

**Report**

# Options in recycling revenues generated through carbon pricing

How 16 governments invest their carbon revenues

**Climate Change**  
April 2013



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# Foreword

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In October 2010, ICMM's Council of CEOs approved the establishment of a new program of activities aimed at the climate change issue. The program would have at its core the idea of championing a "principle-based" approach to guide developing climate change policies, regulations and laws. In addition, it would establish ICMM as a "thought leader" in certain key topics. The following year, they approved a set of seven principles for climate change policy designed to guide the development of effective and efficient national and sub-national climate change approaches that contribute to sustainable development while remaining competitive in a low carbon economy.

*Options in recycling revenues generated through carbon pricing* is one of a series of three reports that describe our work in those areas over the last two years. The other publications look at responding to the risks associated with the physical impacts of climate change and impacts of carbon prices on the competitiveness of commodities in four regions.

ICMM's second principle for climate change policy design states that climate change-related revenues should be used to manage a transition to a low carbon future. Specifically, they should be used to support the development of climate-friendly technologies and to help exposed economic sectors and populations adjust to the costs associated with a carbon limited future.

This report examines how 16 regulatory authorities (representing regional and national governments) are managing their carbon revenues. As far as we are aware, this is the most comprehensive review of current revenue recycling activities that has been published. It is our hope that this analysis will help to inform the public policy debate around this critical issue.

ICMM and its members are committed to playing a constructive and substantive role in the ongoing climate change policy dialogue. This report is a demonstration of that commitment.

Ultimately, our aim is to ensure that we strengthen our contribution to sustainable development by playing our part in addressing the climate change challenge, while at the same time securing the continued competitiveness of the mining and metals industry.



**R Anthony Hodge**  
President, ICMM

# Executive summary

## Scope of this report

This report investigates the management of revenues generated through different carbon pricing policies worldwide and provides recommendations for the design and implementation of such schemes in future. Policies are framed on the principle to “apply climate change related revenues to manage a transition to a low carbon future” (ICMM 2011).

In elaborating on the implementation of that principle, ICMM states: “Emission reduction policies and measures provide new sources of revenues for governments. Such revenues should be directed towards two specific areas: (1) supporting the development of climate friendly technologies; and (2) helping ‘exposed’ economic sectors and populations adjust to the costs associated with a carbon limited future” (ICMM 2011).

This report provides a comprehensive review of existing policy mechanisms in developed and developing countries. Its scope extends beyond the mining and metals sectors and is a contribution to the wider policy debate.

Given that several carbon pricing schemes, including China’s pilot regional emissions trading initiatives, are in the early stages of development, they have not been included here. The review covers revenues generated by carbon taxes and by carbon emissions trading schemes. It does not include broadly defined measures such as sulphur and energy taxes because these environmental, market-based initiatives do not address the carbon content of fuel.

**“The revenues generated by carbon related policies are used in a wide variety of ways around the world; the choice of mechanism adopted in a given jurisdiction reflects local economic and political factors.”**

## Uses of revenues

The revenues generated by carbon related policies are used in a wide variety of ways around the world; the choice of mechanism adopted in a given jurisdiction reflects local economic and political factors. Revenues are being used:

- to support the development of climate-friendly technologies
- to support wider governance issues (such as climate change programming inside governments)
- to protect and/or help ease the transition to low carbon regimes for specified populations
- to help protect trade exposed economic sectors.

Another broad category of use addresses funds designed to be revenue neutral to the authority imposing the fee, as in the case of environmental tax reforms.

In this report, we limit the scope of revenue recycling measures to spending programs linked to the revenue source either explicitly in the legislation or via a statement of political intent, or where a package of measures is designed to be revenue neutral to government.

Not all the carbon pricing measures assessed in this report include plans to recycle revenues to develop climate-friendly technologies or to help vulnerable populations and industry. Many governments see carbon revenues as simply another source of funding for general government expenditure. In some cases, such as the Republic of Ireland carbon tax, the revenues flow into general government budgets; often they are introduced as part of wider tax reform packages rather than in legislation to address climate change specifically. This may even be the case in countries that have revenue recycling schemes in place but are still using a portion of proceeds towards general expenditures or, as in the case of Australia, potentially overcompensating their low- and middle-income population.

However, in many cases some or all of the revenues are theoretically intended for purposes in keeping with the ICMM statement. This is more common when the revenues are used to finance low carbon investment measures (eg carbon sequestration, “greening” energy production).

**“As there are potential trade-offs between the economic, social and environmental outcomes of all these measures, the choice of recycling mechanism is ultimately political and there is no single, optimal approach to recycling carbon revenues. Furthermore, policy must take into account local factors, so it is not possible to design a one-size-fits-all recycling scheme.”**

In other cases, the funds may be used to compensate vulnerable individuals and/or industries so that they are not affected unduly by the carbon tax or other climate measures. Individuals may receive compensation in the form of cash payments, reductions in income tax rates or energy bills, or incentives to fund improvements in household energy efficiency. In the case of industry, corporate taxes may fall and/or direct financial payments may be made to energy intensive industries for the costs of electricity price rises, such as under the European Union’s emissions trading system (EU ETS). Carbon revenues may support the cost of these measures in full or in part.

As mentioned, revenues also can be used to reduce the impacts of carbon pricing on exposed economic sectors (those that are energy intensive and operate in competitive global markets). These revenues can reduce the potential for carbon leakage,<sup>1</sup> for example by funding tax rebates to help keep industries in more costly jurisdictions. That said, providing industry with trading allowances for free has usually been the predominant means used in protecting exposed sectors, in which case no carbon revenue is collected.

### Assessment of different options

Hypothetically, from the perspective of efficient price signals, recycling schemes should reduce existing distortions caused by labour or corporate taxes and provide funding for investments that are likely to have both short- and long-term economic benefits. However, there is some question as to whether these measures might bypass vulnerable groups (particularly those outside the labour market), so a combination of approaches may be more effective in helping such populations.

Current theoretical literature says a strong double dividend signal out of revenue recycling materializes only when the relevant tax regime is already highly distortionary. Yet experience appears to give us an entirely different sort of message. Results from *ex ante* modelling studies provide relatively strong support for the notion that a double dividend is being achieved in many instances.

As there are potential trade-offs between the economic, social and environmental outcomes of all these measures, the choice of recycling mechanism is ultimately political and there is no single, optimal approach to recycling carbon revenues. Furthermore, policy must take into account local factors, so it is not possible to design a one-size-fits-all recycling scheme.

Section 2 first reviews some 16 different revenue recycling mechanisms currently being implemented by regional and national governments with Section 3 using a review of current academic literature to evaluate the relative efficiencies and effectiveness of those schemes.

However, policymakers can look to certain general principles as they develop revenue recycling schemes. In particular, it is usually preferable to use incentives that function within existing markets. For example, governments may be able to encourage job creation by using the carbon revenues to fund a reduction in labour taxes. They can support innovation by recycling carbon revenues into financial instruments to promote technological development.

<sup>1</sup> “Carbon leakage” refers to the possibility of industries shifting production out of a jurisdiction in which they pay relatively high costs for emitting carbon into another region with less or no constraints on greenhouse gas (GHG) emissions.

# Executive summary

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## Recommendations

We recommend that when designing revenue recycling measures, policymakers ask the following questions:

1. Who are the vulnerable socio-economic groups and what are the economic sectors that will be exposed to carbon pricing?
2. How can policymakers target vulnerable groups in an efficient economic manner, to provide them with relief from the impact of carbon measures?
3. How else could the tax system be adjusted, with the help of carbon price revenues, to increase economic welfare?
4. Are the requirements for long-term research and development (skilled workforce, companies, research facilities) in place and ready to access investment?
5. Where can the most cost-effective investments be made to reduce energy consumption and emissions?
6. Could investment in adaptation measures have better social outcomes?
7. What are the most effective mechanisms for supporting these investments?

**“Policymakers can look to certain general principles as they develop revenue recycling schemes. In particular, it is usually preferable to use incentives that function within existing markets.”**



SECTION

1

Background

# SECTION 1

## Background

### 1.1 Introduction

#### Background and objective

This report was commissioned by the International Council on Mining and Metals (ICMM) and conducted by Cambridge Econometrics. Its aim is twofold: to review the management of revenues generated through carbon pricing policies, and to develop recommendations for the future management of these revenues in a manner consistent with ICMM's principles for the design of climate change policy.

This is the most comprehensive review of carbon revenue recycling measures undertaken to date. That said, the report is based on a review of publicly available information (mainly online) rather than through original research or individual discussions with public officials. The scope is largely restricted to policies implemented at national or state/province level. Policies still under design (such as those in China) have not been included.

**“We draw on the economic literature to assess which policies are the most economically efficient, and also consider other issues, such as the equity considerations implied by the ICMM principles’ reference to vulnerable groups.”**

#### ICMM’s principle for revenue use

In Section 2 we first investigate whether revenue recycling measures are in place for each carbon pricing policy reviewed. We then assess these measures against ICMM’s second principle for climate change policy,<sup>2</sup> which holds that policymakers should: “apply climate change related revenues to manage a transition to a low carbon future”.

Then we assess revenue recycling policies against ICMM’s statement regarding implementation of the second principle for revenue recycling, which reads as follows: “Emission reduction policies and measures provide new sources of revenues for governments. Such revenues should be directed towards two specific areas: (1) supporting the development of climate friendly technologies; and (2) helping ‘exposed’ economic sectors and populations to adjust to the costs associated with a carbon limited future” (ICMM 2011).

We pay special attention to the detailed design of policies as we assess them against this statement. Considerations include:

- governance structure
- funding structure
- whether the policy mechanism is transparent and how its implementation is assured.

Exposed economic sectors are assessed separately from exposed (vulnerable) populations. This is because of fundamental differences between the two and the policy mechanisms targeting them.

#### Assessment of options

In Section 3, we draw on the economic literature to assess which policies are the most economically efficient, and also consider other issues, such as the equity considerations implied by the ICMM principles’ reference to vulnerable groups. We also comment on the issue of policy/revenue uncertainty and the impact this has on revenue recycling policy.

In Section 4 we draw broad conclusions from the report and make recommendations for future revenue recycling policies that will accord with ICMM’s principles, drawing on academic literature covering both theoretical analysis and empirical overviews.

<sup>2</sup> As part of the implementation of its climate change program, ICMM has set out seven principles for climate change policy design (ICMM 2011).

## 1.2 Defining revenue recycling

The definition of revenue recycling used in this report is aligned with ICMM's principles:

We limit the scope of revenue recycling measures to spending programs linked to the revenue source either explicitly in the legislation or via a statement of political intent, or where a package of measures is designed to be revenue neutral to government.

The definition encompasses a relatively broad array of institutional arrangements. For example, the legislation establishing the British Columbia recycling scheme stipulates that the revenue collected must be fully compensated for by an associated reduction in non-environmental taxation (Province of British Columbia 2008). This contrasts with the revenue recycling arrangements for the Australia carbon price, for which the size and continuation of the revenue recycling commitment is not protected by legislation. Nevertheless, the establishment of a core component of the recycling scheme is enshrined in legislation and the Government has set out specific plans for how the revenues would be allocated over time (Australian Government 2011). This is taken to constitute a clear statement of political intent. The second part of our revenue recycling definition refers to those schemes, such as the UK climate change levy, for which the introduction of the carbon price was accompanied by a reduction in other taxation. However, these two measures were not linked in legislation either explicitly or through a strong statement of political intent. In practice, it is difficult to pinpoint revenue recycling because of the complexities in linking specific revenue, such as that generated by a carbon pricing mechanism, with a specific government expenditure.

Revenues accruing to government from carbon taxes or carbon pricing mechanisms, such as trading systems with auctioning, can be used to:

- reduce government borrowing
- reduce other taxes
- increase government spending.

In most cases, the revenue recycling measures and carbon price measure are implemented in one piece of legislation. However, in some cases, the revenue recycling measures are in a separate piece of legislation that is bound to the statute enabling the carbon price.

So, although all revenue is recycled in some form or other, this report excludes revenues used to reduce government borrowing and to implement general government spending plans. Instead, this report focuses on revenue recycling measures that are either:

- referenced by legislation either explicitly or via a statement of political intent, or
- introduced in a package of measures so that the carbon pricing revenues reduce other taxes.

This report does not assess the free allocation of allowances from trading schemes or any possible tax-free emissions up to a threshold under a carbon tax, as no revenues are collected.

