

FOR A LOW CARBON ECONOMY



## Carbon pricing, social equity and poverty reduction<sup>1</sup>

### Key Messages

- Putting a price on carbon, whether through a carbon tax or a cap-and-trade system, will enable Canada to make significant reductions in greenhouse gas emissions, at a lower marginal cost than command and control regulations.
- However, carbon pricing tends to disproportionately impact lower-income groups, who spend a greater proportion of their income on carbon-intensive goods, and have less ability to make substitutions towards lower-carbon alternatives. How governments use the carbon pricing revenues will determine the financial impacts on low-income households.
- Policies can be designed to minimize the financial impacts on low-income groups, while maintaining the incentive to reduce emissions. Policy options include recycling carbon revenues to tax cuts and refundable tax credits, providing lump sum payments, and subsidizing public transit and other lower-carbon options that reduce costs to low-income groups.
- Researchers have found that the most effective means of reducing the regressivity of a carbon price (i.e. its disproportionate impact on low-income households) is through lump sum payments to low-income households.
- The carbon revenues that governments can derive from carbon pricing can also be used to reduce poverty, over and above reducing the policy's regressive impact on low-income groups.

**Sustainable Prosperity** is a national research and policy network, based at the University of Ottawa. SP focuses on market-based approaches to build a stronger, greener economy. It brings together business, policy and academic leaders to help innovative ideas inform policy development.

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## The Issue

The approach to decarbonising the Canadian economy favoured by economists, and supported by many in the business and policy communities, is to price carbon.<sup>2</sup> Pricing carbon, either through a carbon tax or cap-and-trade system, makes carbon-intensive goods and services more expensive, thus shifting demand towards lower-carbon alternatives.

The cost burden associated with carbon pricing is shifted onto the public, either through higher prices or lower wages. This is known as the distributional impact of the policy, which measures who bears its economic burden.<sup>3</sup> The net impact on a particular household is a function of its reliance on carbon-intensive products or employment in a carbon-intensive sector, and its ability to substitute towards lower-carbon alternatives. Key design and policy concerns include ensuring that the policy is fair and does not exacerbate existing inequality. Carbon revenues can also be allocated towards reducing poverty, above and beyond addressing the distributional impacts of the policy.

## The Knowledge Base

Governments looking to price carbon can choose between a cap-and-trade system and a carbon tax. Several Canadian provinces (Alberta, British Columbia and Quebec) already have some form of carbon pricing in place, while others are actively considering it. Both options generate revenues for governments: a carbon tax through tax revenues and a cap-and-trade system through the sale of permits.

A carbon price will create an additional cost for companies and sectors that produce carbon-intensive goods and services. This price signal is necessary to spur the decarbonisation of the economy, by making carbon-intensive goods and services more expensive, thereby shifting demand towards lower-carbon alternatives and decreasing production in carbon-intensive sectors. Carbon is embedded in almost every product through the energy (assuming it is derived from a fossil fuel source) used to produce it. In addition to price increases for fossil fuels, which directly affect transportation, housing and fuel expenses, the cost of embedded carbon will impact the price of most goods and services, to varying degrees.

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<sup>2</sup> For details about Canadian business preferences for carbon pricing, see the February 2011 Sustainable Prosperity policy brief, "Canadian Business Preference on Carbon Pricing", available at: <http://sustainableprosperity.ca/article758>

<sup>3</sup> Rivers, Nic October 2010. "Distributional incidence of climate change policy in Canada". Sustainable Prosperity.

The costs of compliance to companies are passed on through changes in consumer prices, stock returns, wages, and other returns to factors of production.<sup>4</sup> A carbon pricing policy is intended to shift behaviour away from carbon intensive goods and fuels by raising their cost, in terms of:<sup>5</sup>

- the way households spend their income;
- the inputs firms use to produce goods; and,
- the allocation of labour and capital between economic sectors.

Carbon pricing policies are designed to produce major economic shifts. However, policies should be designed to protect the most vulnerable populations so that these policies are not regressive.

