Eligible to Trade. <i>Who pays to play?</i></p>	<p>California C & T has three types of entities that participate in the program:</p> <ul style="list-style-type: none"> • Covered entities that meet minimum emissions requirements • Opt-in entities that are below the emissions requirement but choose to participate • Voluntary associated entities that can be an organization or individual that wants to participate in the trading system
<p>Trade Structure. <i>How does the program work?</i></p>	<p>Participants are assigned a cap to reduce overall GHG emissions for that facility based on production. They are given free allowances for their emissions to a certain level, and whatever they produce above the cap they must purchase offsets from another participant in the system. There are 4 auctions held annually and participants must submit an annual report stating their emission status.</p> <p>http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm (See Current Regulations link)</p>
<p>Trade Program Exemption(s). <i>Ex: Nations carve out exemptions for industries exposed to international competition.</i></p>	<ul style="list-style-type: none"> • Unknown
<p>Impacts of Trade Schemes. <i>What effect(s) is the program having locally / regionally / nationally?</i></p>	<ul style="list-style-type: none"> • Economic – So far the impact on industry is marginal, but most allowances have been free. The trading system has been working well with excellent participation. The next few years (as free allowances are phased out) will give a clearer picture of the impact on the economy. • Environmental – This program is currently on track with GHG reduction goals, but does not have the longevity to have clear data. • Social – California consumers are likely going to see marginal increases in electric bills and gas prices, but have not been adversely affected yet.

Program Name: Climate Protection Program

Administering Jurisdiction / Regulatory Authority: The Bay Area Air Quality Management District

Location(s) / Geographic Reach: **San Francisco Bay Area, California, USA**

GHG Emissions Programs of Interest: Past programs that have been absorbed into larger programs, repealed, or failed in court.

Program Overview	<p>Bay Area Air Quality Management District, California—2008</p> <p>The Bay Area Air Quality Management District (BAAQMD) incorporates nine counties of the San Francisco Bay Area. The BAAQMD established a carbon fee in July 2008, and in June 2009, it was increased by 3% to \$0.045 per metric ton of carbon dioxide equivalent (CDE). The fee applies to GHG emissions from BAAQMD permitted facilities. The BAAQMD establishes the cost of implementing GHG reduction programs and then sets the rate by dividing the cost by the total amount of GHG emissions from BAAQMD permitted facilities (Bateman 2009). Approximately 780 facilities are subject to the fee (Bateman 2009).</p> <p>The GHG fee raises revenue for BAAQMD Climate Protection Program projects related to stationary sources. Funded activities include completing and maintaining a regional GHG emissions inventory, supporting local efforts to reduce GHG emissions from stationary sources, developing regulatory measures for GHG emissions from stationary sources, reviewing GHG-related documents, addressing climate issues in the California Environmental Quality Act, and performing administrative activities such as updating databases and invoicing (BAAQMD 2008).</p> <p>The fee is expected to raise \$1.1 million for the BAAQMD (Bateman 2009). It may be raised in the future based on the funding needs of the BAAQMD Carbon Protection Program.</p> <p><i>From: Carbon Taxes: A Review of Experience and Policy Design Considerations - Jenny Sumner, Lori Bird, and Hillary Smith (December 2009) National Renewable Energy Laboratory Technical Report NREL/TP-6A2-47312 (available in PDF, Google)</i></p>
Program Outcome	With the implementation of California's Cap and Trade Program, the Bay Area has revised their Climate Protection Program.
Useful Links	<ul style="list-style-type: none">• Bay Area Climate Protection Program: http://www.baaqmd.gov/Divisions/Planning-and-Research/Climate-Protection-Program.aspx• New York Times (2008): http://www.nytimes.com/2008/04/17/us/17fee.html?_r=0• NBC News (2008): http://www.nbcnews.com/id/24762980/ns/us_news-environment/t/its-first-bay-area-businesses-pay-co-fee/#.VO9ZCC4rlrc• Google Search - Carbon Taxes: A Review of Experience and Policy Design Considerations by Jenny Sumner, Lori Bird, and Hillary Smith for PDF article

Program Name: Excise Tax on Major Emitters of Carbon Dioxide

Administering Jurisdiction / Regulatory Authority: Montgomery County Environmental Protection

Location(s) / Geographic Reach: **Montgomery County, Maryland, USA**

GHG Emissions Programs of Interest: Past programs that have been absorbed into larger programs, repealed, or failed in court.