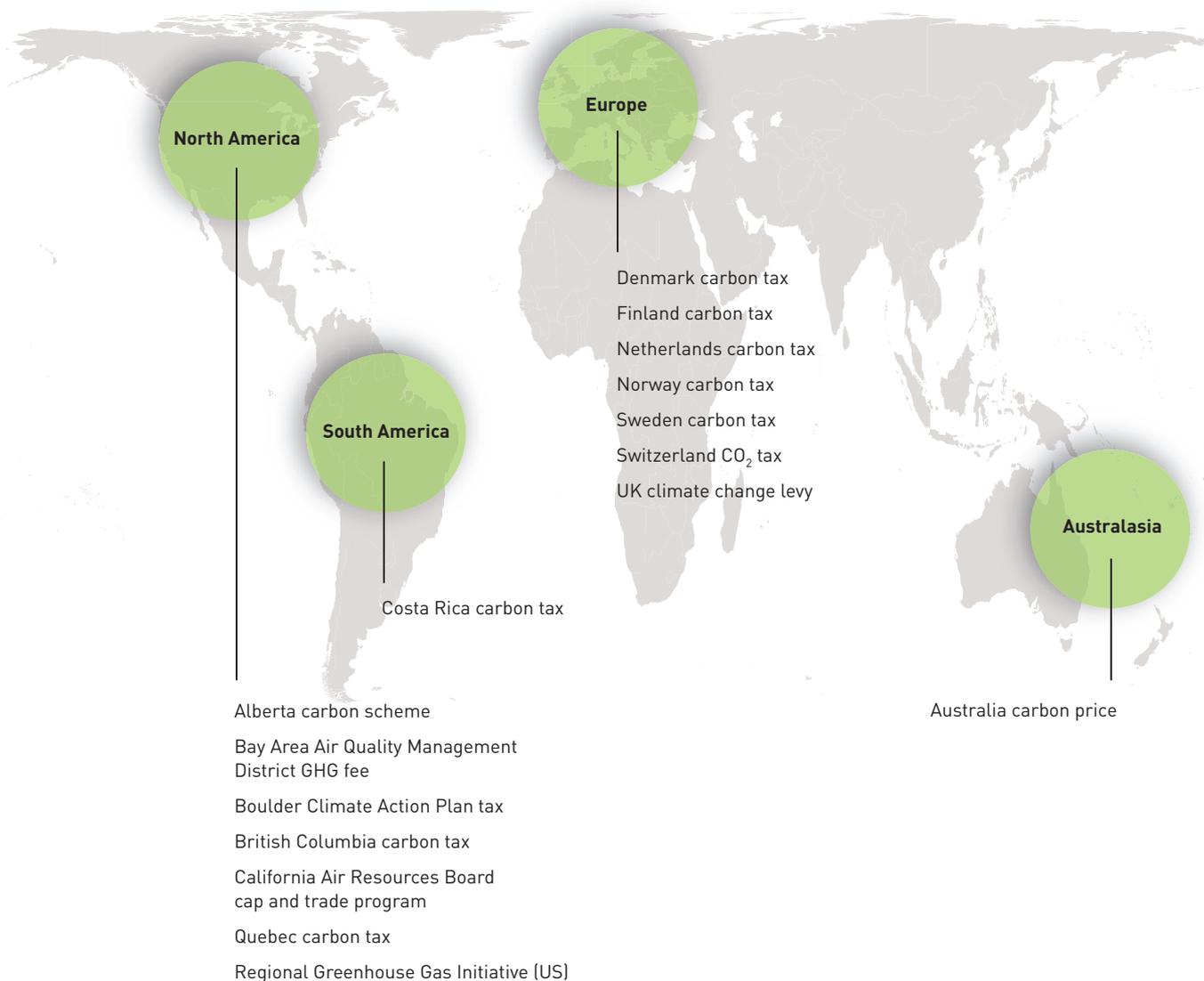
**“In practice, it is difficult to pinpoint revenue recycling because of the complexities in linking specific revenue, such as that generated by a carbon pricing mechanism, with a specific government expenditure.”**

## SECTION 1

# Background

This report has identified 16 cases where public revenues accruing from carbon pricing are working to varying degrees of success, to either support the development of climate-friendly technologies and/or help exposed populations and industry adjust to the costs associated with a carbon limited future.

### Sixteen national and regional governments that are assessed in this report





SECTION

# 2

Current  
revenue  
recycling  
policies

## SECTION 2

# Current revenue recycling policies

### 2.1 Introduction

In this section we identify a range of revenue recycling policies in different countries and assess them against ICMM's second principle. This principle has two features: supporting the development of climate-friendly technologies and helping "exposed" economic sectors and populations to adjust to the costs associated with a carbon limited future. We address these features in Sections 2.3 to 2.5 (and with additional detail in Appendix B to Appendix D).

### 2.2 Carbon pricing mechanisms with revenue recycling

This report examines 16 revenue recycling programs that fit the ICMM two-part definition; these schemes are summarized in Table 2.1. Total revenues from each program are outlined in Table 2.2.

**Table 2.1: Carbon pricing programs with revenue recycling**

Carbon pricing programs	Low carbon related investments	Broader economic support	Protecting vulnerable populations
<b>North and South America</b>			
Alberta carbon scheme	✓		
Bay Area Air Quality Management District GHG fee	✓		
Boulder Climate Action Plan tax	✓		
British Columbia carbon tax		✓	✓
California Air Resources Board cap and trade program	✓		
Costa Rica carbon tax	✓		✓
Quebec carbon tax	✓		
Regional Greenhouse Gas Initiative (US)	✓		✓
<b>Europe</b>			
Denmark carbon tax		✓	
Finland carbon tax		✓	
Netherlands carbon tax		✓	✓
Norway carbon tax		✓	
Sweden carbon tax		✓	
Switzerland CO <sub>2</sub> tax	✓		
UK climate change levy		✓	
<b>Australasia</b>			
Australia carbon price <sup>3</sup>	✓	✓	✓

Sources: Legislative Assembly of Alberta (2008), Australian Government (2011), BAAQMD (2008b), City of Boulder (2009), Government of British Columbia (2010), California Legislature (2012), Pagiola. (2006), Hoerner and Bosquet (2001), Bosquet (2000), Government of Quebec (2008), RGGI Inc (2011), Swiss Federal Council (2007), National Audit Office (2007).

Please note that the table does not cover support for the emissions intensive trade exposed sector because its definition and method of compensation differs significantly across systems and cannot be fairly compared in a simple layout such as the one provided by Table 2.2. For further information, refer to a concurrent report by ICMM entitled, *The cost of carbon pricing: competitiveness implications for the mining and metals industry*.

<sup>3</sup> The Australia carbon price is often described as a tax but will operate as a fixed price ETS until July 2015 when it will shift to a flexible-price ETS [Australian Government 2011]. Most, but not all, of the support for exposed sectors is in the form of free allowances.

**Table 2.2: Total revenues for carbon pricing programs linked to revenue recycling**

Carbon pricing programs	Calendar/ fiscal year	Net revenue collected (US\$m)	Revenue recycled (US\$m)	Revenue recycled (% GDP)
<b>North and South America</b>				
Alberta carbon scheme	2010/11	76.8	57.6	0.02
Bay Area Air Quality Management District GHG fee	2009	1.2	1.2	0.00
Boulder Climate Action Plan tax	2010	1.8	1.6	0.01
British Columbia carbon tax	2010/11	748.9	874.2	0.55
California Air Resources Board cap and trade program	n/a	n/a	n/a	n/a
Costa Rica carbon tax	2003	182.9	6.4	0.04
Quebec carbon tax	2010/11	202.1	202.1	0.06
Regional Greenhouse Gas Initiative (US)	2010	350.8	272.9	0.01
<b>Europe</b>				
Denmark carbon tax	2000	95.9	95.9	0.06
Finland carbon tax	1997	204.5	204.5	0.17
Netherlands carbon tax	1996	144.0	144.0	0.03
Norway carbon tax	1999	101.2	101.2	0.06
Sweden carbon tax	1991	1,652.0	1,652.0	0.64
Switzerland CO <sub>2</sub> tax	2011	736.4	736.4	0.12
UK climate change levy	2010/11	1,080.8	1,080.8	0.04
<b>Australasia</b>				
Australia carbon price	2012/13	7,988.5	7,602.5	0.48

**Sources:**

Government of Alberta (2012), Australian Government (2011), City of Boulder (2011), Government of British Columbia (2012), Sánchez-Azofeifa et al (2007), Hoerner and Bosquet (2001), Sumner et al (2011), Government of Quebec (2012), RGGI Inc (2011), HMRC (2011), ONS (2012), IMF (2012a), IMF (2012b), World Bank (2012), BEA (2012a), BEA (2012b), Statistics Canada (2012), Federal Reserve Bank of St Louis (2012).

**Please note that:**

Alberta carbon related revenues recycled are net of operational costs.

Australia carbon price: based on Australian Government forward estimates. Revenues collected and recycled are inclusive of free allowance allocations. Revenue recycled is exclusive of governance costs.

Bay Area GHG fee: percentage of GDP figure relates to the wider metropolitan area of San Francisco-Oakland-Fremont.

California cap and trade program is still within its first year of operation and revenue forecasts are not yet available.

Regional Greenhouse Gas Initiative: raw revenue data refers to the nine quarters from 2008Q4 to 2011Q1. The figures displayed are a pro rata amount for 2010.

## SECTION 2

# Current revenue recycling policies

This section and Sections 2.3 and 2.4 focus on recycling programs backed either by specific legislative provisions or via a statement of political intent, while other policies using broader measures of revenue recycling are discussed in Section 2.6.

Legislation and regulations providing the basis for revenue recycling measures can be implemented in several different ways. In the simplest case, the revenue recycling and carbon pricing mechanisms are introduced in a single piece of legislation. This is the situation for most recycling programs based in legislation (see Appendix A, Table A.1 for a full list of these). However, in some cases the carbon price and revenue recycling are implemented in separate, but linked, pieces of legislation. Some examples:

- In Australia, the carbon price was implemented via the Clean Energy Act 2011. However, the household assistance components of the revenue recycling measures were implemented through separate pieces of legislation and written to come into force only when the Clean Energy Act was implemented.
- In Costa Rica, the carbon tax and revenue recycling measures were implemented in a single piece of legislation, Forestry Law 7575 (1996). However, the exact proportion of revenues to be recycled was not specified until a subsequent piece of legislation, Fiscal Reform Law No 8114 (2001), was passed.

### Targeted investment programs and the legislative link to revenues

It is notable that targeted low carbon related investments are the most common form of revenue recycling in North and South America, whereas wider forms of economic support and protection for vulnerable populations are more dominant in Europe and Australasia. Furthermore, programs in which carbon related revenues are explicitly linked by legislation to recycling measures tend to be those directing revenues towards targeted investment schemes. This type of scheme is in place in relation to:

- the carbon tax in Costa Rica, in the Canadian provinces of Alberta and Quebec and in the United States (Boulder, California and the Bay Area)
- the Regional Greenhouse Gas Initiative (US).

There are, however, exceptions to this general trend:

- While the Swiss Federal Council regulation established a formal link between carbon tax revenues and recycling measures, the recycling plan provides households with lump sums to compensate for the impact of the national CO<sub>2</sub> tax. In the case of businesses, revenues are distributed in proportion to a firm's total payroll, benefiting labour intensive businesses more than capital-intensive ones.
- In British Columbia, carbon tax revenues are used to reduce non-environmental taxes rather than for targeted spending programs. But under the legislation, the revenues collected through the carbon tax must compensate fully for the reduction in those tax revenues (Province of British Columbia 2008). Carbon revenues and related tax compensation mechanisms are linked more directly in this instance than is usual in most tax reform packages focused on environmental issues.

The UK climate change levy is a somewhat different case.<sup>4</sup> Although the introduction of the levy and the 0.3 percentage point reduction in employers' social security contributions were introduced in the same piece of legislation (HM Government 2000), and the UK Government describes the revenues as "earmarked", there is no explicit legislative link between the tax revenues on the one hand, and the reduction in social security contributions on the other. "Earmarking", sometimes referred to as hypothecation, denotes proceeds from a tax or other government revenue source being used to fund a particular expenditure program rather than flowing into general government coffers.

A legislative link between carbon pricing revenues and the recycling programs implies that the revenues are earmarked. There are "strong" and "weak" forms of earmarking.

In "strong earmarking", revenues from the tax must match the size of the expenditure program (Wilkinson 1994). Historically, the cost of the above-mentioned reduction in the United Kingdom's social security contributions exceeded climate change levy revenues by 30–80 per cent, according to the National Audit Office (National Audit Office 2007).

"Weak earmarking" occurs when tax receipts need not match the spending program. Such packages may generate overall costs for government (as in the United Kingdom example, above) or additional net revenues. A benefit of weak over strong earmarking is that it offers greater flexibility in the government's spending plans. However, this can come at the cost of increased uncertainty over the size of the government's revenue recycling commitment. Of the full list of revenue-raising instruments listed in Table A.1, strong earmarking is practised only in relation to Switzerland's CO<sub>2</sub> tax and the Bay Area Air Quality Management District GHG fee.

<sup>4</sup> See UK Department of Energy and Climate Change, [www.decc.gov.uk/en/content/cms/emissions/ccas/cc\\_levy/cc\\_levy.aspx](http://www.decc.gov.uk/en/content/cms/emissions/ccas/cc_levy/cc_levy.aspx)

## Carbon pricing without revenue recycling

To provide a complete picture, Table 2.3 lists carbon pricing mechanisms that have revenue-generating functions but do not have specific revenue distribution components (as defined in Section 1.2). In the case of the EU ETS, auction revenues collected are redistributed back to national governments. It is at the complete discretion of national governments as to how they will make use of those revenues, although the European Commission has recommended that members should consider using

revenues towards expediting a low carbon transition for vulnerable populations. However, up to this point, revenues have been quite modest. Incoming funds have generally been directed towards the country's general revenues. It also needs to be appreciated that free allocations, such as those provided for industry in the first two phases of the EU ETS, represent as much, if not a more, significant form of compensation for energy intensive, trade exposed industries than might be provided through other direct revenue recycling schemes included in this report.

**Table 2.3: Carbon pricing mechanisms without explicit revenue recycling**

Carbon pricing mechanisms	Comments
<b>Existing carbon pricing mechanisms</b>	
New Zealand ETS	The Government has stated that the scheme should be revenue neutral <sup>5</sup> but this is not enshrined in the legislation (Government of New Zealand 2009) and the state has no specific expenditure plan for revenue recycling. Therefore, it fails to meet this report's criteria for revenue recycling.
EU ETS Phases I and II	Most allowances were freely allocated; only 3% were distributed by auction in Phase II <sup>6</sup> . However, in Phase III at least 50% of allowances will be auctioned and there will be a non-legally binding recommendation that member states spend at least 50% of auction revenues on measures to tackle climate change. <sup>7</sup>
Tokyo cap and trade	Allowances freely allocated (World Bank 2010).
Republic of Ireland carbon tax	Revenues are used to maintain the size of the civil service. Furthermore, €50 million in carbon tax revenues are used to help fund energy efficiency measures, including those for households at risk of fuel poverty. However, according to Burke (2010), Ireland's carbon tax revenues are not earmarked. Instead, these energy efficiency investments are reflected in government spending priorities. Since there has been no explicit tax shift and there is no specific investment fund, the scheme fails to meet this report's definition of revenue recycling.
UK Carbon Reduction Commitment	Following the October 2010 Spending Review, the revenue recycling component of this scheme was abandoned. <sup>8</sup>
<b>Proposed carbon pricing mechanisms</b>	
China	China may implement a carbon tax before the end of its 2011–15 five-year plan and is currently implementing pilot carbon markets at the regional level. <sup>9</sup>
South Africa	South Africa's Treasury Department released a discussion paper on carbon taxation in 2010. Additional proposals were put forward in the minister of finance's annual budget speech in February 2012. Further details of a carbon pricing policy are not yet forthcoming.
South Korea	South Korea recently passed legislation to establish an ETS starting in 2015, but the details have not been established.