The elasticity of demand for the product in question will determine the extent to which carbon costs can be passed on to consumers. Companies that produce goods with inelastic demand (i.e. where price increases would not affect demand) would pass costs onto consumers through higher prices, thereby directly shifting the policy burden onto consumers.<sup>6</sup> On the other hand, companies whose products have elastic demand (i.e. where the quantity of product demanded does change with price) could be forced to absorb the additional carbon costs into their cost structure. To maintain competitiveness, these companies would be forced to cut costs elsewhere, which could result in lower wages, indirectly shifting the burden onto consumers. In the most carbon-intensive sectors, there could also be job losses as output decreases. Workers may have invested in developing skills relevant to a particular industry. If that industry shrinks, these workers will have more trouble finding a job in another sector, depending on skill transferability and availability of transition programs.<sup>7</sup> It is likely that the most intense impacts occur during the transition period (short-to medium-term) and that over time, wages and stock values would tend to return to their initial levels.<sup>8</sup>

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4 Grainger, Corbett A. and Kolstad, Charles D. August 2009. "Who pays a price on carbon?" National Bureau of Economic Research Working Paper.

5 Peters, Jotham, Bataille, Chris, Rivers, Nic and Jaccard, Mark. November 2010. "Taxing Emissions, Not Income: How to Moderate the Regional Impact of Federal Environment Policy". C.D. Howe Institute Commentary.

6 Rivers, Nic October 2010. "Distributional incidence of climate change policy in Canada". Sustainable Prosperity.

7 Fullerton, Don. August 2008. "Distributional Effects of Environmental and Energy Policy: An Introduction". National Bureau of Economic Research Working Paper.

8 Congressional Budget Office. April 25, 2007. "Trade-Offs in Allocating Allowances for CO<sub>2</sub> Emissions". Economic and budget issue brief.

## The International Knowledge Base

The literature shows that in developed countries (e.g. Denmark, Ireland, UK, US, etc.), a carbon price is regressive, unless complementary policies are introduced to reduce the impacts of the policy on lower income groups. The impacts are more regressive when calculated on a per-capita, rather than a household, basis.<sup>9</sup> The main driver of regressivity is the consumption and spending patterns of various income/expenditure groups.<sup>10</sup> In developing countries (e.g. China, Indonesia), research has shown a carbon tax to be progressive, owing to differences in carbon-intensity between urban and rural spending patterns.<sup>11</sup> That is, richer, urban dwellers' lifestyles are far more carbon-intensive than those of the rural population. Rural populations are also more likely to be employed in less energy and capital-intensive sectors, such as agriculture.<sup>12</sup>

Fossil fuel prices see the largest increases (as is intended by the carbon price), while the prices of other goods rises in relation to their embedded carbon content and associated carbon costs, but by a far lesser amount. Table 1 shows the ten goods with the highest expected price increases due to a hypothetical 57€/t CO<sub>2</sub>e carbon tax in the Netherlands. Other research confirms that the goods most impacted by a carbon price are gasoline, electricity, natural gas and food.<sup>13</sup>

Table 1: Top ten product groups experiencing the highest price increase with a 57€/t CO<sub>2</sub> tax in the Netherlands (2000)

PRODUCT GROUP	Price Increase (per cent)
Heating and lighting	101.5
Electricity	49.4
Gas including solid and liquid fuels	35.4
Gasoline and oil	28.4
Fish	11.4
Garden and flowers	6.8
Vegetables	5.6
Holidays, camp and weekend recreation	5.4
Toys	5.4
Butter, cheese and eggs	5.2

Source: Kerkhof, Annemarie C., Moll, Henri C., Drissen, Eric and Wilting, Harry C., January 2008. "Taxation of multiple greenhouse gases and the effects on income distribution: A case study of the Netherlands". *Ecological Economics* 67: 322.

9 Grainger, Corbett A. and Kolstad, Charles D. August 2009. "Who pays a price on carbon?" National Bureau of Economic Research Working Paper.

10 Grainger, Corbett A. and Kolstad, Charles D. August 2009. "Who pays a price on carbon?" National Bureau of Economic Research Working Paper.

11 Brenner, Mark, Riddle, Matthew and Boyce, James K. June 2005. "A Chinese Sky Trust? Distributional Impacts of Carbon Charges and Revenue Recycling in China". University of Massachusetts.

12 Yusuf, Arief Anshory. 2008. "The Distributional Impact of Environmental Policy: The Case of Carbon Tax and Energy Pricing Reform in Indonesia". Economy and Environment Program for Southeast Asia.

13 Grainger, Corbett A. and Kolstad, Charles D. August 2009. "Who pays a price on carbon?" National Bureau of Economic Research Working Paper.

