Nicholas Institute for Environmental Policy Solutions
Working Paper
NI WP 14-09
November 2014

Assessing Carbon-Pricing Policy Options in the United States

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Acknowledgments
The authors wish to thank Larry Linden and Roger Ullman from the Linden Trust for Conservation and Kevin Kennedy from World Resources Institute for comments on an earlier draft of this paper and for their institutions' financial support of this work. All views expressed herein are those of the authors.

How to cite this report
Brian Murray, Tim Profeta, and Billy Pizer. 2014. "Assessing Carbon-Pricing Policy Options in the United States." NI WP 14-09. Durham, NC: Duke University.

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INTRODUCTION

In efforts to reduce greenhouse gas emissions in order to avoid dangerous climate change, much of the focus has been on the pursuit of policy mechanisms that will put a price on carbon. These mechanisms would create a cost to the regulated entity for the emission of a unit of greenhouse gas, thereby creating an economic motivation to avoid that emission. For some but not all emitters, that cost remains imbedded in the prices of goods and services responsible for the emissions, thereby providing system-wide incentives for emissions-reducing behavior. In the United States, carbon-pricing mechanisms have been established in several states and were the central feature of federal legislative proposals of the last decade. With the political failure of those proposals in the 2009-2010 debate, however, creation of a *de novo* carbon-pricing regime has gained much less attention.

There is now discussion in the United States regarding whether calls for fiscal reform and the evolving regulatory setting (especially use of the Clean Air Act to regulate greenhouse gases) might create political appetite for a new effort to pursue a policy to price carbon. To inform that discussion, this paper identifies and assesses options for establishing a price on carbon in the United States.

CARBON-PRICING OPTIONS

Carbon pricing is a policy mechanism that produces one monetary price for the emissions of carbon dioxide and other greenhouse gases (GHGs). In the United States, such a price would most likely be expressed in dollars per ton of carbon dioxide equivalent ($/$CO_2$e). This paper considers three basic approaches to carbon pricing:

- **Carbon tax or fee (tax)**: A fixed price per unit of CO_2e emitted is paid to the government.

- **Cap and trade (C&T)**: Regulators fix the amount of allowed emissions from regulated entities. Most commonly, the system will issue a fixed number of allowances, thereby determining the emissions cap, and require sources to submit allowances for each ton emitted. The allowances can be traded among entities, which will establish a market price. The allowance allocation process can be used to reduce the burden on regulated sources or other indirectly affected sources as discussed below.

- **Tradable performance standard (TPS)**: A TPS regulation establishes a target emissions rate per unit of output or input, rather than an absolute limit on emissions. Sources emitting below the target rate earn credits on the basis of the volume of tons by which they beat the target. Sources emitting above the target must acquire credits equal to the volume by which they exceed the target in order to equal the target rate. Trading between these two groups will establish a price for those credits. This approach only works in sectors where there is a measureable, common input or output across regulated firms (e.g., megawatt-hours of electricity).

For a tax or C&T system, the regulation could be imposed anywhere in the fossil fuel supply chain and not just on actual emitters. That is, the regulation could be imposed on either those extracting or processing fossil fuels, on the basis of their eventual emissions, rather than on actual emitters.

This paper focuses exclusively on pricing created by government regulation of greenhouse gases, rather than on private demand for emission reductions—for example, through a voluntary carbon market or a company's internal transfer price for planning purposes.

KEY DESIGN ISSUES INDEPENDENT OF CHOSEN PRICING MECHANISM

Regardless of which pricing mechanism is selected, there are fundamental design choices to make, all of which are tied in some way to the policy's ambition—that is, to the level and speed of emissions reductions sought.

- **Target stringency**: A more stringent target means a higher tax, a lower emissions cap, or a lower emissions rate performance standard. More stringency produces a higher carbon price and greater reductions, all else equal.

- **Coverage**: Who is subject to the price? In other words, which sectors and entities within those sectors are part of the tax base, are required to hold allowances, or must meet the emissions performance standard? Wider coverage enables a more ambitious reduction goal.

- **Timeline**: What is the schedule of requirements over time? Does the tax get progressively higher or the cap (or rate) progressively lower in the future? If so, by how much and how quickly?