Sources:  
Government of New Zealand (2009), European Commission (2008),  
World Bank (2010), Government of Ireland (2009), Burke (2010),  
Government of South Africa (2012).

<sup>5</sup> See [www.climatechange.govt.nz/emissions-trading-scheme/about/questions-and-answers.html](http://www.climatechange.govt.nz/emissions-trading-scheme/about/questions-and-answers.html)

<sup>6</sup> See [www.gov.uk/participating-in-the-eu-ets](http://www.gov.uk/participating-in-the-eu-ets)

<sup>7</sup> UK Department of Energy & Climate Change.

<sup>8</sup> See [www.gov.uk/crc-energy-efficiency-scheme](http://www.gov.uk/crc-energy-efficiency-scheme)

<sup>9</sup> See [www.reuters.com/article/2012/01/05/china-carbon-idUSL3E8C5D1220120105](http://www.reuters.com/article/2012/01/05/china-carbon-idUSL3E8C5D1220120105)

## SECTION 2

# Current revenue recycling policies

### 2.3 Revenues to support the development of climate-friendly technologies

In total, nine revenue recycling schemes in this report include investment programs supporting the development and deployment of climate-friendly technologies. The types of investments vary between programs but they can be grouped into three broad categories:

- investment in renewable technology and energy efficiency
- investment in research and development (R&D) related to a low carbon regime
- other low carbon investments.

Each investment program is described in Appendix B.

#### Renewable technology and energy efficiency

Renewable technology and energy efficiency investment programs typically involve expenditure on energy efficient retrofits of homes and businesses and the installation of renewable energy technologies. Seven of the nine climate-friendly investment programs in this report include energy efficiency and renewable technology components. These are:

- Alberta carbon scheme
- Australia carbon price
- Boulder Climate Action Plan tax
- California cap and trade scheme program
- Quebec carbon tax
- Regional Greenhouse Gas Initiative (US)
- Switzerland CO<sub>2</sub> tax.

The programs are described in more detail, including their eligibility requirements and management practices, in Appendix B, Section B.2.

#### Low carbon related R&D

Four of the nine investment programs fund R&D into low carbon technologies, including the creation of demonstration facilities and bringing existing technologies to market. These are:

- Alberta carbon scheme
- Australia carbon price
- Quebec carbon tax
- Regional Greenhouse Gas Initiative (US).

The programs are described in more detail, including their eligibility requirements and intellectual property rights (IPR) and contractual issues, in Appendix B, Section B.3.

#### Other low carbon investments

Six of the nine investment programs fund measures not specifically related to renewable technology or energy efficiency. These measures, listed below, foster the creation of GHG inventories and fund adaptation measures:

- Alberta carbon scheme
- Bay Area Air Quality Management District GHG fee
- California cap and trade program
- Costa Rica carbon tax
- Quebec carbon tax
- Regional Greenhouse Gas Initiative (US).

The programs are described in Appendix B, Section B.4.

#### Wider governance

Along with variations in the investment funds' enabling legislation and governance (discussed in Appendix B, Section B.5), there are differences in the size and duration of revenue recycling commitments.

#### Summary

Renewable technology and energy efficiency programs are the most common form of investment married to revenue recycling. However, within this category there are many differences in the range of measures funded and the ways in which allocations are made. In some cases, specific programs are designed and delivered by the government; in others, funding is allocated to third parties selected through open competition (such as Alberta's Climate Change and Emissions Management Corporation). The duration and extent of the revenue recycling commitment may be uncertain even where a legislative link exists between the carbon price revenues and the investment funds.

## 2.4 Protecting vulnerable populations

Five revenue recycling schemes in this report include measures to protect vulnerable populations. These measures can be grouped into spending programs providing assistance to the following:

- low- to middle-income populations
- rural populations
- pensioners and retired persons
- other vulnerable energy users.

Each of the revenue recycling measures protecting vulnerable populations is described in Appendix C.

### Low-income populations

Three types of programs support low-income households through revenue recycling:

- transfer payments
- direct energy bill assistance
- targeted energy efficiency programs.

Three revenue recycling schemes specifically provide assistance to low-income groups:

- Australia carbon price
- British Columbia carbon tax
- Regional Greenhouse Gas Initiative (US).

The measures are described in Appendix C, Section C.2.

### Rural populations

Two revenue recycling programs contain measures to provide assistance to rural populations. These are:

- Australia carbon price
- Costa Rica carbon tax.

However, the primary objective of Costa Rica's scheme is to prevent deforestation rather than to assist rural populations specifically. Both measures are described in Appendix C, Section C.3.

### Pensioners and retired persons

Two revenue recycling programs contain measures to provide assistance to pensioners and retired persons. These are:

- Australia carbon price
- Netherlands carbon tax.

The measures are described in Appendix C, Section C.4.

### Other vulnerable energy users

The Australia carbon price also contains revenue recycling measures to help offset the impact of the carbon price on other vulnerable energy users, such as those with high electricity bills related to medical issues or disability. The measures are described in more detail in Appendix C, Section C.5.

### Vulnerable groups and tax compensation

In addition to the programs identified above, some revenue recycling schemes include reductions in personal income tax rates.<sup>10</sup> These benefit some low-income households by lowering the basic tax rate or by extending tax-free allowances. The following jurisdictions have implemented such tax compensation schemes:

- Denmark
- Finland
- Netherlands
- Norway
- Sweden
- Australia
- British Columbia.

### Summary

The revenue recycling schemes in this section (and reviewed in more detail in the appendices) demonstrate the range of assistance offered to vulnerable groups. These initiatives generally focus on low-income households, with support delivered through energy bill assistance, tax reductions, transfer payments and targeted energy efficiency programs.

<sup>10</sup> See Section 2.6 for a full discussion of tax offsets.

## SECTION 2

# Current revenue recycling policies

### 2.5 Supporting “exposed” economic sectors

“Exposed” economic sectors are carbon emissions intensive and operate in competitive global markets. If governments fail to help them to adapt to low carbon regimes, those industries might transfer production to other jurisdictions with lower constraints on GHG emissions, possibly leading to an increase in a sector’s total emissions. Therefore, these exposed sectors may require support in relation to the carbon price.

Support is usually provided not through explicit revenue recycling, but through the allocation of free carbon allowances (in jurisdictions that are part of an ETS) or legislated exemptions from a carbon tax. Although the sectoral coverage and design of carbon pricing instruments is beyond the scope of this project,<sup>11</sup> free allocations and exemptions do account for a high proportion of potential revenues.

These issues are discussed more fully in Appendix D.

**“Many countries have adopted the principle of revenue neutrality in their environmental tax reforms as it is a more politically palatable way of introducing ‘green’ taxation.”**

### 2.6 Broader economic support

Having reviewed spending programs explicitly linked by legislation to carbon revenues, this section addresses the second part of our working definition of revenue recycling: “where a package of measures is designed to be revenue neutral to government”.

Eight of the revenue recycling programs reviewed fall under this criterion.<sup>12</sup> These are:

- British Columbia carbon tax
- Denmark carbon tax
- Finland carbon tax
- Netherlands carbon tax
- Norway carbon tax
- Sweden carbon tax
- UK climate change levy
- Australia carbon price.

### Environmental tax reform

While low carbon investments are the most common form of revenue recycling in the United States and Canada, environmental tax reform packages (ETRs) dominate in Europe. The Nordic countries pioneered such reforms to shift the burden of tax from economic production, such as capital and labour, towards environmental externalities (Ekins and Speck 2011). Carbon pricing with revenue recycling is a specific example of ETR.

Many countries have adopted the principle of revenue neutrality in their environmental tax reforms as it is a more politically palatable way of introducing “green” taxation. Environmental tax reform usually unfolds over several years. For example, the Danish ETR went through three distinct phases between 1992 and 2002 (Hoerner and Bosquet 2001).

“Strong earmarking” (see Section 2.2) usually is not practised because of the difficulties in matching environmental tax receipts with revenues foregone through related reductions in labour and capital taxes.

<sup>11</sup> The impacts of carbon pricing mechanisms on competitiveness are explored in the concurrent ICMM report, *The cost of carbon pricing: competitiveness implications for the mining and metals industry*.

<sup>12</sup> The British Columbia and Australia schemes also fall under the first criterion of our revenue recycling definition.

### Prevalence of ETRs

Several countries in northern Europe have embarked on environmental tax reforms. Since the late 1990s, Norway has designed its environmental taxes to be revenue neutral. In January 1999, the Norwegian carbon tax was extended to cover air transport (later withdrawn due to international air transport agreements), domestic marine transport of goods and the North Sea supply fleet. The tax was made revenue neutral through a reduction in personal income taxation (Hoerner and Bosquet 2001).

Some countries, such as Finland and the Netherlands, embarked on “revenue negative” ETRs, thereby lowering the overall tax burden (Bosquet 2000). Australia, British Columbia, Denmark, Finland, the Netherlands, Norway, Sweden and the United Kingdom have undergone environmental tax reforms related to carbon emissions.

### ETRs with support for energy efficiency

Additional revenue recycling measures accompanied the Danish and Dutch ETRs. Some of the combined revenues from the Netherlands energy taxes<sup>13</sup> is recycled to businesses through accelerated depreciation of investments in environmental equipment, and through tax deductions for investment in energy efficiency measures (Government of the Netherlands 2004). The Danish ETR recycles part of total energy tax revenues from 1996 into investment subsidies for businesses. These subsidies covered up to 30 per cent of the cost of investment in energy efficiency measures; one important condition of the subsidy program is that the payback period cannot be longer than three years (Larsen 1999).

“While recycling programs may be linked legislatively to carbon tax revenues, stakeholders may remain uncertain about the exact proportion and duration of revenue recycling.”

.....  
<sup>13</sup> The carbon tax raises the majority of these revenues (Sumner et al 2011).

## SECTION 2

# Current revenue recycling policies

### 2.7 Summary remarks

Many revenue recycling schemes related to carbon pricing meet the criteria established for this report. In fact, these schemes account for the large majority of carbon pricing mechanisms now in place. (Although, because the EU ETS does not meet our definition of revenue recycling, the schemes covered here do cover a relatively smaller proportion of emissions currently priced.) In particular, revenue raising and recycling components were linked through legislation either explicitly or through a statement of political intent in 12 of the 22 mechanisms reviewed; in five more, revenue recycling was part of an ETR. While recycling programs may be linked legislatively to carbon tax revenues, stakeholders may remain uncertain about the exact proportion and duration of revenue recycling.

Many schemes included in this report recycle revenues into low carbon investment programs. This is the most common form of revenue recycling in the United States and Canada. North Americans invested in a wide range of projects, usually involving energy efficiency measures or installation of renewable energy technology, often targeted at low-income households. In Europe, reductions in labour and income taxes are the most common form of revenue recycling and often are part of ETRs.

In the schemes reviewed in this report, revenues are not explicitly recycled to carbon intensive trade exposed sectors. Instead, assistance for these industries is provided in the form of tax exemptions and free emissions trading allowances.

While some revenue recycling measures actively support the transition to a low carbon economy, others may undermine the integrity of the carbon price signal that is meant to discourage carbon-intensive activity. This is the case for programs that help cover the energy bills of low-income households. These supports may reduce or remove the incentive for households to reduce their energy consumption if they reduce the effective cost of energy (for example, lump sum payments such as the United Kingdom's Winter Fuel Payment, at least in price terms, do not have this effect). In contrast, providing the poor with targeted grants to improve household energy efficiency helps to offset the adverse effects of the carbon price without removing the incentive for households to further reduce energy use. Tax compensation measures and direct transfer payments fall somewhere in between: while they do not undermine the carbon pricing mechanism, they do fail to encourage long-term changes in energy use.

**“Tax compensation measures and direct transfer payments fall somewhere in between: while they do not undermine the carbon pricing mechanism, they do fail to encourage long-term changes in energy use.”**



SECTION

# 3

Revenue  
recycling and  
economic  
efficiency

### 3.1 Introduction and definition

A full evaluation of the different types of revenue recycling requires an assessment of the relative economic efficiencies of each method. In this report, economic efficiency is defined as the minimization of excess burden or deadweight loss to society as a whole, rather than the cost efficiency of an individual firm's production process. However, economic efficiency is only one of the considerations that may underlie revenue recycling mechanisms. Equity considerations are also important. When promoting the transition to a low carbon economy, governments may want to lighten the cost of that transition on vulnerable groups in line with the ICMM principles. These issues are discussed further in Section 4. Impacts on the development of new technology, which may affect long-term economic efficiency, may be important as well.

The scope of this assessment covers only the process of recycling revenues back to vulnerable populations and industry. It does not consider the relative efficiencies of the different approaches to raising those revenues. However, it is not possible to completely separate the two; if the revenues are used to develop low carbon technologies, the revenues could work to help lower the level of carbon pricing schemes, if those prices were expressly intended to reduce net GHG emissions.

Section 3.2 provides a review of the academic literature on the economic efficiency of revenue recycling options. The findings of this literature review are then used to inform a broad assessment of the economic impact of the revenue recycling programs currently under evaluation.

**“In this report, economic efficiency is defined as the minimization of excess burden or deadweight loss to society as a whole, rather than the cost efficiency of an individual firm's production process.”**

### 3.2 Literature review

Most academic literature exploring the economic efficiency of revenue recycling options is focused on the potential existence of a “double dividend” impact.

#### The double dividend hypothesis

The hypothesis is that a double dividend exists when revenues generated by taxing a market externality, for example GHG emissions, are used to reduce other distortionary taxes such as income tax. This has two benefits: the tax motivates a reduction in the incidence of the market externality, for example the level of GHG emissions, and it benefits the economy by reducing distortionary tax.

There are two versions of the double dividend hypothesis: the strong and weak form (Goulder 1995). The weak form holds that the efficiency costs of environmental taxation, in terms of its distortionary effect on production decisions, are lower if revenues are used to reduce distortionary taxes as opposed to providing lump sum payments to certain groups. The strong form states there will be a net efficiency gain from the environmental tax, ie that the efficiency gains from reducing distortionary taxation outweigh the efficiency cost of raising the revenue in the first place.