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European countries have used at least some of their carbon tax revenues to reduce personal income taxes, which have shown to be ineffective in reducing a carbon tax's regressivity. Denmark implemented a CO<sub>2</sub> tax in 1992/1993, with separate schemes for industry and households. Low-income households are compensated through lowered income taxes and supplemental child support payments.<sup>14</sup> This approach has not fully offset the tax's regressivity, though other options to increase the tax's progressivity have not been explored because their cost is seen to be too high.<sup>15</sup> Sweden, which introduced a carbon tax in 1991, reduced income taxes to attempt to reduce the tax's regressivity, though data shows that it has not been effective in doing so.<sup>16</sup> Sweden also introduced a public transit subsidy, which decreased the price of transit by almost 30 per cent.<sup>17</sup> The Netherlands, which undertook a series of energy tax reforms between 1988 and 2002, has used the revenues raised from these taxes to lower personal income taxes, and also subsidize household energy efficiency investments.<sup>18</sup>

### The knowledge base in Canada

Research carried out in Canada shows that carbon pricing disproportionately impacts lower-income groups because expenditures on carbon-intensive goods make up a larger share of their expenses (see Figure 1 – where column one represents the lowest income group and five the highest). The low-income cut off (LICO) is considered to be when a household spends more than 70 per cent of its income on essentials (i.e. food, shelter, and clothing). Canadian households spend about six per cent on average of their total expenditures on fossil fuels, with the lowest quintile spending five per cent, the middle class about seven per cent, and the wealthiest also five per cent.<sup>19</sup>

Low-income households also tend to borrow more on a proportional basis, so their expenditures can exceed their income. Therefore, looking at expenditures can sometimes understate the actual distributional impact on lower-income groups. Figure 2 shows the share of income spent on fossil fuels by quintile, from lowest to highest. It clearly shows that lower-income groups spent a lot more of their income on fossil fuels (more than ten per cent for the lowest quintile) versus higher income groups (just over four per cent for the highest quintile).

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14 Wier, Mette, Birr-Pedersen, Katja, Klinge, Jacobsen, Henrik and Klok, Jacob. 2005. "Are CO<sub>2</sub> taxes regressive? Evidence from the Danish experience". *Ecological Economics* 52 (2005) 239-251.

15 Wier, Mette, Birr-Pedersen, Katja, Klinge, Jacobsen, Henrik and Klok, Jacob. 2005. "Are CO<sub>2</sub> taxes regressive? Evidence from the Danish experience". *Ecological Economics* 52 (2005) 239-251.

16 Miller, John. 2010. "Levelling the Carbon Playing Field: A Ralwsian Take on Carbon Taxation and Climate Justice". Indiana University Bloomington. Working Paper.

17 Bråannlund, Runar and Nordström, Jonas. 2004. "Carbon tax simulations using a household demand model". *European Economic Review* 48 (2004) 211-233.

18 Vollebergh, Herman R.J. 2008. "Lessons from the polder: Energy tax design in The Netherlands from a climate change perspective". *Ecological Economics* 64 (2008): 660-672.