Program Overview	In May of 2010, Montgomery County, Maryland passed the Excise Tax on Major Emitters of Carbon Dioxide. This tax was levied on any stationary emitter that produces more than 1 million tons of carbon dioxide a year. The rate was set at \$5 per ton emitted. This tax was aimed at a single coal-fired power plant owned by Mirant Corporation. The revenue was to be used to fund county energy efficiency programs.
Program Outcome	Mirant Corp. filed a lawsuit against the county saying that the tax was actually a fee directed solely on their operation. The initial court case ruled in favor of the county and upheld that it was a tax not a fee. In the court of appeals, Mirant, now known as Genon Mid-Atlantic, won the case classifying the tax as an unjust fee on their business. Montgomery County, Maryland repealed the tax in July 2012.
Useful Links	<ul style="list-style-type: none">• From Main Page, Search for Expedited Bill No. 29-10 to see the original Excise Tax on Major Emitters of Carbon Dioxide: http://www.montgomerycountymd.gov/index.aspx• From Main Page, Search Executive Regulation Carbon to see repeal of tax: http://www.montgomerycountymd.gov/index.aspx• Maryland County Carbon Tax Law Could Set Example For Rest of Country: http://insideclimatenews.org/news/20100525/maryland-county-carbon-tax-law-could-set-example-rest-country• Montgomery County Carbon Tax Law Could Set Example for Rest of Country: http://insideclimatenews.org/news/20100525/maryland-county-carbon-tax-law-could-set-example-rest-country• Montgomery County Climate Change Page (click Climate Protection Plan): https://www.montgomerycountymd.gov/DEP/sustainability/climate-change.html• Story from Climate News: http://insideclimatenews.org/news/20100525/maryland-county-carbon-tax-law-could-set-example-rest-country

Program Name: New Mexico Cap-And-Trade Program
Administering Jurisdiction / Regulatory Authority: New Mexico Environmental Improvement Board
Location(s) / Geographic Reach: New Mexico, USA

GHG Emissions Programs of Interest: Past programs that have been absorbed into larger programs, repealed, or failed in court.	
Program Overview	<p>New Mexico's Environmental Improvement Board approved a regional cap and trade program on Nov.2 2010. The Environmental Improvement Board voted 4-1 in favor of the petition by New Energy Economy, which calls for large polluters such as coal-fired power plants and refineries to reduce their greenhouse gas emissions by 3 percent per year from 2010 levels.</p> <p>The board amended the proposal to make the new regulations effective in 2013.</p>
Program Outcome	<p>Cap and Trade Rules Repealed Feb. 2012: The decision by the Environmental Improvement Board to repeal the cap and trade rules came in response to petitions filed by New Mexico's largest electric utilities, oil and gas developers and others who feared the rules would push businesses and jobs to neighboring states.</p>
Useful Links	<ul style="list-style-type: none"> • New Mexico Panel Approves Carbon Cap and Trade Rule (Bloomberg Business Nov.3,2010): http://www.bloomberg.com/news/articles/2010-11-03/new-mexico-panel-approves-carbon-cap-and-trade-plan-awaits-other-states • N.M. set to Overturn Carbon Cap (Governor's Wind Energy Coalition March 2012): http://www.governorswindenergycoalition.org/?p=1635 • New Mexico Greenhouse Gas Emissions Cap Approved by Regulators (Huffington Post 12/7/2010): http://www.huffingtonpost.com/2010/12/07/new-mexico-greenhouse-gas_n_793022.html • NM's cap and trade regulation repealed (Capitol Report New Mexico Feb. 2012): http://www.capitolreportnewmexico.com/2012/02/nms-cap-and-trade-regulation-repealed/