#### Economic efficiency and taxation

To examine this idea more closely, it is important to understand why there might be efficiency gains and losses associated with certain types of taxation. According to economic theory, efficient economic signals would arise from taxing individuals in lump sums according to their labour market abilities (Mirrlees 1971). In reality, a government is unable to discover an individual's true ability and instead must use a person's labour market income as an indicator of their ability and the basis for taxation. This taxation of labour market income creates a wedge between the gross wage paid by employers and the net wage received by individuals.

An individual can either choose to spend time working or at leisure, assuming the availability of employment opportunities. A tax on labour income reduces the financial reward for working and, depending on an individual's preferences, may encourage the substitution of work time for more leisure time. Hence, by lowering the relative price of leisure and encouraging the substitution of income by leisure, this wedge might result in a distortion of an individual's labour supply decision (compared to the free market outcome). This is why, from a theoretical perspective, taxes based on labour market income are considered economically inefficient. Similar arguments may be applied to taxes on capital consumption or other economic activities. This reasoning underlies the academic argument for using revenues from taxes on environmental externalities, such as GHG emissions, to reduce distortionary taxation.

The theory behind the “stronger” definition of the double dividend assumes that the costs associated with taxing environmental externalities are outweighed by the benefits of recycling these revenues, ie there is a net efficiency gain. Using environmental taxation on GHG emissions as an example, the efficiency cost arises from its effect on production costs. By increasing the cost of a factor of production and therefore unit production costs, the carbon tax is likely to place upward pressure on prices, resulting in reduced real wages (and a small reduction in labour supply, given the relative decline in the benefits of working compared to leisure). This implies an erosion of the existing labour income tax base, necessitating a higher rate of income tax to raise a given amount of revenue. This is known as the tax interaction effect (Parry and Oates 1998). A double dividend in the strong form, therefore, comes about only if the efficiency gain from recycling revenues outweighs the efficiency loss associated with the tax interaction effect.

#### Does the double dividend exist?

There is a consensus in the published literature about the existence of the weak double dividend. This suggests that using recycled revenues to lower distortionary (labour) taxes results in more efficient price signals than does lump sum recycling. However, according to the theoretical literature, a strong double dividend will only be achieved if the existing tax system prior to the introduction of the environmental tax was already highly distortionary (Bovenberg 1999).

Yet, experience appears to give us an entirely different sort of message from the theoretical literature. Results from *ex ante* modelling studies provide relatively strong support for the notion that a double dividend can be achieved in practice. For example, in a review of 131 model simulations drawn from 56 studies, Bosquet (2000) concludes that an employment double dividend was achieved in 73 per cent of cases. These simulation results were obtained from a variety of different types of model, including computable general equilibrium, partial equilibrium, macroeconomic and input-output. The overall conclusion in favour of the existence of a double dividend is therefore not sensitive to the assumptions of a particular model or class of models. The empirical evidence on the existence of the double dividend generally is based upon *ex ante* modelling exercises. In measuring the second dividend that results from the reduction of distortionary taxation, empirical studies tend to focus on employment as opposed to economic welfare (which is used in the theoretical formulation of the dividend), in part because it is a more measurable concept but also because it is of practical policy importance. It is important to note, however, that employment and economic welfare are distinct concepts and an increase in one does not necessarily imply an increase in the other.

#### Efficiency in carbon savings

Many recycling policies outlined in Section 2 include elements that could lead to further reductions in GHG emissions. Although this report does not aim to evaluate the efficiency of these measures (and there is not much literature available; many of the programs would have to be evaluated individually), it is possible to see how efficiency could be measured in terms of emissions reduced per unit of spending.

It is important to note the interaction between economic and environmental efficiency in revenue recycling. If the revenue recycling measures reduce emissions, then the carbon price required to cut emissions to a particular level would theoretically be reduced. In other words, an efficient use of revenues towards supporting reductions in net GHG emissions should mean a lower price for carbon is required to meet the stated environmental objective. A full evaluation of the trade-offs in efficiency would need a macroeconomic, model-based assessment.

**“An efficient use of revenues towards supporting reductions in net GHG emissions should mean a lower price for carbon is required to meet the stated environmental objective.”**

## SECTION 3

# Revenue recycling and economic efficiency

### 3.3 Which revenue recycling options are more efficient?

#### Distortionary tax compensation

While there is an ongoing debate in the literature about the existence of a strong double dividend, the existence of a weak double dividend is generally accepted (see Section 3.2). This implies that recycling programs that reduce distortionary taxes are more efficient, in economic terms, than are lump sum recycling programs. However, these schemes tend only to benefit those already in the tax system and may exclude the most vulnerable groups.

One important caveat is that the economic literature offers no a priori assessment of the relative economic efficiency of targeted investment schemes related to low carbon policies, although Parry and Oates (1998) note it is theoretically possible for such schemes to produce an economic welfare gain. Whether a gain is realized in practice will depend on exactly how the revenues are invested; in particular, projects should be highly leveraged such that each dollar of revenue spent should generate additional, privately funded low carbon investment activity.

#### The prevalence of distortionary tax compensation

Table 3.1 details carbon pricing schemes containing revenue recycling components that offset distortionary taxes; these are more common in Europe.

The most common way of reducing distortionary taxes is by cutting personal income taxes and employers' social security contributions. As evidenced in Section 3.2, empirical and theoretical evidence supports the latter choice. In his 2000 survey of the empirical literature, Bosquet found that in job creation, the best outcomes are achieved when revenues are recycled through reductions in employers' social security contributions. From a theoretical standpoint, such reductions (as opposed to personal income tax cuts) could lead to an increase in employment that helps to minimize the negative tax interaction effect, by limiting the price increases resulting from environmental taxation (Andersen 2009).

On the basis of these economic efficiency arguments alone, the revenue recycling schemes in Denmark, Finland, the Netherlands and the United Kingdom could be judged the most effective. However, economic efficiency is only one of many considerations for policymakers. They also must weigh equity considerations, such as mitigating the effect of carbon pricing on vulnerable groups, and dynamic issues such as facilitating a managed transition to a low carbon economy. Revenue recycling schemes therefore should be designed on a case-by-case basis to reflect the specific circumstances of the economy in which they are to be implemented, and the balance of policy objectives.

Finally, the administration costs of reducing other taxes will be almost zero, and potentially much lower than the investment schemes described below.

**“Revenue recycling schemes therefore should be designed on a case-by-case basis to reflect the specific circumstances of the economy in which they are to be implemented, and the balance of policy objectives.”**

**Table 3.1: Revenue recycling schemes and distortionary tax compensation measures**

Revenue recycling scheme	Distortionary tax lowered				Comments
	Personal income tax	Employers' social security contribution (SSC)	Employees' social security contribution (SSC)	Corporate tax	
<b>North and South America</b>					
British Columbia carbon tax	✓			✓	Reductions in personal income tax, general corporate income tax and small business corporate income tax.
<b>Europe</b>					
Denmark carbon tax	✓	✓			Personal income tax and employers' SSC reduced over three phases of environmental tax reform in the 1990s.
Finland carbon tax	✓	✓			In 1997, state personal income tax rates, employers' SSC and local personal income tax rates were reduced (by around FIM 5.5bn). This was partly financed by higher carbon tax rates (around FIM 1.1bn) and landfill tax rates (FIM 0.3bn).
Netherlands carbon tax	✓	✓		✓	Employers' SSC reduced by 0.19 percentage points, the lowest rate of corporate income tax reduced, personal income tax rate reduced and tax-free allowance extended.
Norway carbon tax	✓				Rates of personal income taxation reduced.
Sweden carbon tax	✓		✓		As part of 1991 environmental tax reform, personal income tax rates reduced.  As part of 2001 environmental tax reform, employees' SSC lowered by 0.1 percentage points and tax-free personal allowance increased by SEK 1,200.
UK climate change levy		✓			Employers' SSC reduced by 0.3 percentage points.
<b>Australasia</b>					
Australia carbon tax and ETS	✓				Tax-free allowance for low- and middle-income households increased. Also provides direct grants to families under a certain income threshold.

Sources:  
National Audit Office (2007), Australian Government (2011),  
Government of British Columbia (2010), Hoerner and Bosquet (2001),  
Bosquet (2000).

Please note that the table excludes revenue recycling schemes that do not contain distortionary tax compensation schemes.

## SECTION 3

# Revenue recycling and economic efficiency

### Targeted low carbon investments

Many recycling schemes evaluated in Section 2 are targeted low carbon investment programs promoting energy efficiency, renewables and associated low carbon R&D. Such programs may be important in overcoming market failures and other barriers to the adoption of low carbon technologies at the required scale.

The textbook concept of economic efficiency is assumed to exist in a stylized world in which markets are competitive; there is perfect and complete information about costs, benefits and actions of others; economic agents behave rationally; and property rights are well defined and enforceable. However, features of the market for renewable and energy efficient technologies may violate one or more of these conditions. These features may motivate government to intervene on economic efficiency grounds,<sup>14</sup> and are discussed in more depth below.

#### Industry

Often there are large start-up costs for targeted low carbon investments, which tend to be capital intensive and depend on efficient capital markets. However, potential creditors may demand substantial risk premiums because of uncertainties associated with new technologies and future energy prices (which determine the investment payback period). Wohlgemuth and Madlener (2000) provide evidence to suggest that lenders are inexperienced in evaluating the risks of renewable energy investments and so are less inclined to lend capital for these initiatives. Although this study is slightly dated, there may be transferable insights for other nascent low carbon technologies, including carbon capture and storage (CCS). A given investment firm may not capture the full potential of an R&D expenditure. Instead, a significant proportion of the economic benefits may accrue to its competitors if IPR is not adequately protected or if the protection is not over a sufficiently long time horizon. This problem is considered especially pronounced in fragmented markets such as the construction and building industries in the United States (Brown 2001). Furthermore, planning horizons for conventional commercial investments may be too short to capture the benefits from R&D investments in low carbon technologies. As a consequence of these two factors, R&D investment in the sector is likely to fall far short of what is necessary.

#### Households

Households go through complex decision-making processes before they adopt energy efficiency measures and renewable technology. A thorough evaluation of costs and benefits involves calculating the full life cycle costs of different renewable technology options and energy efficiency savings and their discounted values. In reality, most households lack the time, knowledge and/or ability to conduct such assessments. Brown (2001) suggests that the assessment of options is more likely to be influenced by simpler evaluation criteria, including upfront costs. Brown argues that more complex assessments are hindered by imperfect information about energy efficiency and renewable energy products and the limited amount of ability and time consumers have to make such decisions.

In rented homes, the “principal-agent problem” is an additional factor. In this situation, an agent is given authority to act on behalf of a principal; however, the economic incentives are such that the agent may not act in the best interests of the principal. In this context, landlords are the “agent” and have little incentive to invest in energy efficiency measures for homes they let out since the tenants are “principals” and would be the sole beneficiaries of lower household energy bills.<sup>15</sup> Brown (2001) notes this is a particular problem in multi-family buildings in which tenants account for a high proportion of occupants.

In terms of dynamic efficiency, energy efficiency programs for low-income households could be viewed as a preferred option. This is because they help to mitigate the adverse impact of the carbon mechanism while maintaining the integrity of the carbon price signal. In contrast, direct assistance in paying energy bills removes the incentive for households to reduce their energy consumption and does not support the transition to a low carbon economy over the long term.

**“Planning horizons for conventional commercial investments may be too short to capture the benefits from R&D investments in low carbon technologies.”**

<sup>14</sup> Note that the neoclassical school of thought maintains that market failure is not a *sufficient* condition for government intervention (which could result in government failure).

<sup>15</sup> One consideration with regard to this argument is whether the value of energy efficiency measures is capitalized in house prices and subsequently increases the property’s potential resale value.

### Funding allocation

These types of market failures may justify carbon price recycling into low carbon investments. However, the degree to which revenue recycling can help to address underinvestment in climate-friendly technologies depends on the design of the investment program.

Governments may choose to invest in low carbon projects of their own design but such top-down decision making may not lead to the most efficient use of resources and may result in market failures. A better approach is to encourage managers of specific projects to apply to government for investment funding; in all likelihood, this will yield a wide array of options. This may be preferable, as modern portfolio theory suggests that to maximize expected returns, governments should invest funds in a broad range of projects.

However, there may be circumstances in which it is clearly advantageous for governments to assist in the development of new technology; this needs to be considered on a case-by-case basis.

In all cases, governments should keep an eye on the administrative costs of allocating funds. Although there is little information available about these costs, they could become significant if the state funds numerous small investment schemes.

### Distributional effects

The implementation of the carbon pricing mechanism is likely to lead to distributional effects across industrial sectors and between income groups. Revenues can help address those concerns.

#### Households

Carbon pricing revenues are commonly used to offset distortionary income or payroll taxes. The theoretical literature has shown how, under certain circumstances, this can result in increased economic efficiency. Furthermore, *ex ante* modelling evidence (Bosquet 2000) has demonstrated that employment gains also can result. While this is likely to provide households with some compensation for their share of the carbon price, it is unlikely to benefit vulnerable populations as much. This is because only those people receiving income can benefit from income tax reductions (and only those in the workforce can benefit from payroll tax reductions).

However, reductions in income taxes tend to benefit some low-income groups as the reductions are typically in standard tax rates. There is an economic efficiency argument for reducing tax rates (by reducing marginal rates or increasing tax thresholds) in the lower bands because:

- the labour supply response is greatest in these groups
- energy or capital can substitute for low-income labour
- these groups have lower savings rates.

This is discussed further in Appendix C, Section C6.

Sales or value-added taxes are also problematic in targeting vulnerable populations. In many countries, these populations are already exempt from taxes on the goods and services they consume the most, or these goods and services may be subject to zero rates of tax. For example, food, medical equipment and children's clothing in the United Kingdom are subject to a zero rate of value-added tax and household energy and heating are taxed at a discounted rate.<sup>16</sup> In Canada, the goods and services tax on basic groceries and medical devices is zero.<sup>17</sup> So to compensate the most vulnerable members of society, it may be necessary to use lump sum transfers, even if they are less economically efficient in attaining a particular social outcome such as protecting vulnerable people.