19 Rivers, Nic January 2011. "Distributional impacts of climate change policy in Canada". Working Paper.

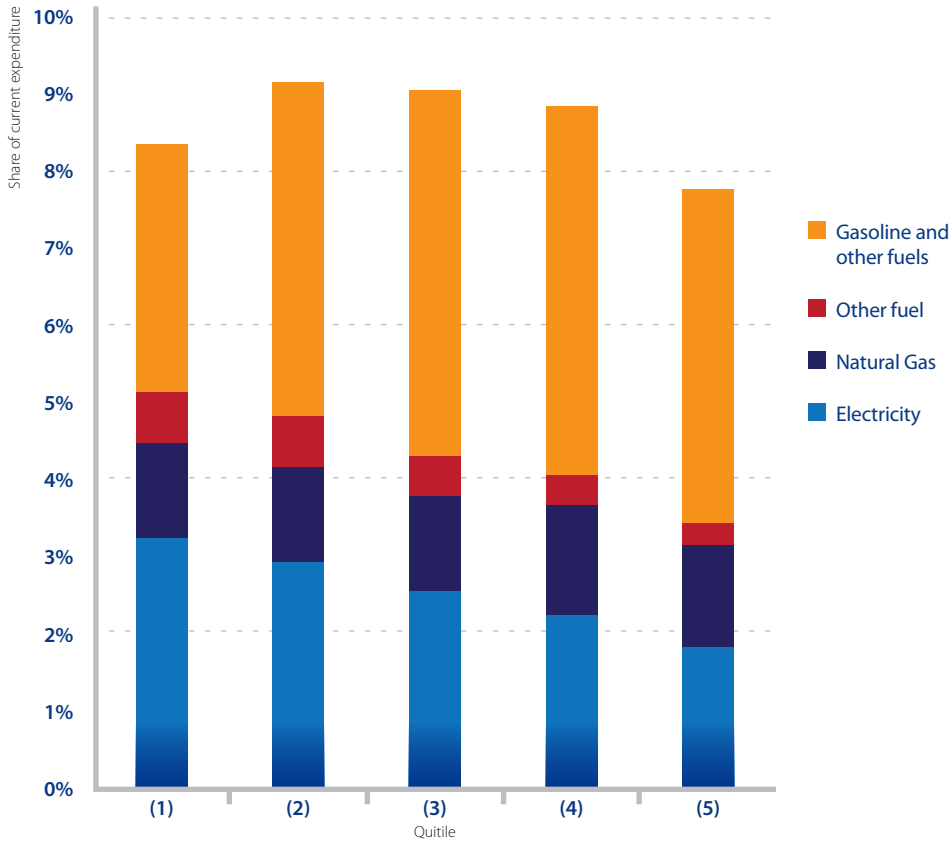


Figure 1:  
Share of expenditures on fossil fuels by quintile

Source: Rivers, Nic. January 2011. "Distributional impacts of climate change policy in Canada". Working Paper.

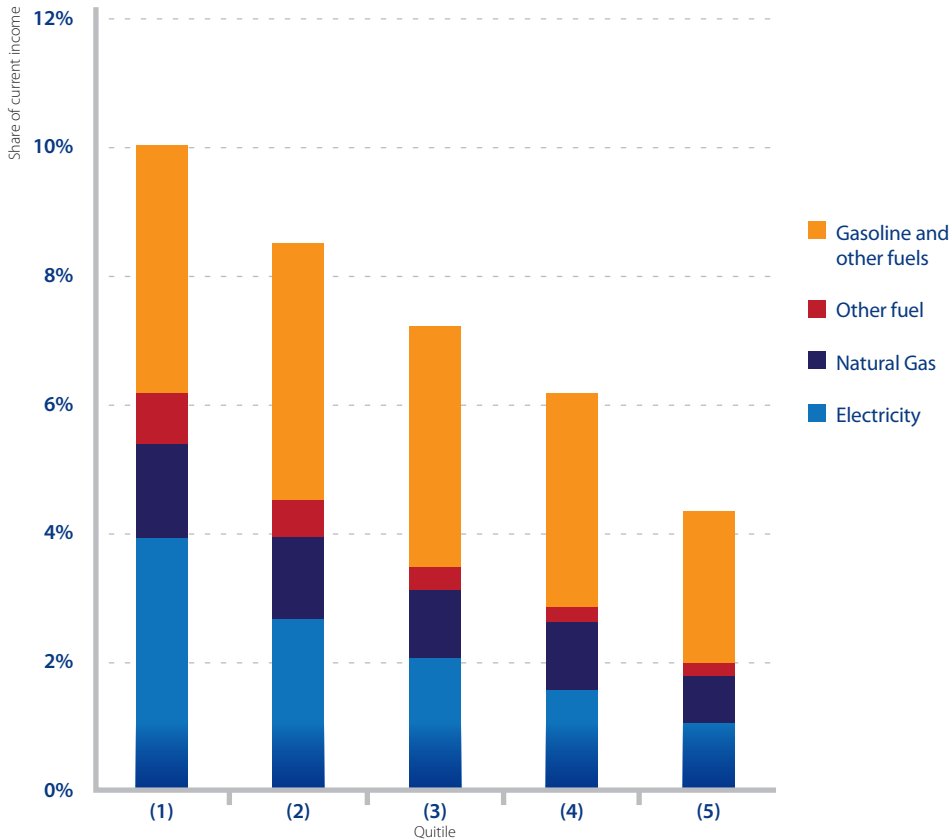


Figure 2:  
Share of income spent on fossil fuels by quintile

Source: Rivers, Nic. January 2011. "Distributional impacts of climate change policy in Canada". Working Paper.

