

CANADA'S **ECOFISCAL** COMMISSION
Practical solutions for growing prosperity

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Canadian Options for Greater Economic
and Environmental Prosperity

November 2014





CANADA'S ECOFISCAL COMMISSION

WHO WE ARE

A group of independent, policy-minded Canadian economists working together to align Canada's economic and environmental aspirations. We believe this is both possible and critical for our country's continuing prosperity. Our Advisory Board comprises prominent Canadian leaders from across the political spectrum.

We represent different regions, philosophies, and perspectives from across the country. But on this we agree: ecofiscal solutions are essential to Canada's future.

OUR VISION

A thriving economy underpinned by clean air, land, and water for the benefit of all Canadians, now and in the future.

OUR MISSION

To identify and promote practical fiscal solutions for Canada that spark the innovation required for increased economic and environmental prosperity.

For more information about the Commission, visit Ecofiscal.ca



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Executive Summary

Canada's Ecofiscal Commission will examine practical fiscal solutions for Canada that spark the innovation required for increased economic and environmental prosperity. We believe that aligning Canada's economic and environmental aspirations is both critical and possible for our country's continuing prosperity.

SMART ENVIRONMENTAL POLICY IS SMART ECONOMIC POLICY.

Canada's current and future economic prosperity depend on protecting our clean air, water, and land, and also reducing our greenhouse gas emissions. They depend on ramping up Canadian innovation to respond not only to today's demands, but also to the emerging environmental realities that will shape the markets of tomorrow. We can no longer afford to silo our economic and environmental agendas. The sustained well-being of Canadians requires new policies that align our aspirations for a thriving economy and a clean environment. Current evidence suggests that we can achieve this by using *ecofiscal* policies.

Ecofiscal policies correct market price signals to encourage the economic activities we want (job creation, investment, and innovation) while discouraging those we don't (greenhouse gas emissions and pollution of our land, air, and water). The revenue generated from pollution fees can create further benefits; for example, by reducing taxes on families and businesses or investing in new technologies or critical public infrastructure.

ECOFISCAL REFORM IS A CRITICAL OPPORTUNITY FOR THE COUNTRY.

Canada is fortunate, both in terms of its economic prosperity and its unparalleled natural assets. It has maintained this prosperity not by accident, but through deliberate policy choices. Just as Canada successfully tackled high government budget deficits and embraced freer international trade, implementing ecofiscal policies is our next ambitious, and critical, policy opportunity.

Total Canadian government revenues now represent more than one-third of our gross domestic product (GDP), yet our ecofiscal revenues are only 1% of GDP, a significantly lower share than in other major OECD (Organization of Economic Co-operation and

Development) countries. The International Monetary Fund recently suggested that by using ecofiscal policies reflecting damages caused by fossil fuel consumption and traffic congestion, Canada could generate revenues of roughly \$26 billion. This would provide an opportunity to achieve further benefits by recycling these revenues back into the economy. Ecofiscal reform thus presents a tremendous untapped opportunity for Canada.

The aim of this report is to start the conversation required to examine these opportunities. The evidence presented here highlights the success of ecofiscal policies already implemented in Canada and the rest of the world—evidence that makes a strong and reasoned argument for greater use of these tools across Canada.

Here are the five pillars of that argument:

1. Canada's natural wealth is fundamental to our economy; damaging it is costly. Sectors such as tourism, forestry, and agriculture rely directly on the health of our ecosystems; most others rely indirectly on the same. The costs of repairing environmental damage use funds that could be invested fruitfully elsewhere in the economy. Increased health problems caused by pollution, the remediation of contaminated sites, and the impacts of climate change will cost taxpayers dearly. Estimates suggest, for example, that air pollutants in Canada will impose health costs of roughly \$230 billion between 2008 and 2031. Ongoing climate change is also expected to have major economic implications for Canada, with estimated costs rising from around \$5 billion annually in 2020 to between \$21 billion and \$43 billion annually by 2050. The Insurance Bureau of Canada noted that the "terrible effects of new weather extremes" cost insurers a record-breaking \$3.2 billion in 2013.

2. Canadians deserve a better fiscal system. Canada's current fiscal system—the entire collection of taxes, subsidies, and spending policies used by government—is working against our well-being by holding back innovation and productivity while inadvertently promoting greenhouse gas emissions and pollution of our land, air, and water. Taxes are crucial for financing essential government services, but all taxes are not created equal. Income taxes, which

Canada uses extensively, reduce incentives for investment and job creation and tend to reduce economic growth. In contrast, taxes on pollution, which we use sparingly, create incentives for activities that improve the health of our environment.