#### Industries

A carbon pricing mechanism will impose extra costs on industries, with the greatest impact visited on emissions intensive, trade exposed sectors.<sup>18</sup> A large-scale reduction in the capital assets of these industries would hinder their transition to low carbon production processes. So it can be argued that owners of capital should be compensated financially to allow the identification of opportunities to reduce their carbon emissions and to reduce the impact of carbon related costs during transition. Furthermore, carbon pricing alone may not stimulate the required carbon abatement activity. The recycling of revenues back to industry can be used to help achieve the long-term environmental outcomes of the carbon pricing mechanism, for example by financing longer-term investment in more efficient equipment.

<sup>16</sup> See [www.hmrc.gov.uk/vat/forms-rates/rates/goods-services.htm](http://www.hmrc.gov.uk/vat/forms-rates/rates/goods-services.htm)

<sup>17</sup> See [www.cra-arc.gc.ca/tx/bsnss/tpcs/gst-tps/gnrl/txbl/zrrtd-eng.html](http://www.cra-arc.gc.ca/tx/bsnss/tpcs/gst-tps/gnrl/txbl/zrrtd-eng.html)

<sup>18</sup> See the concurrent ICMM report *The cost of carbon pricing: competitiveness implications for the mining and metals industry* for an assessment of these costs.

## SECTION 3

# Revenue recycling and economic efficiency

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Moreover, there is an argument that industry should be compensated to reduce the cost competitiveness impact of carbon pricing mechanisms, particularly if it leads to carbon leakage. Carbon leakage describes a relocation of carbon emitting production from one jurisdiction that has introduced a carbon pricing mechanism to another jurisdiction that has not. The implication is that global carbon emissions could remain unaffected as a result of a climate pricing policy in a particular jurisdiction and, as a result, the carbon pricing policy is counterproductive. By shielding or compensating energy intensive trade exposed sectors, the risk of carbon leakage can be reduced.

However, to date, protection has usually been in other forms, such as free emissions trading allowances for industry, which lie beyond the scope of this report.

**“The recycling of revenues back to industry can be used to help achieve the long-term environmental outcomes of the carbon pricing mechanism, for example by financing longer-term investment in more efficient equipment.”**



SECTION

# 4

Conclusions

## SECTION 4

# Conclusions

### Current revenue recycling experience

A large majority of the carbon pricing schemes currently in place have an associated revenue recycling mechanism ranging from those linked in legislation (either explicitly or as statement of political intent) to those implemented as a package of environmental tax reform. However, in terms of market size, the schemes that do implement revenue recycling represent a smaller proportion of the emissions currently priced. In particular, there is no revenue recycling obligation in Phases I and II of the EU ETS and no legally binding commitment in the third phase.

#### How have existing revenues been spent?

The recycling function of the existing schemes can be broadly grouped in three categories of expenditure. In particular, of the 16 existing revenue recycling schemes, nine invest some proportion of carbon pricing revenues towards low carbon investment programs, five towards assisting vulnerable and low-income populations and eight towards broader economic support in the form of associated tax reductions. Support for emissions intensive, trade exposed sectors is generally limited to exemptions from the carbon pricing mechanism or, in the case of emissions trading schemes, an allocation of free carbon allowances.

#### Low carbon investment funds

Low carbon investments represent a relatively heterogeneous mix of expenditures. Most of the schemes engaged in this type of recycling activity allocate revenues across a combination of energy efficiency measures and the development and implementation of renewable energy technology. A slightly smaller number use a proportion of revenues to directly fund research into low carbon technologies such as the development of demonstration facilities and bringing fledgling technologies to market. The final type of low carbon investment is funding of projects not specifically related to energy efficiency measures and renewable technologies. These include the construction of CCS facilities, low carbon transportation projects, sustainable infrastructure development and natural resource conservation and management.

#### Protecting vulnerable populations

Revenue recycling schemes that allocate revenue towards the protection of vulnerable people have tended to focus on three specific target recipients: medium- to low-income households, pensioners/retired persons and rural populations. The type of assistance provided within these three categories is varied, but has mainly taken the form of energy bill assistance, targeted energy efficiency programs for low-income households and transfer payments and credits through tax systems.

#### Broader economic support

This category of revenue expenditure is associated with ETRs in which the revenues collected from the imposition of a carbon tax are recycled via a reduction in tax rate: typically, personal income tax and social security contributions (either employers' or employees'). This type of revenue recycling has the possibility of yielding economic welfare benefits to the wider economy. However, these benefits will not necessarily be realized for those vulnerable groups that are not in the labour market.

The current experience of revenue recycling has demonstrated a broad variety of spending activities. In practice, recycling schemes are likely to distribute revenues across a number of types of expenditure, reflecting the specific situation and spending priorities of the jurisdiction in which the carbon price operates.

### Market-based instruments and their associated revenues

Climate policy developed in the 1990s pioneered the deployment of market-based instruments. Emissions pricing, designed to discourage GHG emissions and to raise revenues, is increasingly common. The EU ETS has established allowance trading to cap emissions and many other jurisdictions now have carbon pricing instruments. Such instruments can influence behaviour while also raising revenues. The question is, how should the revenues be used?

#### How to use revenues accruing from market-based instruments?

One option is to view carbon pricing as broadening the tax revenue base (which could also include non-tax instruments such as auctioning of emissions allowances in an emissions trading scheme). In this case, the revenues are used for general government expenditure, or to balance reductions in other revenue sources such as employment taxes. Another approach is to use the revenues to reduce carbon emissions further; this may be through investments in energy efficient equipment or by supporting development of low carbon technologies. Finally, the revenues may be used to reduce or compensate for costs of carbon pricing incurred by individuals and industries.

In designing a revenue recycling package, authorities must consider a range of economic and political considerations; this report has found no single approach suitable for all countries or all circumstances.

### Trade-offs and complementary objectives

There are complementarities and trade-offs between these different criteria. For example, the most economically efficient measures may provide little support for vulnerable populations. Alternatively, increasing the spending power of low-income groups may provide the largest economic stimulus. Similarly, there may be trade-offs and complementarities between economic and environmental objectives. For example, the economic return on investment in renewables could be lower than the return on other investment projects, such as in transport or communications infrastructure.

Some schemes, such as those in Australia, split the revenues across a variety of purposes; these may benefit a wide range of socio-economic and industrial groups but there may be additional administrative costs when such a complex mechanism is used.

### Market-based revenue recycling approaches

As stated earlier, there is no one-size-fits-all mechanism for revenue recycling. However, a key finding of this report is that in terms of economic efficiency, tax reductions often are preferable to lump sum payments provided to all groups, regardless of their behaviour. This is because tax incentives can motivate targeted stakeholders to increase economic “goods” such as the labour supply or capital accumulation. Investment funds should stimulate market finance and, where possible, they should avoid being too prescriptive in terms of specifying where the funds are to be used.

There is also a role for other policies that correct market failure, such as investment in energy efficiency measures; despite their substantial economic benefits, target populations may not take advantage of these measures for a number of reasons, for example because they are capital constrained or simply because they do not know enough about them.

The most difficult political aspect of such initiatives is to ensure they are “fair” by providing support to vulnerable population groups and to owners of capital used in carbon-intensive production processes. Inevitably, there will be winners and losers in any tax reform as it is by nature a redistributive process, but this can be offset through well planned countermeasures.

### Vulnerable populations

From both social and environmental perspectives, it is better to assist vulnerable households in adapting to a low carbon regime. For example, this could be by improving residential energy efficiency (correcting the market failure outlined above), rather than indefinitely subsidizing energy consumption.

Reductions in existing distortionary tax rates also could play a role, although most vulnerable households may be outside the existing income taxation base.

### Exposed sectors

In the case of exposed economic sectors, the issue is largely one of competitiveness, which may be compromised by carbon measures introduced on a national or regional level rather than at the global level. These measures increase unit costs for industrial energy consumers and put them at a disadvantage vis-a-vis foreign competitors operating in jurisdictions with relatively lax climate policies. Comparison of revenue recycling with other measures such as free allocation of allowances from emissions trading schemes is outside the scope of this report. However, we note that revenue recycling is one approach available to policymakers. For example, the EU ETS allows for financial compensation to be made to electricity intensive industries for the effects of increased electricity prices (although there is no explicit linkage to revenue raised).

### Future considerations

Finally, any study of revenue recycling must take into account the prevailing economic climate in many developed countries, particularly in the United States and much of Europe. They are searching for ways to broaden their tax bases. In these countries, the debate has moved on from whether environmental taxes should replace labour and capital taxes, to how any revenues can be raised to support current government spending (although there continues to be substantial opposition to new taxes in the United States). Recycling may be implicit in government policy only if, for example, the introduction of a carbon tax means income taxes do not have to be increased.

Interest in generating carbon pricing revenues is growing in the developing world, so the issue of revenue recycling will grow in importance. While developing countries are interested in the developed world experience, they will want their policies to reflect their own national priorities. The nature of revenue recycling measures in these countries remains to be seen. There may be greater emphasis on public investment in adaptation measures to protect vulnerable populations from the effects of climate change than has been seen in developed countries.

## SECTION 4

# Conclusions

### Key questions for policymakers

In summary, while there is no single revenue recycling scheme suitable to all societies, there are some key questions that should be considered by policymakers across jurisdictions. That said, this report has taken stock of measures that, in their particular contexts, have been implemented fairly successfully. For example, several jurisdictions have directed revenues towards energy efficiency measures, which in turn work to help to address market failures, thereby easing the transition to a low carbon economy.

### Financing low carbon investments

Development of new technology could lead to potential “first mover” advantage and the creation of new export industries (with attendant economic benefits), but some conditions must be met if policy is to be effective:

- Is there the necessary mix of research institutes and companies to develop and commercialize new technologies?
- Does the workforce have the required high-level skills?

In terms of financing new capital investment, the key questions include:

- Which consumers use the most energy and produce the greatest amount of emissions?
- Which sectors have the lowest cost options for reducing emissions?
- Would these investments be made without government support?
- Where are the greatest market failures?
- Would it be more cost effective to consider non-energy emissions, for example from agriculture and forestry?
- What investment measures would help vulnerable populations adapt to climate change?
- What are the most effective ways to support investment?

### Easing the transition for vulnerable populations and exposed economic sectors

The short-term objective is to ease the social and economic transition to a low carbon structure. The first step is to identify the following:

- Who are the most vulnerable socio-economic groups that will be affected by carbon pricing?
- Which economic sectors are most exposed to pressures of competitiveness?

Then, to ensure efficient use of revenues:

- How can these groups be specifically targeted?
- What is the most effective use of revenues for reaching these groups?

### Remaining revenues

Some of the objectives discussed above may be achieved through alternative measures that are not related directly to either climate goals or carbon pricing; these options include income tax cuts or increases in general government expenditure. Although they may be efficient in promoting economic growth, they will not be as well targeted as measures designed on the criteria above.

“The short-term objective is to ease the social and economic transition to a low carbon structure.”

SECTION

# 5

References and  
appendices



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# Appendix A: Carbon pricing mechanisms with revenue recycling

Further to the discussion in Section 2.2, Table A.1 details those programs in which revenue recycling is linked, either through legislation or a strong statement of political intent, to the carbon pricing mechanism.

**Table A.1: Legislative basis of revenue recycling programs**

Carbon pricing instrument	Implementing legislation/regulation for revenue recycling	Implementing legislation/regulation for carbon pricing mechanism
Alberta carbon scheme	Climate Change and Emissions Management Act, 2003 Climate Change and Emissions Management Amendment Act, 2008	Climate Change and Emissions Management Act, 2003 Climate Change and Emissions Management Amendment Act, 2008
Australia carbon tax and ETS <sup>19</sup>	Clean Energy Act, 2011 Clean Energy (Tax Laws Amendments) Act, 2011 Clean Energy (Household Assistance Amendments) Act, 2011	Clean Energy Act, 2011
Bay Area Air Quality Management District GHG fee	California state law provides for BAAQMD to levy fees to recover the direct and indirect costs associated with implementing and enforcing programs related to stationary sources of air pollution	California state law provides for BAAQMD to levy fees to fully recover the direct and indirect costs associated with implementing and enforcing programs related to stationary sources of air pollution
Boulder Climate Action Plan tax	Initiative 202 Climate Action Plan tax, 2006	Initiative 202 Climate Action Plan tax, 2006
British Columbia carbon tax	Carbon Tax Act, 2008	Carbon Tax Act, 2008
California Air Resources Board cap and trade program	Assembly Bill-1532, an act to add Part 8 to Division 25.5 of the Health and Safety Code, relating to GHG emissions, 2012	Assembly Bill-1532 an act to add Part 8 to Division 25.5 of the Health and Safety Code, relating to GHG emissions, 2012
Costa Rica carbon tax	Forestry Law 7575, 1996 Fiscal Reform Law No 8114, 2001	Forestry Law 7575, 1996
Netherlands energy taxes	Law of 13 December 1995 amending the income tax and corporation tax in connection with the introduction of an energy tax	Law of 13 December 1995 amending the income tax and corporation tax in connection with the introduction of an energy tax
Quebec carbon tax	An Act respecting the implementation of the Québec Energy Strategy and amending various legislative provisions, 2006 Sustainable Development Act, 2006	An Act respecting the implementation of the Québec Energy Strategy and amending various legislative provisions, 2006
Regional Greenhouse Gas Initiative (US)	Memorandum of Understanding, 2005	Memorandum of Understanding, 2005
Switzerland CO <sub>2</sub> tax	Regulation of 8 June 2007 on the CO <sub>2</sub> tax (CO <sub>2</sub> regulation)	Regulation of 8 June 2007 on the CO <sub>2</sub> tax (CO <sub>2</sub> regulation)

Sources:  
Legislative Assembly of Alberta (2008), Commonwealth of Australia (2011a)–(2011c), BAAQMD (2008a), City of Boulder (2006), Province of British Columbia (2008), California Legislature (2012), Pagiola (2006), Sánchez-Azofeifa et al (2007), Government of the Netherlands (2004), National Assembly of Quebec (2006a), National Assembly of Quebec (2006b), RGGI (2005), Swiss Federal Council (2007).