Low-income groups also have less ability to substitute low-carbon alternatives, and tend to have different carbon spending patterns than higher income groups. For example, they may spend proportionately more on home heating (perhaps because their homes are less energy efficient), but less on motor fuels because they have a lower rate of vehicle ownership.<sup>20</sup> Rural households are more heavily impacted than those in urban areas, as they tend to have higher energy expenditures.<sup>21</sup> In addition to overall higher spending on fossil fuels, lower income groups may consume a greater amount of higher carbon content fuels (e.g. coal) than higher income groups.<sup>22</sup> Structural factors contribute significantly towards a household's spending pattern and ability to make substitutions with regards to carbon-intensive goods. For example, living in a suburb means increased dependence on automobile travel, due to greater distances and less access to public transit or other alternatives.

There are lifestyle and other factors besides income that may also make certain groups, such as women, Aboriginal peoples or others living in remote communities, more vulnerable to negative welfare impacts arising from carbon pricing. For example, rural and remote communities are often more dependent on fossil fuels (e.g. for travelling large distances, and often for electricity from diesel generators), with less flexibility to make substitutions (e.g. lack of public transit or electricity grid). The uneven impact of carbon pricing on different groups or communities can, without proper policy design, make carbon pricing's costs unfairly and unevenly distributed.

British Columbia (BC) implemented a carbon tax in 2008. Since its inception, the tax has raised \$848 million, which is projected to exceed one billion annually by fiscal 2012-13.<sup>23</sup> The tax itself is regressive after 2011, but "revenue neutral", as the impacts are offset by tax cuts to personal and corporate income taxes, and a Low Income Climate Action Tax Credit.<sup>24</sup> Research has shown that the tax credit is the most important tool for reducing the carbon tax's regressivity.<sup>25</sup> For BC's carbon tax to remain progressive, the low-income tax credit must be grown.<sup>26</sup>

Low-income groups also have less ability to substitute low-carbon alternatives, and tend to have different carbon spending patterns than higher income groups.

20 Speck, Stefan. 1999. "Energy and carbon taxes and their distributional implications". *Energy Policy* 27 (1999) 659-667.

21 Rivers, Nic January 2011. "Distributional impacts of climate change policy in Canada". Working Paper.

22 Callana, Tim, Lyons, Seán, Scott, Susan, Tol, Richard S.J. and Verde, Stefano. July 2008. "The Distributional Implications of a Carbon Tax in Ireland". Economic and Social Research Institute Working Paper.

23 Government of British Columbia, "Tax Cuts Funded by the Carbon Tax", n.d. Available online at: <http://www.fin.gov.bc.ca/tbs/tp/climate/A2.htm>.

24 Lee, Marc and Sanger, Toby. October 2008. "Is BC's Carbon Tax Fair? An Impact Analysis for Different Income Levels". Canadian Centre for Policy Alternatives (BC Office).

25 Lee, Marc and Sanger, Toby. October 2008. "Is BC's Carbon Tax Fair? An Impact Analysis for Different Income Levels". Canadian Centre for Policy Alternatives (BC Office).

26 Lee, Marc and Sanger, Toby. October 2008. "Is BC's Carbon Tax Fair? An Impact Analysis for Different Income Levels". Canadian Centre for Policy Alternatives (BC Office). Page 5.

## How Governments Can Lessen the Regressive Impacts of Climate Policy on Vulnerable Populations

Carbon pricing, either through a carbon tax or cap-and-trade system, can generate substantial revenues for governments. Table 2<sup>27</sup> shows the estimates that have been made for Canadian carbon revenues at the national level.

Table 2: Estimates of carbon price revenue by 2020 (2009)

ORGANIZATION	Estimated annual revenue by 2020
National Roundtable for the Environment and Economy (NRTEE)	\$53 billion <sup>28, 29</sup>
David Suzuki Foundation and the Pembina Institute	\$45.5 billion <sup>30</sup>
David Suzuki Foundation	\$50 billion <sup>31</sup>

Source: Various; see footnotes

Research suggests that the distributional effects of carbon pricing are determined by how governments choose to allocate revenues.<sup>32</sup> The substantial revenue potentially generated by a carbon pricing policy creates a number of policy options for governments to consider, and revenue can be divided so that several options are implemented simultaneously. The following uses of revenue have been proposed in various jurisdictions that are currently, or are considering, pricing carbon: revenue recycling (i.e. personal and/or corporate tax cuts), deficit reduction, public investment, addressing distributional issues and poverty reduction. When deciding amongst revenue disbursement options (or combination of options), there are a variety of factors for governments to consider, including environmental effectiveness, economic efficiency, distributional impacts (equity), and administrative and political feasibility.<sup>33</sup>

Research suggests that the distributional effects of carbon pricing are determined by how governments choose to allocate revenues.