Program Name: Carbon Tax Act

Administering Jurisdiction / Regulatory Authority: British Columbia Ministry of Finance

Location(s) / Geographic Reach: **Province of British Columbia, Canada**

Taxation Programs: Taxes consumption, mostly of fossil fuels, that leads to emission of carbon dioxide.	
Program Overview	The government of British Columbia, Canada has imposed a revenue neutral tax on carbon produced by the combustion of fuel. The tax is levied on the end user of fuel and spans all sectors of the market (Individual, Business, Industrial, Transportation, etc.). Fuel retailers collect the tax revenue for the Ministry of Finance, who in turn offer other tax reductions to province constituents. http://www.fin.gov.bc.ca/tbs/tp/climate/carbon_tax.htm
Definitions of Carbon Sources being taxed. Which GHG emissions are covered/not covered?	<ul style="list-style-type: none"> • Carbon: Gasoline, Diesel (light fuel oil), Methanol Blend, Heavy Fuel Oil, Aviation Fuel (non-jet), Jet Fuel, Natural Gas, Propane, Coal –high heat value, Coal – low heat value, Light Fuel Oil, Kerosene, Naphtha, Butane, Ethane, Gas Liquids, Pentanes Plus, Refinery Gas, Coke Oven Gas, Coke, Petroleum Coke, Tires-Shredded, Tires-Whole • Other GHGs- not covered • Non-fossil carbon dioxide emissions - Peat • Other- none
Year of Inception/Subsequent Renewal Years. How long has this program been active?	<ul style="list-style-type: none"> • Inception July 1, 2008 • 2012 Final Incremental Tax Increase • Active Tax in 2015
Carbon Tax Program Structure	
Entity Taxed. Who pays the tax?	<ul style="list-style-type: none"> • Consumers of fuels/substances used in internal combustion engines or used to produce heat.
Taxation Structure. At what point is the tax levied? (When ownership of the fuel changes hands)	<ul style="list-style-type: none"> • Taxes are levied at the time of fuel purchase.
Tax Exemption(s). Ex: Nations carve out tax exemptions for industries exposed to international competition.	<ul style="list-style-type: none"> • Farmers can claim an exemption for the use of colored fuel in farming. Industrial greenhouse growers can receive a carbon tax relief grant for 80% of the carbon tax paid for greenhouse heating. <p>The following fuel is exempt from carbon tax:</p> <ul style="list-style-type: none"> • Fuel purchased by an end purchaser, who at the time of sale has entered into a contract with a common carrier to export the fuel from B.C. for their own use outside B.C. • Fuel purchased by a registered consumer (e.g. inter-provincial air services), a registered air service or a registered marine service • Fuel used in an inter-jurisdictional cruise ship • Fuel used in a ship prohibited from coasting trade under the Coasting Trade Act (Canada) • Fuel purchased in sealed, pre-packaged containers of four litres or less. <p>http://www2.gov.bc.ca/gov/topic.page?id=595366BB35434674B7D5290A25320637</p>
Entity Taxing. Who collects the tax? Are they already collecting other taxes (e.g., gasoline retailers)?	Fuel retailers collect carbon taxes at the time of fuel purchase. Carbon tax is collected along with motor fuel tax and/or Provincial sales tax and ICE Fund tax.