<sup>19</sup> Note that only the Household Assistance Package of the Australian revenue recycling scheme is established in legislation.

# Appendix B: Revenues to support the development of climate-friendly technologies

## B.1 Introduction

### Low carbon spending programs

In the United States and Canada, the most common form of revenue recycling is through investment funds related to climate change (mitigation and adaptation). Table B.1 lists the carbon pricing schemes that recycle revenues in this way and categorizes the types of expenditure in which the investment funds are engaged.

**Table B.1: Revenue recycling investment programs**

Revenue recycling investment programs	Energy efficiency	Renewables	Low carbon R&D	Other low carbon investments
Alberta carbon scheme	✓	✓	✓	✓
Australia carbon price	✓	✓	✓	
Bay Area Air Quality Management District GHG fee				✓
Boulder Climate Action Plan tax	✓	✓		
British Columbia carbon tax	N/A	N/A	N/A	N/A
California Air Resources Board cap and trade program	✓	✓		✓
Costa Rica carbon tax				✓
Denmark carbon tax	N/A	N/A	N/A	N/A
Finland carbon tax	N/A	N/A	N/A	N/A
Netherlands carbon tax	N/A	N/A	N/A	N/A
Norway carbon tax	N/A	N/A	N/A	N/A
Quebec carbon tax	✓	✓	✓	✓
Regional Greenhouse Gas Initiative (US)	✓	✓	✓	✓
Sweden carbon tax	N/A	N/A	N/A	N/A
Switzerland CO <sub>2</sub> tax	✓	✓		
UK climate change levy	N/A	N/A	N/A	N/A

Sources:  
Legislative Assembly of Alberta (2008), Australian Government (2011), BAAQMD (2008b), City of Boulder (2009), California Legislature (2012), Pagiola (2006), Government of Quebec (2008), RGGI Inc (2011).

Please note that N/A denotes the revenue recycling schemes without an investment program component.

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# Appendix B: Revenues to support the development of climate-friendly technologies

## B.2 Renewable technology and energy efficiency

### Overview

Seven of the spending programs identified in Table B.1 include energy efficiency and renewable energy components.

Generally, the type of projects permitted within these categories of spending is quite broad but typically they entail retrofitting homes and businesses for greater energy efficiency, and the installation of renewable energy technologies.

### Alberta

Revenues collected under the Alberta carbon scheme go into the province's Climate Change and Emissions Management Fund (CCEMF) for use in implementing its climate change strategy, the main strands of which are as follows (Government of Alberta 2008):

- conversion and efficient use of energy
- implementation of CCS
- "greening" energy production.

As of September 2011, the fund contained C\$257 million, of which C\$12 million was committed to projects.<sup>20</sup>

### Australia

The Australia carbon price is linked to a number of revenue recycling schemes supporting the installation of energy efficiency measures and renewable power generation. Under its Clean Technology Investment Program, A\$800 million will be available from 2011 to 2018 to provide manufacturing industries with grants to support investment in energy efficient plant and processing technology. The minimum grant size is A\$25,000 and funding is provided on a 1:3 co-investment ratio (AusIndustry 2012a). Australia's revenue recycling measures also consist of a A\$200 million Clean Technology Food and Foundries Investment Program offering transitional assistance to those industries from 2011 to 2017 (AusIndustry 2012b). The country's recycling measures also promote investment in energy efficiency and renewable technology for local communities and households. For example, the Community Energy Efficiency Program will provide A\$200 million in funding from 2012 to 2016 to improve energy efficiency in community buildings and facilities (Australian Government 2012).<sup>21</sup>

### Boulder, Colorado

Revenues from the city of Boulder carbon tax are allocated to low carbon investments in keeping with priorities identified in its Climate Action Plan. These include the following (City of Boulder 2011):

- retrofitting existing buildings and replacing household appliances to improve energy efficiency and to promote energy conservation
- promotion of renewable energy sources for individual buildings and sites.

In 2011–12, about US\$2.3 million in Climate Action Plan expenditure was allocated to these priorities.

### California cap and trade

The first auction took place in November 2012 and the compliance obligations began in January 2013 (CARB 2012). The program's implementing legislation specifies that allowance revenues must be deposited into a Greenhouse Gas Reduction Account and used only for measures to reduce GHGs. This includes use for "clean and efficient energy, through energy efficiency, clean and renewable distributed energy generation, and related activities" (California Legislature 2012).

### Quebec

All revenues from the Quebec carbon tax are paid into its Green Fund to finance the measures in the province's Climate Change Action Plan to reduce and avoid GHG emissions (Government of Quebec 2008). The total Climate Change Action Plan budget for 2006–12 stood at C\$1.6 billion,<sup>22</sup> 82 per cent of which was allocated to programs to reduce or avoid GHG emissions.

### Regional Greenhouse Gas Initiative (RGGI) (US)

Around 62 per cent of total RGGI revenues across all participant states<sup>23</sup> were allocated to energy efficiency and renewable energy programs between September 2008 and December 2010 (RGGI Inc 2011). While the spending programs are state specific, the most common types involve energy efficient retrofits for homes and businesses and subsidies for the installation of renewable generation technology.

20 See <http://environment.alberta.ca/02486.html>

21 Note that although the Community Energy Efficiency Program is presented as part of the Australian "Clean Energy Future" legislative package (for example, see: [www.cleanenergyfuture.gov.au/clean-energy-future/an-overview-of-the-clean-energy-legislative-package/](http://www.cleanenergyfuture.gov.au/clean-energy-future/an-overview-of-the-clean-energy-legislative-package/)), its funding is not formally linked to the carbon pricing revenues.

22 Note that the total 2006–12 Climate Action Plan budget includes a C\$350 million contribution from the Canadian federal government trust fund for clean air and climate changes, in addition to carbon tax revenues (Government of Quebec 2008).

23 RGGI participant states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont.

### Switzerland

Since 2010, one-third of Swiss CO<sub>2</sub> tax revenues (up to a maximum of CHF 200 million per year)<sup>24</sup> are recycled through the climate-friendly building program set up by the federal government and cantons (Das Gebäudeprogramm von Bund und Kantonen). The building program is in operation until 2012 and around two-thirds of annual revenues allocated to it are spent on energy efficiency renovations to buildings; the remaining third is spent on renewable energy promotion.<sup>25</sup>

### UK climate change levy

In the past, some revenue from the United Kingdom's climate change levy was used to fund the UK Carbon Trust, a non-profit organization providing advice and financial support to help businesses reduce carbon emissions and secure investment in the development of low carbon technologies. However, the organization lost its core government funding in 2011 (Carbon Trust 2011) and the additional revenues from the levy are no longer directly used to support the trust.

### Eligibility

Eligibility criteria vary between investment programs. In some cases, only businesses operating in specific sectors may apply for funding while in others, participation is open to a broad range of entities including universities and non-profit organizations. The specific eligibility requirements of each scheme are discussed below.

### Alberta

CCEMF eligibility rules are specific to each call for expression of interest (EOI). In the past, some EOIs were open to industry, municipalities, R&D institutions, technology developers and non-profit organizations; others were restricted to facilities subject to specific GHG reporting requirements or to small and medium enterprises. Funding is usually provided on a co-investment basis; projects with backing from the federal or provincial governments are not eligible.

### Australia

Eligibility for funds under the Australian carbon price scheme varies according to the specific scheme. Grants under the Clean Technology Investment Program are available to facilities meeting the following criteria (AusIndustry 2012a):

- they are non-tax-exempt corporations incorporated in Australia and undertaking manufacturing activity in Australia
- they use at least 300 megawatt hours of electricity or five terajoules of natural gas in the full financial year prior to application
- they use an electricity/fuel mix that results in emissions of at least 0.27 kilotonnes of CO<sub>2</sub> equivalent.

Alternatively, manufacturing industries covered by the carbon price are eligible. To be eligible for funding under the Clean Technology Food and Foundries Investment Program, applicants must operate in those industries in Australia undertaking a manufacturing activity. Applicants must also be non-tax-exempt corporations incorporated in Australia (AusIndustry 2012b). Only local government bodies or non-profit organizations whose primary objective is to assist or service the community are eligible for funding under the Community Energy Efficiency Program (Australian Government 2012). Schools, universities, profit-making organizations and state and territorial government agencies are explicitly excluded from eligibility.

### Boulder

Boulder's Climate Action Plan is implemented through a number of programs. Projects must (City of Boulder 2011):

- maximize GHG reductions
- minimize tax dollars spent per ton of reduced GHG
- provide assurances of a reasonable payback period and the expectation of private sector co-investment.

The Climate Action Plan also stresses that the projects it backs should:

- engage the community
- be funded on a leverage or investment gap basis
- result in readily measurable GHG reductions
- be highly visible to the wider community
- involve a proven technology with a high likelihood of success.

<sup>24</sup> This was increased by the Swiss Parliament to an annual maximum of CHF 300 million in December 2011.

<sup>25</sup> See [www.bafu.admin.ch/umwelt/status/03985/index.html?lang=en](http://www.bafu.admin.ch/umwelt/status/03985/index.html?lang=en)

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# Appendix B: Revenues to support the development of climate-friendly technologies

### California cap and trade

Since California's first auction only took place in November 2012, no revenues have been recycled as yet. The California Air Resources Board has not yet formally established how the revenues will be distributed and who will be eligible to apply for them; however, the enabling legislation stipulates that revenues will be awarded to "measures and programs that meet specified criteria" (California Legislature 2012).

### Quebec

The revenues from Quebec's Green Fund for renewable technology and energy efficient investments have been delivered through the GHG emissions reduction or avoidance actions' measures contained in its 2006–2012 Climate Change Action Plan. Each measure is delivered through one or more distinct programs, each of which has its own specific eligibility criteria.

### RGGI

US RGGI participant states implement their energy efficiency and renewable technology investments through their own programs with their own specific eligibility criteria. For example, the state of New Hampshire recycles some RGGI allowance revenues into its Business Energy Conservation Revolving Loan Fund, which provides loans to businesses for energy efficiency improvement purposes. Both commercial enterprises and non-profit organizations are eligible to apply for loans. The minimum size of loan is US\$100,000 and the maximum repayment period is five years.<sup>26</sup> Loan applicants are expected to demonstrate that they can repay their loans based on either historical revenue or projections of future income.

### Switzerland

The building program of the federal government and cantons has two components. The energy efficient building renovation component operates across all cantons and funds improved insulation in heated buildings constructed before the year 2000. CHF 30 is provided for each square metre of insulated window and external floor, wall or door and CHF 10 per square metre to insulate walls, floor and doors surrounding unheated rooms.<sup>27</sup> The minimum amount of funding available is CHF 3,000. Businesses exempt from the CO<sub>2</sub> tax are not eligible for assistance, neither are households or businesses that have received other government subsidies for their renovation projects. The scope of assistance under the second component of the program varies by canton but funding usually is provided for renewable energy technology and for using waste heat.

### Management and administration

The management and administration details of the various renewable technology and energy efficiency investment programs are discussed below.

#### Alberta

The Alberta CCEMF is allocated via the Climate Change and Emissions Management Corporation (CCEMC), a non-profit organization operating independently of the Alberta Government. The CCEMC issues calls for EOIs and invitations to tender for proposals related to strategic investment in areas such as renewable energy and energy efficiency. Funding proposals undergo multiple stages of assessment, including an initial review by an evaluation committee of technical experts, an oral presentation and a third party review by technical experts outside the initial evaluation committee. CCEMF awards are subject to project-specific contracts that stipulate monitoring and reporting requirements. With regards to IPR, funding contracts are based on the general principle that CCEMC retains unlimited rights to a project's technical data, reports and analysis while the applicant owns the project technology. Another clause states that if co-funded technology is not commercialized within a specified period, it can be made available to other organizations and individuals in Alberta (CCEMC 2012).

#### Australia

Proposals for funding from Australia's Clean Technology Investment Program are assessed against the following criteria (AusIndustry 2012a):

- the anticipated reduction in carbon emissions intensity, including those resulting from energy efficiency improvements
- the applicant's capacity and capability to undertake the project
- the extent to which the project maintains and improves the competitiveness of the applicant's business.

The following additional criterion applies to grant applications in excess of A\$1.5 million:

- the project's potential to help build a competitive, low carbon manufacturing industry in Australia, with benefits to the broader national economy.

<sup>26</sup> See [www.rw.doe.gov/savings/nh-bfa-business-energy-conservation-revolving-loan-fund](http://www.rw.doe.gov/savings/nh-bfa-business-energy-conservation-revolving-loan-fund)

<sup>27</sup> See [www.dasgebaeudeprogramm.ch/index.php/de](http://www.dasgebaeudeprogramm.ch/index.php/de)

Award decisions are made by Innovation Australia, an independent statutory panel of private sector experts; applications for funds of A\$10 million or more will be referred to the Australian Cabinet (AusIndustry 2012a). Innovation Australia uses the same merit criteria to award funds from the Clean Technology Food and Foundries Investment Program. The Department of Climate Change and Energy Efficiency manages the award process for the Community Energy Efficiency Program. The proposals undergo viability assessments and must demonstrate the following (Australian Government 2012):

- their potential to improve energy efficiency
- their potential to encourage better energy management practices
- their value for money.

Funding is provided on a 50 per cent co-contribution basis, up to a maximum grant of A\$5 million, and is subject to a performance-based funding agreement (Australian Government 2012). As part of the grant assessment process, applicants must detail plans to manage and protect IPR related to their projects and provide arrangements for their use by the Department of Climate Change and Energy Efficiency (Australian Government 2012).

#### **Boulder**

The Boulder municipal government designs and commissions its climate action programs rather than using competitive processes to gather proposals. Programs are usually delivered through a combination of public sector bodies and third party, non-profit organizations (City of Boulder 2011).

#### **California cap and trade**

Under California state legislation, allowance revenues are paid into the new Greenhouse Gas Reduction Account, held within the California State Air Pollution Control Fund. The California Air Resources Board awards the funds.