27 From: Sustainable Prosperity, December 2010. "Carbon Pricing, Climate Change, and Fiscal Sustainability in Canada". Available online at: <http://sustainableprosperity.ca/article586>

28 NRTEE, "Achieving 2050: A Carbon Pricing Policy for Canada (Advisory Note)," 2009. Available online at: <http://www.nrtee-trnee.com/eng/publications/carbon-pricing/carbon-pricing-advisory-note/carbon-pricing-advisory-note-eng.pdf>.

29 Note NRTEE published this estimate of revenue discounted to a present value at a rate of 8%, or roughly \$18 billion per year by 2020. The estimate quoted here represents the author's calculation of the *undiscounted* figure, to facilitate comparison with other estimates.

30 Pembina Institute and David Suzuki Foundation, Climate Leadership, Economic Prosperity, 2009. Available online at: <http://pubs.pembina.org/reports/climate-leadership-report-en.pdf>.

31 David Suzuki Foundation, "Pricing Carbon: Saving Green," 2008. Available online at: [http://www.davidsuzuki.org/publications/downloads/2008/Pricing\\_Carbon\\_saving\\_green\\_eng.pdf](http://www.davidsuzuki.org/publications/downloads/2008/Pricing_Carbon_saving_green_eng.pdf).

32 Rivers, Nic January 2011. "Distributional impacts of climate change policy in Canada". Working Paper.

33 For a thorough discussion of these criteria, see NRTEE, "Achieving 2050: A Carbon Pricing Policy for Canada (Technical Report)," 2009. Available online at: <http://www.nrtee-trnee.com/eng/publications/carbon-pricing/carbon-pricing-tech/carbon-pricing-tech-background-eng.pdf>.



## Addressing Distributional Issues

Because carbon pricing, and its impact on energy prices, is likely to be regressive, governments should allocate some of the carbon pricing revenues to help offset those impacts. Vulnerable groups should not be made to disproportionately bear the costs of a policy. Perhaps the strongest argument in favour of using at least some portion of carbon revenues to reduce distributional issues is that it is a necessity to sustain long-term political support of carbon pricing. This option would also increase the fairness of the policy, which is an often cited concern of policy makers. Just as governments consider the uneven competitiveness and carbon leakage impacts of carbon pricing on sectors of the economy, households, particularly those with low incomes, need support in adjusting to a carbon price.

## Poverty Reduction

In Canada, more than 3 million people are living below Statistics Canada's after-tax low-income cut-off.<sup>34</sup> Governments can also allocate carbon revenue towards a more significant poverty-reduction program. Poverty can also exacerbate environmental issues (and vice-versa), for example, as low-income groups may be more dependent on natural resources, and more prone to overharvesting to help meet basic needs.

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<sup>34</sup> Yalnizyan, Armine. August 2010. "The problem of poverty post-recessions". Canadian Centre for Policy Alternatives. Page 3. Available at: <http://www.policyalternatives.ca/sites/default/files/uploads/publications/reports/docs/Poverty%20Post%20Recession.pdf>

## Policy Options: Reducing Impacts on Vulnerable Populations

There are a variety of options that governments can implement to increase the fairness and progressivity of a carbon price to build off these existing programs, as shown in table 3.

Table 3: Options available to government to reduce the regressivity of carbon prices

CATEGORY	Option	Pros	Cons
<b>Tax Reform</b>	• Reduce distortionary taxes (i.e. payroll, income and corporate).	• Economists tend to view this as the most economically efficient option.	• Doesn't reduce regressivity (doesn't fully offset price increases). <sup>38</sup>
	• Tax credit (refundable or not).	• Relatively easy to administer and deliver. • Has been used successfully in jurisdictions with a carbon tax (e.g. BC).	• Increases the level of inequality in society. <sup>39</sup> • Forgoes opportunity to reduce distortionary taxes.
<b>Income support</b>	• Provide a lump sum carbon rebate.	• Preserves the incentive to reduce emissions. <sup>40</sup> • Found to be the most effective in reducing regressivity. <sup>41</sup> • Increases the level of equality in society. <sup>42</sup>	• Forgoes opportunity to reduce distortionary taxes.
<b>Subsidies</b>	• Fund building energy efficiency improvements. <sup>43</sup> • Transitional assistance for those working in affected sectors. <sup>44</sup> • Subsidized public transit. <sup>45</sup>	• Funds are targeted to address specific issues, including structural issues such as lack of access to public transit in city suburbs.	• Forgoes opportunity to reduce distortionary taxes. • Doesn't reduce regressivity (doesn't fully offset price increases).
<b>Other assistance</b>	• Help lines. <sup>46</sup> • Education.		