Ecofiscal policies use market forces to rebalance this equation. They align economic and environmental priorities, creating incentives for conservation, but allowing flexibility in how firms and individuals reduce their pollution. They enable reductions in other taxes, such as corporate and personal income taxes. For example, ecofiscal reforms in Denmark that target air, carbon, and water pollution were used to lower personal income tax rates and reduce employer contributions to social security and pensions while supporting investment in energy efficiency.

3. Ecofiscal policies can be designed to ensure fairness in multiple ways. Fairness is intrinsic to the use of ecofiscal policies, since they require polluters to pay for the environmental damage they cause. Fairness also means ensuring that our grandchildren inherit Canada's natural wealth, not its ecological debt. Failure to invest in clean energy now will cost Canadians many times over down the line. According to estimates by the OECD, for example, every dollar invested now in a low-carbon electricity sector results in more than four dollars saved by future generations (who would otherwise be required to reduce emissions at much higher costs).

Acting fairly also means making decisions that respect and accommodate the diversity of Canada's regions, sectors, and families. Well-designed ecofiscal policies can recognize the differences between regions and need not involve wealth transfers between them. They can also ensure that additional burdens are not placed on the most vulnerable. For example, research suggests that only 10% of the revenue generated by a Canadian carbon tax would be required to offset the impact of the tax for low-income Canadians. Similarly, several policy options exist to address the potential impact of ecofiscal policies on firms' competitiveness.

4. Improving innovation is critical for Canada's future. Ecofiscal policies drive innovation by creating incentives for the development of new technologies that reduce pollution and environmental damage. In Sweden, for example, a price on emissions of nitrogen oxides coincided with a seven-fold increase in patents on pollution-reducing technology from 1988 to 1993. Over the longer term, this innovation will put Canada in a more secure and advantageous position, particularly as our trading partners implement more of their own ecofiscal policies.

5. Canadians can seize an opportunity for long-term, clean prosperity. Right now, however, we are behind the curve. We lag behind most OECD countries in innovation and productivity growth; we also lag behind them in environmental performance. Perhaps not surprisingly, we are close to the bottom of the list in the use of ecofiscal policies. However, important progress—particularly at the provincial level—shows that these policies can and do work in Canada.

This report is the starting point for **Canada's Ecofiscal Commission**. Future research by the Commission will focus on practical policy solutions that can drive the innovative economy we need to succeed in the 21st century. The Commission's future reports will explore these opportunities for pragmatic Canadian policy. Policy issues will likely include:

- **Road congestion pricing.** Road access is free yet it leads to congestion, air pollution, greenhouse gas emissions, and lost productivity through wasted time. Congestion is becoming a significant issue in Canada's major cities. Congestion pricing could be a promising policy solution to promote efficient transportation systems.
- **Municipal user fees.** Cities have limited revenue tools; they tend to rely on property taxes to fund municipal infrastructure. At the same time, users of infrastructure often have no incentive to limit their usage. User fees can create incentives for conservation while also ensuring that cities do not have to overbuild infrastructure.
- **Carbon pricing.** Global climate change will have major economic costs for Canada. Pricing carbon emissions can help achieve reductions at the lowest cost, can contribute to global emissions reductions, and can help position Canadian firms to compete in a cleaner global economy.
- **Subsidy reform.** Many existing Canadian subsidies are environmentally harmful, fiscally wasteful, or both. Biofuel subsidies for ethanol, for example, may actually increase greenhouse gas emissions while also representing large public expenditures. Phasing out such subsidies can therefore generate both economic and environmental benefits.

Executive Summary *continued*

- **Air pollution pricing.** Despite existing regulations, firms have insufficient incentives to reduce emissions of local air pollutants, which have major impacts on ecosystems and human health. Air pollution pricing would create incentives for reducing emissions as well as for the development of new technologies to do so.
- **Water pollution pricing.** Toxic effluents released into waterways—whether from agricultural runoff, tailing ponds from mines, or other municipal and industrial wastewater—can have major implications for ecosystems, but also for human health and for economic activity. Appropriately pricing water pollution can encourage less pollution of Canada’s lakes, rivers, and streams.
- **Water use pricing.** Free or inexpensive water leads to over-consumption, putting pressure on supply. Pricing water use appropriately can create incentives for water conservation, though care must be taken to ensure the policy is applied fairly.
- **Catastrophic risk pricing.** Existing liability, insurance, and securities frameworks may not be sufficient to address environmental damages from low-probability catastrophes—such as major rail catastrophes (e.g., Lac Mégantic, Quebec) or tailings pond dam breaches (e.g., Mount Polley, BC)—and thus may provide firms with insufficient incentive for risk management. Risk pricing could fill this gap and reduce the likelihood of catastrophic damage.