<p>Tax Amount. <i>What amount is the tax? Are there rates or scales?</i></p>	<ul style="list-style-type: none"> • \$30 per tonne of CO₂ e • \$0.0675 per litre of clear gasoline • This tax followed an incremental increase scale starting in 2008 that peaked in 2012 and has not been increased further. • For a complete list visit: http://www2.gov.bc.ca/gov/topic.page?id=IA80D78D2FC440ECB036B9EDEIEA777I&title=Motor%20Fuel%20and%20Carbon%20Tax (See Tax Rates on Fuels PDF)
<p>Disposition of Proceeds. <i>What happens to the revenue collected by government?</i></p>	<p>When the carbon tax was introduced, one of the key principles was that the tax would be revenue neutral. All carbon tax revenue would be returned to individuals and businesses through reductions in other taxes and not used to fund government programs. The principle of revenue neutrality will be maintained. Carbon tax revenues will continue to be recycled through tax reductions and not used to fund programs or other initiatives. (From Minister of Finance Report)</p>
<p>Impacts of Taxation. <i>What effect(s) is the program having locally / regionally / nationally?</i></p>	<ul style="list-style-type: none"> • Economic - “Economic analysis conducted for the carbon tax review indicates that BC’s carbon tax has had, and will continue to have, a small negative impact on gross domestic product (GDP) in the province.” http://www.fin.gov.bc.ca/tbs/tp/climate/carbon_tax.htm (See Carbon Topic Box) • Environmental - The carbon tax is very broad based encouraging consumers to reduce GHG emitting fuel consumption over time. • Social – By increasing price signals to consumers, the carbon tax is having an effect on consumer fuel consumption reduction, and encouraging energy efficient vehicle and appliance purchases.

Appendix D: European Union Emissions Trading Scheme: Overview and Interaction with National Carbon Taxes

Prepared by Meister Consulting Group

The European Union Emissions Trading Scheme (EU ETS) was launched in 2005 as the first and largest greenhouse gas (GHG) emissions trading scheme in the world. The EU ETS involves all 28 EU member states, as well as Iceland, Liechtenstein, and Norway and regulates approximately 45% of the EU's greenhouse gas emissions.¹⁴ The ETS has been modestly successful in reducing GHG emissions with total EU GHG emissions 19.2% below 1990 levels as of 2012 and GHG emissions intensity steadily declining since its introduction.¹⁵ Nevertheless, the ETS has suffered criticism since its inception, particularly for the wide range of exemptions and the severe over-allocation of carbon allowances in the first two phases. The combination of over-allocation and the 2008 Eurozone recession caused the price of a tonne of carbon to collapse from approx. €20 in 2011 to just €2.75 on April 17, 2013.¹⁶ While the European Parliament voted in February 2015 to put 1.6 billion tonnes of surplus allowances into reserve starting at the end of 2018,¹⁷ the inability to permanently remove surplus allowances and slow response from European leaders has called the future of the ETS into question. In early 2015, the spot price for a tonne of carbon in the EU ETS was around €7; prices in the California market are nearly two-thirds higher at \$12.63/tonne.¹⁸

Eight other countries in Europe have implemented national carbon taxes despite also participating in the ETS.¹⁹ A ninth European country, Switzerland, is not part of the EU or EEA and operates its own independent emissions trading scheme and national carbon tax, both implemented in 2008.²⁰ The eight EU countries with national carbon taxes participating in ETS can be divided into pre-ETS and post-ETS groups. Finland, Norway, Sweden, and Denmark introduced carbon taxes between 1990 and 1992, most of which initially targeted fossil fuel consumption, production, and importing. Beyond the primary goals of reducing emissions and stimulating investment and innovation in energy efficiency, renewables, and the low carbon economy, most of these countries also utilized energy and carbon taxes as revenue substitutions for cuts in labor and income taxes. The United Kingdom also introduced a carbon tax in 2001. Generally, the price of a tonne of carbon under these national taxes greatly exceeds the current spot price for a tonne of carbon in the ETS.²¹ Since joining the ETS, the adjustments made by each country to their carbon taxes have varied, though most countries have at least partially exempted ETS participants to avoid double taxation:²²

- **Denmark:** Most ETS participants exempted from national carbon tax; energy-intensive, non-ETS industries subjected to reduced tax to match ETS burden; some sectors doubly taxed (e.g. district heating producers)
- **Finland:** Few post-ETS changes; no exemption for ETS-participating industries