- **Added flexibility**: By definition, a tax, C&T system, or tradable performance standard is a relatively flexible mechanism in that each allows regulated entities the freedom to employ a lower-cost compliance strategy and induces greater innovation than would a more command-oriented approach (e.g., fixed limits on each facility's emissions or emissions rate). A C&T system and tradable performance standard can be made even more flexible—for example, by allowing emissions reductions from outside the covered sectors to be used for compliance through offset credits or by extending the compliance periods to allow more flexible decisions about investment timing. Added flexibility may increase a pricing mechanism's ambition to the extent that it reduces the cost of achieving a given level of reduction.

- **Use of revenues or allowance value:** All three pricing mechanisms create an economically valuable asset, either a direct revenue stream (through taxation of the emission or auctioning of allowances) or an implicit value stream of allowances. A tradable performance standard implicitly assigns that value to subsidize the output or input defining the target rate. A C&T system or tax policy must explicitly establish which entity receives the value stream and whether its use is restricted. These considerations have important distributional consequences, as discussed below.

The key point here is that the success of any carbon-pricing scheme is tied to decisions on design issues that will apply regardless of the pricing mechanism employed. For instance, a C&T approach is not fundamentally more or less ambitious than a tax or tradable performance standard, but a mechanism with wide coverage and stringent targets that decline over time is more ambitious than one with narrow coverage and low targets that remain flat.

NORMATIVE CRITERIA FOR COMPARING A TAX, CAP-AND-TRADE SYSTEM, AND TRADABLE PEFORMANCE STANDARD

Although the policy's overall ambition is independent of the chosen mechanism, there are important differences in how each mechanism delivers emissions reductions in terms of cost, certainty, and distributional consequences. To compare the mechanisms on these grounds, we define several normative criteria:

- **Cost-effectiveness**, or capacity to equalize the marginal cost of abatement across mitigation opportunities and thereby produce a given emissions reduction level at the lowest possible cost.

- **Emissions certainty**, or capacity to ensure that a given emissions level in a given time period is achieved.

- **Price/cost certainty**, or capacity to ensure a predictable, non-volatile price signal over time, which in turn ensures predictable compliance costs for businesses.

- **Equity and distributional fairness**, or capacity to equitably distribute the cost burden of the reductions across and within regulated sectors and across producers and consumers, regions, income groups, and other populations that matter from a social welfare or political standpoint.

ASSESSMENT OF MECHANISM OPTIONS

Table 1 compares carbon-pricing mechanisms with respect to cost-effectiveness, emissions certainty, price/cost certainty, and equity and distributional fairness.

Table 1. Comparison of carbon-pricing mechanisms with respect to cost-effectiveness, emissions certainty, price/cost certainty, and equity and distributional fairness.

Criterion	Carbon tax (fee)	Cap-and-trade system	Tradable performance standard
Cost-effectiveness	Achievable in principle as long as tax is applied uniformly across all sources	Achievable in principle as long as cap uniformly covers all sources and trading across all sources is allowed	Encourages cost-effective choices regarding direct emissions but may not increase downstream product prices to reflect carbon content. Does not encourage cost-effective choices among downstream products.
Emissions certainty	Emissions at regulated sources will vary with economic shocks as well as specific technology shocks that mitigation costs. Tax rate adjustment may be needed to bring emissions in line with goals.	Cumulative emissions will be certain across regulated sources.	Emissions will fluctuate with the level of input or output used to define the emissions rate.
Price/cost certainty	Prices remain predictable based on government schedules.	Price will fluctuate in response to changing conditions and, importantly, any uncertainty about future caps.	Price will fluctuate in response to changing conditions and, importantly, any uncertainty about future emissions rate targets. Exactly how a rate versus a cap affects price and cost certainty is unclear.
Equity and distribution	Prices throughout the economy will adjust to reflect the price of carbon to direct emitters and all the downstream customers who buy products that involve carbon emissions in their production. Put another way, the perceived cost of the carbon tax will include not just the mitigation cost, but also the value of all the carbon that is emitted. This value will come to the government in the form of tax revenue that can be re-distributed—but it is unlikely to affect the perceived carbon cost.	Similar to a tax, prices throughout the economy will adjust to reflect the price of carbon to direct emitters and all the downstream customers who buy products that involve carbon emissions in their production. The main difference is that the value of the emitted carbon will go to the entities receiving the initial allowance allocation. These entities could include the government (if allowances are auctioned) or other stakeholders (emitting sources or downstream consumers) if they are given allowances for free or if they are designated a baseline emissions target from which only deviations pay (receive) a price.	By design, power prices only increase on the basis of mitigation costs to meet the performance standard. They do not rise to reflect the price of all embedded carbon as in a mass-based carbon-pricing scheme. Downstream consumers observe almost no price increase (and, in the short run, carbon-intensive product prices can fall). Compared with a tax or C&T system, the standard has much smaller distributional consequences (and, relatedly, no tax revenue or allowance value to distribute).