#### **Quebec**

The following government organizations are responsible for managing the GHG emissions reduction or avoidance actions' measures contained in the Climate Change Action Plan (Government of Quebec 2008): Ministry of Sustainable Development, Environment and Parks; Ministry of Economic Development, Innovation and Export Trade; Department of Natural Resources and Wildlife; Department of Transport; Ministry of Agriculture, Fisheries and Food; and the Agency for Energy Efficiency.

#### **RGGI**

US RGGI participant states implement their energy efficiency and renewable technology investments through their own programs, so management and administration arrangements are scheme specific. For example, New Hampshire has the Business Energy Conservation Revolving Loan Fund administered by the New Hampshire Business Finance Authority (BFA). BFA takes a security stake in all assets that it finances.

#### **Switzerland**

The federal government and cantons have a joint building program to promote energy efficiency, which each level of government administers within its own jurisdiction. The responsible bodies are the Federal Office for the Environment and the Federal Office of Energy, and the Conference of Cantonal Energy Directors.

## SECTION 5

# Appendix B: Revenues to support the development of climate-friendly technologies

### B.3 Low carbon related R&D

Some revenue recycling investment programs directly fund R&D into low carbon technologies. This includes funding demonstration facilities and bringing existing technologies to market.

#### Overview

Four of the policies reviewed recycle revenue into low carbon related R&D.

#### Alberta

Revenues collected under the Alberta carbon scheme are paid into its CCEMF to implement the province's climate change strategy, the main strands of which are the following (Government of Alberta 2008):

- energy conversion and efficiency
- implementation of CCS
- "greening" energy production.

Many projects funded via this strategy, in particular those related to CCS technology, involve the development and demonstration of pilot technologies.

#### Australia

The Australia carbon price is potentially linked to a number of programs funding R&D in low carbon technologies. Under the Clean Technology Innovation Program, carbon price revenues will be used to provide grants to businesses for R&D into renewable and energy efficient technologies. A total of A\$200 million will be available from 2012 to 2017 through grants of A\$50,000–A\$5 million for individual projects (Australian Government 2011). Grants will be awarded competitively and provided on a 50 per cent co-investment basis. The Australian revenue recycling measures also will support investment in R&D via the Clean Energy Finance Corporation (CEFC). It funds the development and deployment of clean-energy technologies; funding vehicles include commercial loans, concessional-rate loans, loan guarantees and equity investments. The CEFC will receive A\$10 billion in carbon-allowance revenues from 2013 to 2018. It is intended to be commercially oriented and for profits to be reinvested.<sup>28</sup>

#### Quebec

All revenues from the Quebec carbon tax are paid into its Green Fund to finance the measures in the province's Climate Change Action Plan for reducing and avoiding GHG emissions (Government of Quebec 2008). R&D funding accounts for nearly 9 per cent of the total 2006–2012 Climate Change Action Plan budget.<sup>29</sup>

#### RGGI

Approximately 1.1 per cent of total RGGI revenues were spent on low carbon related R&D between September 2008 and January 2010 (RGGI Inc 2011). The state of New York has invested a portion of its RGGI allowance revenues to partially fund its Advanced Power Technology program. This initiative finances the development and market deployment of long-term technologies to reduce GHGs. The New York State Energy Research and Development Authority (NYSERDA) administers the program. Evaluation panels consisting of external reviewers recommend who should win the awards; a multidisciplinary internal committee then approves the awards (NYSERDA 2009).

#### Eligibility

The eligibility criteria for low carbon R&D funding vary across programs. In some cases, a wide variety of different types of organizations may apply for funding; in others, more restrictive criteria apply.

#### Alberta

As with funding allocated to renewable technology and energy efficiency projects, eligibility for R&D funding from Alberta's CCEMF is specific to each call for EOI. In the past, some EOIs have been open to industry, municipalities, R&D institutions, technology developers and not-for-profit organizations; others have been more restricted.

#### Australia

Eligibility for the Australian Clean Technology Innovation Program is relatively open. Businesses, public sector research organizations and university enterprises may apply for funding. Although the CEFC is not yet fully established and operational, the CEFC expert review panel has recommended that the CEFC invests only in commercial activities located principally in Australia (Commonwealth of Australia 2012). It also recommends that all investment proposals be assessed against commercial investment criteria.

<sup>28</sup> Note that although the CEFC program is presented as part of the Australian "Clean Energy Future" legislative package (for example, see [www.cleanenergyfuture.gov.au/clean-energy-future/an-overview-of-the-clean-energy-legislative-package/](http://www.cleanenergyfuture.gov.au/clean-energy-future/an-overview-of-the-clean-energy-legislative-package/)), its funding is not formally linked to the carbon pricing revenues and is in fact drawn from the government consolidated revenue fund.

<sup>29</sup> Note that the total 2006–2012 Climate Change Action Plan budget includes a C\$350 million contribution from the Canadian federal government trust fund for clean air and climate changes, in addition to carbon tax revenues (Government of Quebec 2008).

**Quebec**

The Quebec Government has identified its priority areas for allocation of R&D finance under its Climate Change Action Plan. In particular, it funds R&D in the following areas: forestry, agricultural and municipal biomass valorization, GHG capture and storage, geothermal energy, solar energy and hydrogen (Government of Quebec 2008). Financial assistance is provided for demonstration, pre-commercialization and marketing activities only, so that the investment can be recovered rapidly through sales and exports of the new technology (Government of Quebec 2008).

**RGGI**

Projects funded through New York State's Advanced Power Technology program will be pursued only if one or more key New York stakeholders commits to actively supporting all phases of the initiative (NYSERDA 2009). This might include energy generators, renewable resource developers or electricity utility companies.

**IPR and contractual issues**

The following is a discussion of the rules governing IPR and other financial issues governing research funded by the programs.

**Alberta**

As with renewable technology and energy efficiency funding, R&D financing from the Alberta CCEMF is allocated via the CCEMC. The CCEMC issues calls for EOIs and invitations to tender for proposals, including those for R&D funding. Proposals undergo multiple stages of assessment, including an initial review by an evaluation committee of technical experts, and an oral presentation and third party review by technical experts outside the initial evaluation committee. CCEMF awards are subject to project-specific contracts stipulating monitoring and reporting requirements. With regards to IPR, CCEMC retains unlimited rights to a project's technical data, reports and analysis while the applicant owns the project technology. If co-funded technology is not commercialized within a specified time period, the contract states that it can be made available to other organizations and individuals in Alberta (CCEMC 2012).

**Australia**

The Australian CEFC provides equity financing, among other forms of investment. It will own a stake in any intellectual property embodied in the funded organizations, although the exact financial terms and conditions will be offered on a case-by-case basis (Commonwealth of Australia 2012).

**Quebec**

Financial assistance for R&D under Quebec's Climate Action Plan is delivered by the following government ministries: Ministry of Sustainable Development, Environment and Parks; Ministry of Economic Development, Innovation and Export Trade; Department of Natural Resources and Wildlife; and the Agency for Energy Efficiency.

**RGGI**

Contracts awarded as part of New York State's Advanced Power Technology program are reported publicly through the NYSERDA's regular procurement reports.

## SECTION 5

# Appendix B: Revenues to support the development of climate-friendly technologies

### B.4 Other low carbon investments

Some revenue recycling investment programs directly fund R&D into low carbon technologies. This includes funding demonstration facilities and bringing existing technologies to market.

#### Overview

Six of the revenue recycling programs reviewed in this report invest in low carbon projects that are not specifically related to renewable technology and energy efficiency. These are discussed below.

#### Alberta

Revenues collected under the Alberta carbon scheme go into its CCEMF to implement the province's climate change strategy. One of the main strands of this climate strategy is the implementation of CCS projects (Government of Alberta 2008), including:

- demonstration of the use of specified gas capture, use and storage technology
- development of opportunities for removal of specified gases from the atmosphere
- measurement of the natural removal and storage of carbon.

#### Bay Area

California state law gives the Bay Area Air Quality Management District (BAAQMD) the authority to recover costs associated with implementing and enforcing programs related to stationary sources of air pollution (BAAQMD 2008a). This restricts the ways in which the revenues may be spent. The BAAQMD has decided the revenues will be used to finance (BAAQMD 2008a):

- development and maintenance of a regional inventory of GHG emissions
- completion of region-wide studies to identify and evaluate potential GHG emission control options for application at stationary sources in the Bay Area
- development of regulatory measures for GHGs at stationary sources
- review of GHG-related documents
- other miscellaneous activities, such as database system updates and invoicing.

#### California cap and trade

The first California cap and trade allowance auction took place in November 2012 and so no allowance revenues have been recycled as yet (CARB 2012). However, according to California legislation, all allowance revenues must be paid into a Greenhouse Gas Reduction Account and used only to reduce GHG emissions. The means of doing so may include (California Legislature 2012):

- low carbon transportation
- sustainable infrastructure development
- natural resource conversion and management.

#### Costa Rica

The Costa Rican carbon tax is the only investment scheme that does not recycle revenues into energy efficiency, renewables or low carbon R&D projects. Instead, some revenues partially fund the environmental services (PES) program. It provides payments for landowners and indigenous communities with financial incentives to practise sustainable development and forest conservation (Pagiola 2006).

#### Quebec

All revenues from the Quebec carbon tax are paid into its Green Fund to finance measures in Quebec's Climate Change Action Plan to reduce and avoid GHG emissions (Government of Quebec 2008). The 2006–2012 Climate Change Action Plan includes adaptation and awareness measures that account for 9.3 per cent of the C\$1.6 billion Climate Change Action Plan budget.<sup>30</sup>

#### RGGI

A share of RGGI revenues has been recycled into programs that fund other sorts of climate change-related investment. These range from educational outreach to maintaining a regional GHG emissions inventory (as is done by the BAAQMD) (BAAQMD 2008a). The revenue investment fund for the proposed California cap and trade program will finance low carbon transportation, sustainable infrastructure development, and land and natural resource conservation (California Legislature 2012).

<sup>30</sup> Note that the total 2006–2012 Climate Change Action Plan budget includes a C\$350 million contribution from the Canadian federal government trust fund for clean air and climate changes, in addition to provincial carbon tax revenues (Government of Quebec 2008).

### B.5 Wider governance

As noted in Section 2.2, there is often a legislative link between a revenue-raising instrument and targeted recycling investment programs. Nevertheless, significant variations in legislation and governance rules across jurisdictions means there are differences as to exactly how, and how much of, the revenues should be spent. In some cases, legislation or other statutory instruments state what portion of revenues are to be spent on investment projects.

#### Costa Rica

Originally, about one-third of national carbon tax revenues was to go into the PES program. In practice, the Ministry of Finance paid smaller and more variable shares of revenues into the PES. The subsequent Fiscal Reform Law No 8114 fixed the PES share at 3.5 per cent in 2001; this share is much lower than had been envisaged but it is, at any rate, legally guaranteed (Pagiola 2006).

#### Quebec

The law governing some of Quebec's revenue recycling investment programs permits more discretion on the part of the Government or the fund management than is seen in other jurisdictions. Under Quebec's carbon tax legislation, monies may be transferred into and out of its Green Fund on a temporary basis. According to the following government statement, it appears the Green Fund may be used to help cover a general budget deficit (National Assembly of Quebec 2006b): "Despite any provision to the contrary, the Minister of Finance must, in the event of a deficiency in the consolidated revenue fund, pay out of the Green Fund the sums required for the execution of a judgment against the State that has become *res judicata*."

#### RGGI

RGGI provides another example of using revenues to finance general government expenditure. Between September 2008 and January 2010, 17.4 per cent of total RGGI allowance revenues were used to reduce the budget deficits of participant states.<sup>31</sup> The memorandum of understanding signed by participant states specifies that only 25 per cent of allowance revenues must be used for "a consumer benefit or strategic energy purpose" (RGGI 2005). In contrast, the legislation establishing the Boulder carbon tax requires that all revenues go into the Climate Action Plan fund program (City of Boulder 2009).

These cases highlight the fact that there can be considerable uncertainty over the exact size and duration of the revenue recycling commitment even when legislation specifically links revenues to low carbon investment funds.

<sup>31</sup> This practice occurred in New Hampshire, New Jersey and New York.

## SECTION 5

# Appendix C: Protecting vulnerable populations

### C.1 Introduction

Several of the revenue recycling schemes under review include specific measures to assist vulnerable populations. Four population groups receive targeted assistance (see Table C.1). In addition to these four, revenue recycling schemes that reduce personal income tax rates also tend to benefit low-income households, as do extensions to tax-free allowances. Programs such as these have been implemented in Australia, British Columbia, Denmark, Finland, the Netherlands, Norway and Sweden.

### C.2 Low-income populations

This review has identified three revenue recycling programs providing specific assistance to low-income populations. These are the Australian carbon price scheme, the British Columbia carbon tax and the Regional Greenhouse Gas Initiative in the United States. Support is offered through:

- transfer payments
- direct energy bill assistance
- targeted energy efficiency programs.

Targeted energy efficiency programs are optimal as they provide vulnerable populations with relief from the impact of the carbon pricing mechanism without undermining the carbon price signal. In contrast, direct energy bill assistance removes the incentive, provided by the carbon price, to reduce energy consumption.

**Table C.1: Summary of vulnerable populations supported by revenue recycling schemes**

Revenue recycling schemes	Low-income	Rural	Pensioners and retired persons	Other vulnerable energy users
Australia carbon price	✓	✓	✓	✓
British Columbia carbon tax	✓			
Costa Rica carbon tax		✓		
Netherlands carbon tax			✓	
Regional Greenhouse Gas Initiative (US)	✓			

Sources:  
Australian Government (2011), Government of British Columbia (2010), Pagiola (2006), Hoerner and Bosquet (2001), RGGI Inc (2011).

Please note that schemes that do not include explicit measures to protect vulnerable populations are excluded from the table.

## Transfer payments

Of all the revenue recycling programs reviewed, the Australian and British Columbian schemes offer specific transfer payments to low-income households.