¹⁴ http://ec.europa.eu/clima/policies/ets/index_en.htm

¹⁵ http://ec.europa.eu/clima/policies/g-gas/docs/kyoto_progress_2014_en.pdf

¹⁶ <http://www.economist.com/news/finance-and-economics/21576388-failure-reform-europes-carbon-market-will-reverberate-round-world-ets>

¹⁷ <http://www.theguardian.com/environment/2015/feb/24/european-carbon-emissions-trading-market-reform-set-for-2019>

¹⁸ March 2, 2015 <http://calcarbodash.org/>

¹⁹ <http://daily.sightline.org/2014/11/17/all-the-worlds-carbon-pricing-systems-in-one-animated-map/>

²⁰ <http://www.bafu.admin.ch/emissionshandel/05545/?lang=en>

²¹ State and Trends of Carbon Pricing, World Bank

²² http://www.ieep.eu/assets/1282/ETR_study_by_IEEP_for_the_Swiss_Government_-_Annexes_-_21_June_2013.pdf

- **Norway:** Some ETS-participating industries and installations exempted from carbon tax; off-shore petroleum industry (the initial target of the carbon tax) is notably not exempted and pays the highest national carbon tax rates
- **Sweden:** The highest carbon tax rates in the world; emissions from ETS participants involved in manufacturing are exempted; non-ETS industries and non-manufacturing ETS industries are partially exempt (i.e. % reduction in tax rate)
- **United Kingdom:** Climate Change Levy on electricity and fossil fuels supplied to non-residential consumers; can be reduced by agreeing to participate in Climate Change Agreements in some energy intensive sectors;²³ no exemptions for participating in ETS; UK also introduced a voluntary emissions trading scheme in 2002 prior to ETS.

Additionally, Iceland had not yet joined the ETS when it implemented its carbon tax in 2010. However, it joined the ETS in 2012 and similarly exempted all ETS participants from the tax, setting the price of the tax to the ETS reference price and indexing it to inflation. France, Ireland, and the United Kingdom implemented new carbon taxes after joining the ETS. For all three countries, the introduction of carbon taxes served to address shortfalls with the ETS related to exemptions and price:²⁴

- **France:** Carbon tax implemented in 2013 targeting fossil fuels not covered by ETS; will ultimately be expanded to cover fuels used for transportation and heating;
- **Ireland:** Carbon tax implemented in 2010 to target liquid—and later solid—fossil fuels not covered by ETS; exemptions for participants in ETS²⁵
- **United Kingdom:** Carbon Price Floor introduced in 2013 to account for lower-than-expected ETS spot prices; originally set to increase from £16/tonne of carbon in 2013 to £30 in 2020, but frozen at £18 in 2014

Despite the size of the EU ETS, the variety of national carbon taxes implemented across Europe has resulted in a somewhat complex landscape with numerous unintended consequences resulting from the interaction of national policies with the ETS. In Denmark, the double burden on combined heat-and-power plants and large district heating plants under the carbon tax and ETS has moved energy consumption from ETS to non-ETS coal plants, resulting in a net increase in emissions.²⁶ Over 20 energy and emissions taxes and levies operate in parallel with ETS in the UK, leading to strong criticism for inefficiency and inconsistency in national energy policy.²⁷ Carbon taxes in most European countries have been criticized as regressive, despite the existence of some mitigating exemptions.²⁸

²³ <https://www.gov.uk/green-taxes-and-reliefs/climate-change-levy>

²⁴ IEEP

²⁵ <http://www.publicpolicy.ie/budget-2013-three-cheers-for-the-carbon-tax/>

²⁶ http://www.dors.dk/graphics/Synkron-Library/Publikationer/Rapporter/Milj%F8_2011/Disk/Summary.pdf

²⁷ <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/energy-policies-carbon-pricing.pdf>

²⁸ IEEP