OPTIONS FOR USING THE VALUE STREAM GENERATED BY THE PRICING SYSTEM

As indicated above, carbon taxes and C&T programs create a volume of revenue or allowance value that must be administered in some way by the government. A target emissions level of 5 billion tons and a targeted carbon price of $15–$20 per ton, for example, generates $75–$100 billion of revenue or allowance value per year. Although this dollar range may fluctuate under a carbon tax or C&T system, it would appear to put carbon revenue fourth on the list of current federal revenue sources, behind individual income taxes, payroll taxes, and corporate income taxes (Tax Policy Center, http://www.taxpolicycenter.org/briefing-book/background/numbers/revenue.cfm).

What should be done with this value stream? Economists have studied the issue of how best to use the revenues from a carbon tax since the policy option first gained saliency about two decades ago (Bovenberg and Goulder 2000; Fullerton and Metcalf 1998; Goulder, Parry, and Burtraw 1997). In addition to economists' prescriptions, political factors and other considerations have led to the following commonly proposed uses of tax revenues or allowance values:

- **Dividend:** Return the proceeds directly to all households as an income transfer.

- **Reduce taxes:** Cut taxes on income, corporate taxes, and other revenue sources, possibly in a revenue-neutral way. Because these existing taxes distort economic decisions, removing them has economic efficiency benefits, referred to as the *double dividend*.

- **Direct to regulated sources**: Return the value to the regulated sources (typically emitters, but possibly upstream fossil fuel producers), thereby reducing their burden of paying for all carbon. Under a C&T system, allowances are given to sources formulaically, using bases such as history or output; under a tax, sources are liable for the tax only when emissions exceed a source-specific exemption (which should be transferable). Either way, emitters still face a common price defined by the tax or allowance market price as they make decisions at the margin to adjust emissions.

- **Distribute value to indirectly affected parties:** The proceeds could be sent to (or spent on programs for) parties that would bear a disproportionate burden of carbon pricing even if they are not directly regulated. These parties could include firms in energy-intensive, trade-exposed sectors that buy power from directly regulated sources, regions that depend on fossil fuel extraction, and low-income households that will absorb a larger share of their income in energy costs driven up by carbon prices.

- **Low-carbon technology programs:** Invest in programs to develop and induce adoption of low-carbon technologies.

- **Adaptation:** Invest proceeds in programs intended to help communities adapt to the impacts of climate change.

One attribute to consider in the above-noted uses is revenue neutrality, or the notion that any program proceeds be transferred back to the general population or distinct groups, but not be used to increase government expenditures or create new programs.

As shown in Table 2, each of the uses has some merit, but also potential tradeoffs among economic activity effects, distribution, and other practical considerations, including whether the use would be revenue neutral.

Table 2. Tradeoffs of carbon-pricing revenue uses.

	Criteria			
Revenue option	**Cost to economy**	**Distribution**	**Revenue neutral?**	**Other considerations (e.g., practical or political feasibility)**
Dividend	Low, though can undermine cost-effectiveness if dividend is based on energy use (thereby reducing incentive to cut energy).	Returns funds to ultimate source of labor and capital ownership that bear the cost burden to begin with. Fairness will depend on how dividend is computed – i.e., per household, based on use, number of people in household, or income.	Yes, in principle.	Inherent political appeal to recipient households, but possibly political opposition of other stakeholders deprived of the value of the revenue.
Reduce distortionary taxes	Strong potential to lower costs to the economy if used to reduce distortionary taxes.	Most benefits those whose taxes are reduced, potentially tilting distribution to higher-income households. If increased efficiency raises growth rate of economy, benefits may be more widespread.	Yes, in principle.	Inherent political appeal, but some skepticism from public about whether other taxes will really be cut. British Columbia has addressed this issue by having a transparent process, and political popularity has been high.
Direct to regulated sources	Low, though can undermine cost-effectiveness if payment is updated on the basis of emissions or other outcomes.	Compensates emitters for their direct burden, but may create windfall gains if their burden is already compensated by higher prices paid by downstream consumers (and lower prices received by fossil suppliers).	Yes, in principle.	Political forces often favor this kind of compensation to directly affected parties, regardless of their ability to recover their burden through market prices. Not all emitting sectors have equal ability to pass costs off to buyers and suppliers.
Distribute to indirectly affected parties	Cost-effectiveness can be undermined if payments are updated on the basis of production, energy use, or other outcomes. For instance, consumer refunds based on energy use would raise mitigation costs relative to a fixed dividend or transfer.	Distributional concerns are the underlying objective of the transfers.	Yes, unless compensation is indirect through government programs.	Is a particular distribution made through a permanent or transitional program? If made through a transitional program, the schedule appropriate to anticipate the needed transition will be a political issue. Where will the residual value go as the transitional program ends?
Low-carbon technology program	Has potential to increase economic output if it can correct externalities associated with	The first-order effect of technology subsidies is to accrue to owners of capital and labor targeted by the subsidies, but induced	No	Some political resistance to "picking winners" and recent well-publicized expensive loan guarantees (e.g., Solyndra).