Source: Various, see footnotes

Researchers have modeled the different options available to governments looking to offset the regressivity of carbon pricing. In the Canadian context, Rivers found that lump sum payments, versus reductions in personal income taxes, are more effective in mitigating the regressive impacts of a carbon pricing policy.<sup>44</sup>

35 Blonz, Joshua, Burtraw, Dallas and Walls, Margaret A. September 2010. "Climate Policy's Uncertain Outcomes for Households: The Role of Complex Allocation Schemes in Cap and Trade". Resources for The Future.

36 Rivers, Nic 2011. "Distributional incidence of climate change policy in Canada". Working paper.

37 Callana, Tim, Lyons, Seán, Scott, Susan, Tol, Richard S.J. and Verde, Stefano. July 2008. "The Distributional Implications of a Carbon Tax in Ireland". Economic and Social Research Institute Working Paper.

38 Blonz, Joshua, Burtraw, Dallas and Walls, Margaret A. September 2010. "Climate Policy's Uncertain Outcomes for Households: The Role of Complex Allocation Schemes in Cap and Trade". Resources for The Future.

39 Rivers, Nic, 2011. "Distributional incidence of climate change policy in Canada". Working paper.

40 Feng, Kuishuang, Hubacek, Klaus, Guan, Dabo, , Contestabile, Monica, Minx, Jan and Barrett, John. 2010. "Distributional Effects of Climate Change Taxation: The Case of the UK". Environ. Sci. Technol. 2010, 44, 3670–3676.

41 Brenner, Mark, Riddle, Matthew and Boyce, James K. June 2005. "A Chinese Sky Trust? Distributional Impacts of Carbon Charges and Revenue Recycling in China". University of Massachusetts.

42 Bräannlund, Runar and Nordström, Jonas. 2004. "Carbon tax simulations using a household demand model". European Economic Review 48 (2004) 211-233.

43 Callana, Tim, Lyons, Seán, Scott, Susan, Tol, Richard S.J. and Verde, Stefano. July 2008. "The Distributional Implications of a Carbon Tax in Ireland". Economic and Social Research Institute Working Paper.

44 Rivers, Nic 2011. "Distributional incidence of climate change policy in Canada". Working paper.

When choosing options, policy makers must consider how the targeted recipients already interact with the government, and the income support programs already in place, to ensure efficient delivery. Participation rates in existing government income-support programs or tax credits can demonstrate the delivery mechanism with the highest potential uptake rate. For example, tax cuts do not benefit lower income groups because they pay little in income taxes.<sup>45</sup> But tax credits can offer an income support solution even to those not paying taxes. Policy-makers must pay careful attention to design issues and unintended consequences, even after they have selected what seems to be the appropriate instrument.

## Implications for Policy-makers:

1. Canadian policy-makers should regard carbon pricing as the best option to achieve significant carbon emissions reductions while setting Canada on the path towards a low-carbon economy. At the same time, careful policy design is necessary to ensure that vulnerable populations are not disproportionately affected by such a policy.
2. There are trade-offs between equality and economic efficiency when it comes to choosing how to allocate revenues from a carbon price. The fact is that the most economically efficient policies tend to exacerbate income inequality.<sup>46</sup>
3. It is government's responsibility to ensure the fairness and equality of its policies, suggesting that at least a portion of carbon revenues should be directed towards reducing the negative financial impacts of the policy on low-income and vulnerable groups. Lump sum payments are the most effective means of mitigating the regressive impacts of a carbon pricing policy on low-income households.
4. If real poverty reduction is an objective of government, future carbon revenues potentially offer a source of revenue to provide low-income Canadians additional income support.

Lump sum payments, versus reductions in personal income taxes, are more effective in mitigating the regressive impacts of a carbon pricing policy.

45 Rivers, Nic 2011. "Distributional incidence of climate change policy in Canada". Working paper.

46 Rivers, Nic 2011. "Distributional incidence of climate change policy in Canada". Working paper.