### Australia

As part of the Australia carbon price, the Household Assistance Package offers the following support (Australian Government 2011):

- Households in receipt of the Family Tax Benefit received one-off, lump sum payments in spring 2012. This is known as the Clean Energy Advance, equivalent to a 1.7 per cent increase in the maximum annual rate of the Family Tax Benefit.
- From July 2013 onwards, each household in receipt of the Family Tax Benefit will receive a Clean Energy Supplement equivalent to a 1.7 per cent increase in the relevant rate of Family Tax Benefit; it can be received quarterly or fortnightly.
- Households can apply for a low-income supplement of A\$300. Applicants must demonstrate that the Household Assistance Package assistance they have received has not offset the impact of the carbon price adequately.

The 1.7 per cent increase in the Family Tax Benefit consists of a 0.7 per cent increase to compensate for the estimated impact of the carbon price on inflation and a 1 per cent real increase in family tax benefits (Australian Government 2011). In future, the Clean Energy Supplement will be indexed to the consumer price index (CPI) only.

### British Columbia

The British Columbia carbon tax scheme must be revenue neutral, so it is accompanied by a low-income climate action tax credit. The credit works to counterbalance the impact of the carbon tax on low- and moderate-income households. The maximum annual amount available is C\$115.50 per adult and C\$34.50 per child. This maximum amount is for individuals and families living below the net income threshold (linked to British Columbia's CPI). The amount available to those above the threshold decreases as their annual net income increases.<sup>32</sup> The credit is delivered to individuals in quarterly instalments via the income tax system. Forecasts indicate the low-income climate action tax credit will account for 15–20 per cent of annual carbon tax revenues over the tax years 2010/11 to 2012/13 (Government of British Columbia 2010).

<sup>32</sup> See the British Columbia Income Tax Act available online at: [www.bclaws.ca/EPLibraries/bclaws\\_new/document/LOC/freeside/--%20Income%20Tax%20Act%20RSBC%201996%20c.%20215/00\\_Act/96215\\_00.htm](http://www.bclaws.ca/EPLibraries/bclaws_new/document/LOC/freeside/--%20Income%20Tax%20Act%20RSBC%201996%20c.%20215/00_Act/96215_00.htm)

## Direct energy bill assistance

Direct energy bill assistance programs provide financial relief to households to help them pay their electricity bills. The only such schemes reviewed in this report are run by the RGGI participant states of Delaware, Maryland and New Jersey.<sup>33</sup>

### RGGI

The Maryland Electric Universal Service Program (EUSP) provides ongoing assistance to help low-income households pay their electricity bills. Eligibility is based on electricity usage and household income. Benefits are paid directly to the utility company on behalf of eligible households. In 2010, Maryland used US\$15 million of its RGGI allowance revenues on this scheme, providing 24,456 households with an average benefit of US\$624 (MEA 2011). The EUSP program also includes an arrearage retirement assistance scheme under which low-income households can apply to receive full funding for unpaid electricity bills, up to a maximum of US\$2,000 and no more than once every seven years per applicant. In 2010, this EUSP component provided 26,308 households with an average assistance of US\$1,011 (MEA 2011). The combined expenditure of EUSP programs accounted for around 44 per cent of Maryland's RGGI allowances for 2009 and 2010.

From September 2008 to December 2010, Delaware used approximately 5 per cent of its total RGGI auction allowances to supplement the federally funded Low-Income Home and Energy Assistance Program (LIHEAP) in Delaware. LIHEAP, as implemented in Delaware, provides low-income households with credits to help them pay their utility bills. To be eligible, a household's income cannot exceed 200 per cent of the federal poverty level. Households must apply for assistance annually. LIHEAP also has a Summer Cooling Assistance Program (SCAP) and Crisis Assistance Program. SCAP provides low-income households with funds to pay summer electricity bills or, where funds are available, free air conditioning units. The latter is likely in conflict with the environmental objectives of the revenue-raising instrument. Catholic charities in the state administer the Crisis Assistance Program, providing one-off grants to low-income households unable to pay their energy bills.

When New Jersey was still an RGGI member, 18.4 per cent of its RGGI revenues were used to provide direct electricity bill payment assistance to low- and moderate-income households.

<sup>33</sup> Note that New Jersey exited the RGGI in 2011.

### Targeted energy efficiency programs

The final category of revenue assistance to low-income households consists of targeted energy efficiency programs. The RGGI member states of Maryland, Rhode Island, Vermont and New York all recycle some proportion of their revenues through such programs.

#### RGGI

Maryland operates a Multifamily Energy Efficiency and Housing Affordability (MEEHA) program. It is a response to the fact that many of Maryland's low-income households live in rented accommodation but most retrofitting programs do not cover apartments or condominiums. The MEEHA scheme contributes towards the energy efficiency upgrades for new apartment buildings or those undergoing renovation by the Department of Housing and Community Development (DHCD). The DHCD, building management associations and affordable housing agencies identify candidate renovation projects (MEA 2011). The program pays out a maximum of US\$2,500 per housing unit, and up to US\$500,000 per renovation project (MEA 2011). This scheme was allocated US\$1.7 million out of Maryland's RGGI allowance revenues in 2010 (MEA 2011).

About 60 per cent of Rhode Island's RGGI allowance revenues are invested in its Least Cost Energy Efficiency Utility Account. Financial grants from that account are given to non-profit organizations providing energy efficiency services to low-income households not covered by existing incentive programs.

In Vermont, 100 per cent of revenue allowances are invested in its Heating and Process Energy Efficiency Program, of which 50 per cent must be used to support energy efficiency retrofits for lower- and middle- income consumers.

In New York, 36.6 per cent of allowance revenues are invested in Residential Space and Water Heating Efficiency funds. According to that program's investment plan, "a substantial portion of the funds in this category will be used to support energy efficiency improvements in low-income housing".

### C.3 Rural populations

Costa Rica's carbon tax and Australia's carbon price are the only recycling programs using revenues to assist rural populations.<sup>34</sup>

#### Australia

As part of the Remote Indigenous Energy Program, A\$40 million in carbon price revenues will be made available over five years to support energy generation in remote indigenous communities; this includes training people to handle ongoing energy operations and maintenance. The Department of Families, Housing, Community Services and Indigenous Affairs has administrative responsibility for the program, including the selection of delivery organizations (Australian Government 2011).

The Indigenous Carbon Farming Fund<sup>35</sup> will provide A\$22 million in carbon price revenues over five years to help train indigenous communities to develop carbon farming projects<sup>36</sup> and to support savannah fire management activities that are likely to have a high level of indigenous community participation (Australian Government 2011).

#### Costa Rica

Under Costa Rica's PES scheme, 3.5 per cent of carbon tax revenues are recycled to provide financial incentives to landowners and indigenous communities, to encourage them to practise sustainable development and forest conservation (Pagiola 2006). The Costa Rican carbon tax provides some support to rural populations. However, that program's stated objective is forest conservation. Consequently, this form of revenue recycling should be considered "mitigation and adaptation" funding. Still, as Pagiola (2006) notes, environmental services often emanate from poor rural areas so the program may provide indirect assistance to vulnerable people.

<sup>34</sup> Some other revenue recycling programs offer assistance to farms; however, this is more appropriately viewed as industrial assistance rather than helping rural populations in general.

<sup>35</sup> Note that although the Indigenous Carbon Farming Fund is presented as part of the Australian "Clean Energy Future" legislative package (for example, see [www.cleanenergyfuture.gov.au/clean-energy-future/an-overview-of-the-clean-energy-legislative-package/](http://www.cleanenergyfuture.gov.au/clean-energy-future/an-overview-of-the-clean-energy-legislative-package/)), its funding is not formally linked to the carbon pricing revenues.

<sup>36</sup> In Australia, farmers and land managers can earn carbon credits by storing carbon or reducing GHG emissions on the land. [www.climatechange.gov.au/cfi](http://www.climatechange.gov.au/cfi)

#### C.4 Pensioners and retired persons

The Australia carbon price and the Netherlands carbon tax include specific provisions for pensioners and retired persons.

##### **Australia**

In early 2012, under Australia's Household Assistance Package, pensioners received a lump sum Clean Energy Advance of A\$250 for single persons and A\$380 for each couple.<sup>37</sup> Pensioners also receive a Clean Energy Supplement equivalent to a 1.7 per cent increase in their maximum annual pension rate (Australian Government 2011). This financial assistance for pensioners mirrors the Clean Energy tax credit for working families. As with the family supplement, the pensioners' 1.7 per cent increase consists of a 0.7 per cent increase to account for the estimated impact of the carbon price on inflation and a 1 per cent real increase in the annual pension rate (Australian Government 2011). In future, the Clean Energy Supplement will be indexed to the CPI.

##### **The Netherlands**

As part of the revenue recycling measures related to the Netherlands carbon tax, the tax-free allowance for senior citizens was increased (Vermeend and van der Vaart 1998).

#### C.5 Other vulnerable energy users

##### **Australia**

Australia's Household Assistance Package offers support to individuals who, for medical or disability reasons, generate high electricity bills. Under the Essential Medical Equipment Payment, an eligible household receives an annual grant of A\$140 to offset the impact of the carbon price on their electricity costs (Australian Government 2011).

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<sup>37</sup> This was a one-off payment to ensure that vulnerable groups received cash assistance prior to the implementation of the carbon price (Australian Government 2011).

### C.6 Vulnerable groups and tax compensation

In addition to the programs identified above, revenue recycling schemes that reduce personal income tax rates<sup>38</sup> also tend to benefit low-income households insofar as the basic rate of tax is lowered or the tax-free allowance is extended. Australia, British Columbia, Denmark, Finland, the Netherlands, Norway and Sweden have implemented programs of this nature.<sup>39</sup>

#### Income tax reductions

Economic efficiency arguments are discussed in more detail in Section 3. However, it is worth noting here that there is an economic efficiency argument for reducing tax rates for low- (rather than high-) income earners. This is because the elasticity of labour supply tends to be highest at low-income levels (Mors 1995): in comparison to high earners, low-income individuals are more likely to change their participation in the labour market in response to changes in net wages. It also has been suggested that low-income labour is typically a relatively good substitute for energy and capital (Mors 1995), so reducing labour taxes may help to reduce energy consumption. Reducing taxes in low-income brackets may offset distortions in the tax system to a greater extent than would reductions in tax rates for high-income brackets. This directs revenues towards low-income individuals (specifically via reductions in labour income taxes).

In addition, recycling revenues into reductions in social security contributions or labour income taxes shifts the burden of taxation onto those outside the workforce (Bosquet 2000). This shift is likely to require higher contributions from vulnerable groups such as pensioners and the disabled. Offsetting these would require supplementary social measures.

### The Swiss case

About two-thirds of total revenues from the Swiss carbon tax are recycled to both households and businesses. The total amount recycled back to households is determined by that sector's share of total energy use. For administrative simplicity, revenues are recycled back to individuals by reducing their statutory health insurance premiums. However, the same amount is recycled back to everyone,<sup>40</sup> meaning this program is similar to a lump sum approach. Although this recycling scheme provides a continuing incentive for households to reduce their energy consumption and is more equitable than income tax reductions,<sup>41</sup> it may affect vulnerable groups disproportionately.

38 See Section 2.6 for a full discussion of tax offsets.

39 For some revenue recycling schemes, such as the Australia carbon price, tax reductions are also offered on higher-income brackets, benefiting middle-income rather than low-income households.

40 Federal Office of the Environment leaflet (2011), available online at: [www.bafu.admin.ch/dokumentation/medieninformation/00962/index.html?lang=en&msg-id=46899](http://www.bafu.admin.ch/dokumentation/medieninformation/00962/index.html?lang=en&msg-id=46899)

41 The International Energy Agency applauds the Swiss revenue recycling approach as an example of best practice (IEA 2007).

## Appendix D: Supporting “exposed” economic sectors

### Overview

“Exposed” economic sectors are carbon intensive and operate in competitive global markets. If governments fail to help exposed industries adapt to low carbon regimes, the fear is those industries might transfer production to other jurisdictions with relatively lax constraints on GHG emissions. This could lead to an increase in a sector’s total emissions. Carbon leakage is most likely to happen when a carbon price or environmental policy is introduced unilaterally. To discourage carbon leakage, exposed sectors may require support in relation to the carbon price.

### Free ETS allowances

Normally, exposed sectors are not explicitly supported with recycled revenues. Instead, such sectors receive free carbon allowances (eg under the EU ETS) or specific legislative exemptions from paying the carbon tax.

For example, the Australia carbon price supports such sectors through its Jobs and Competitiveness Program providing free emissions allowances for organizations meeting the following eligibility criteria (Australian Government 2011):

- either operation in a market with a ratio of international trade to total domestic production that is greater than 10 per cent in any year in the period 2004–08, or a demonstrated inability to pass carbon price costs onto customers due to the extent of international competition (to be judged on a qualitative basis)
- an industry-wide average emissions intensity threshold for a given activity.

Eighty per cent of emissions from manufacturing activities in Australia meet the above criteria. These industries include aluminium, steel, pulp and paper, glass, cement and petroleum production (Australian Government 2011). While no revenue has been raised explicitly, the free allocations are expected to amount to around 34 per cent of potential carbon pricing revenues in the Australian Government’s 2011–15 forward estimates.

The first two phases of the EU ETS provided free allowances to all sectors involved in the scheme.

### Defining free allocation

There is debate as to whether these exemptions and allocations should be treated as revenue recycling or as measures preventing revenues from being raised in the first place. For this report, they have been treated as revenues that have not been raised and therefore they are outside the scope of this analysis. However, it is clear that such free allocations and exemptions constitute a high proportion of potential revenues. The competitive impacts of carbon pricing mechanisms are explored in the ICMM report, *The cost of carbon pricing: competitiveness implications for the mining and metals industry*.

### Other support

Most support for exposed sectors is through free allowances, but the Australian carbon pricing scheme includes some other measures such as energy efficiency grants to manufacturers through the Clean Technology Investment Program and the Clean Technology Food and Foundries Investment Program.

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The International Council on Mining and Metals (ICMM) was established in 2001 to improve sustainable development performance in the mining and metals industry. Today, it brings together many of the world's largest mining and metals companies as well as national and regional mining associations and global commodity associations. Our vision is one of leading companies working together and with others to strengthen the contribution of mining, minerals and metals to sustainable development.

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