	Criteria			
Revenue option	**Cost to economy**	**Distribution**	**Revenue neutral?**	**Other considerations (e.g., practical or political feasibility)**
	underinvestment in low-carbon technologies, but it could also lead to inefficiencies if it lets factors other than economic potential dictate how funds are allocated. The likelihood of non-economic allocation of funds would appear to be a greater risk if all $75-$100 billion was designated, rather than a smaller fund with a clear focus.	gains could be spread more widely. In-kind payments for special groups, e.g., low-income energy efficiency/ weatherization programs can reach target populations.		
Adaptation	In principle, averts some of the economic damage from climate change relative to no adaptation.	Depends how adaptation program distributes funds.	No.	Could be used to meet U.S. international commitments to fund adaptation under the UNFCCC. Could be used to fund adaptation programs in key U.S. regions.

SUMMARY OF THE RATIONALE FOR EACH OPTION

The main rationale for each of the mechanisms discussed above is as follows:

- **Carbon Tax (Fee):** This mechanism is relatively simple in operation and builds in certainty about costs. It may need to be coupled with a dividend or tax cuts to avoid "tax and spend" labeling.

- **Cap-and-Trade System:** This option is preferred by those focused on emissions but raises concerns about the predictability of costs. Allowance revenue may need to be given away as a dividend or through tax cuts to avoid special-interest giveaway concerns that emerged during the Waxman-Markey and Kerry-Graham-Lieberman legislative debates of 2009–2010.

- **Tradable Performance Standard:** This option is the most complex one examined here, and it only works in sectors where output is measurable. It avoids large changes in electricity and product prices, along with associated distributional consequences of redistributing all revenue (even if through dividends and tax cuts). Avoiding these price changes also makes this option less cost-effective than the other two options.

OTHER IMPORTANT FACTORS TO CONSIDER

The carbon-pricing options described here raise various considerations, including the following:

- **Interaction of carbon pricing with supplemental and overlapping policies:** Any number of policies will affect investment incentives to reduce GHG emissions. Individually and collectively, these policies might alter the effectiveness of a carbon-pricing regime.

- **Sector-specific approaches:** Carbon pricing could be deployed in different ways in different sectors. Policy makers could pursue a tradable performance standard in the power sector (one possible approach under the EPA's proposed Clean Power Plant rule) to minimize electricity price effects, but they might desire a tax or cap-and-trade system in another sector where concern about price effects is less prevalent.

- **Effective precedents:** Policy makers do not write on a blank sheet when they seek to price carbon. Efforts to do so in the European Union, Canada, and elsewhere can provide relevant insights, as can state-level efforts in the United States.

- **Transitional effectiveness:** At this point, U.S. federal climate policy is focused on conventional regulatory efforts, such as establishment of performance standards and enforcement of Clean Air Act programs. How these efforts might incorporate carbon pricing or transition to more comprehensive carbon-pricing regimes is a largely uninvestigated question.

REFERENCES

Bovenberg, A.L., and L.H. Goulder. 2000. "Environmental Taxation and Regulation in a Second-Best Setting." In *Handbook of Public Economics,* Second Edition, edited by A. Auerbach and M. Feldstein. New York: North Holland.

Fullerton, D., and G. Metcalf. 1998. "Environmental Taxes and the Double-Dividend Hypothesis: Did You Really Expect Something for Nothing?" *Chicago-Kent Law Review* 73: 221–256.

Goulder, L.H., I.W.H. Parry, and D. Burtraw. 1997. "Revenue-raising Versus Other Approaches to Environmental Protection: The Critical Significance of Preexisting Tax Distortions." *RAND Journal of Economics* 28(4): 708–731.