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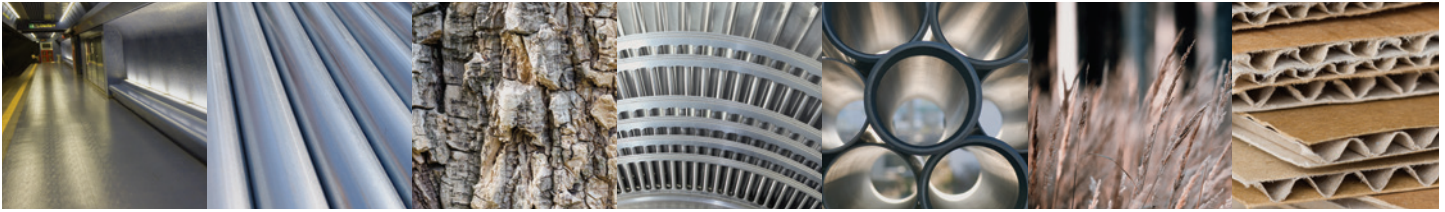
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1. Aligning Economic and Environmental Priorities

Smart environmental policy is smart economic policy. Canada’s economic prosperity—now and in the future—depends on protecting our air, water, and land. To ensure the sustained well-being of Canadians, new policies are needed to align our environmental and economic objectives.

1.1 CANADIANS WANT CLEAN PROSPERITY

Economic concerns are always important for Canadians. Polling commissioned by Environment Canada from Harris/Decima suggests that the economy was the top priority in 2013. Yet the majority of Canadians also strongly value the environment, ranking it the third highest priority in 2013 (Hill, 2014). In short, Canadians appear to want both a strong economy *and* a clean environment.

Identifying policies that can help achieve both objectives is the purpose of Canada’s Ecofiscal Commission. We believe that aligning Canada’s economic and environmental aspirations is both critical and possible for our country’s continuing prosperity. This is not a question of left versus right or industry versus conservation. All Canadians—and our governments of all political stripes—can support policies that help ensure greater prosperity both today and tomorrow. But such policies need to be smart.

1.2 CANADA NEEDS SMART POLICY

Ecofiscal policies correct market price signals to encourage the economic activities we do want (job creation, investment, and innovation) while reducing those we don’t want (greenhouse gas emissions and the pollution of our land, air, and water). They provide real incentives for investment in innovative technologies so that we can continue benefiting economically from our natural wealth while also providing better protection to the environment.

Ecofiscal policies also generate revenue that can be recycled back to the economy to create further economic benefits; for example, by reducing income and payroll taxes or investing in new technologies or critical public infrastructure.

The key idea underpinning ecofiscal reform is that taxes on pollution are better than taxes on income, jobs, or profits. Corporate

Ecofiscal policies increase our wealth.

High living standards and natural wealth are inseparable. We cannot achieve one in the long run by running down the other. By protecting and valuing Canada’s environmental assets, we will promote enduring growth. In fact, our future wealth depends on doing just that.

“I joined the Ecofiscal Commission because our future prosperity depends on our ability to grow in the context of a healthy environment. We need smarter fiscal policies to get there.”

Preston Manning

*President & CEO, Manning Centre;
former leader of the official Opposition, Canada*

and personal income taxes reduce incentives for investment and hiring, and tend to reduce economic growth. In contrast, taxes on pollution create incentives for innovating products and processes that avoid causing environmental damage.

Canada’s environmental assets are critical for our long-term prosperity. Designing policies that harness market incentives to recognize the true economic value of these assets is the best way to protect them. Harnessing market forces also creates powerful

1. Aligning Economic and Environmental Priorities *continued*

incentives for the development of lower-cost environmental technologies. A well-designed package of policies could therefore produce both a more prosperous economy and a cleaner environment.

Well-designed ecofiscal policies can also be fair. Ensuring polluters pay for the environmental damage they cause is intrinsic to ecofiscal policies. We have a responsibility to the current generation of young Canadians, as well as to those not yet born. They deserve to have access to the same natural wealth that has benefited us so greatly. Their future prosperity will depend on how well we protect what will soon be *their* environmental assets. In addition, careful design can ensure that ecofiscal policies do not disproportionately affect vulnerable Canadians or Canadian regions.

Canada is fortunate, both in terms of its economic prosperity and its unparalleled natural assets. It has maintained this prosperity not by accident, but through deliberate policy choices. Sometimes these choices require challenging the status quo. In the 1990s, our provincial and federal governments successfully tackled their high budget deficits, we embraced free trade with the United States and Mexico, and the Bank of Canada was an early pioneer in adopting an inflation-targeting framework. Each of these policy decisions was complex and contentious, but few today deny their importance to Canada's long-term prosperity.

Ecofiscal policies are another ambitious and important policy opportunity. Like all policies, however, they must be designed and implemented well in order to realize their benefits. We may not have all the answers today, but we must begin the hard work and the public conversations required to develop practical policy solutions for aligning our economic and environmental objectives.

1.3 ABOUT THIS REPORT

This report presents the case for implementing ecofiscal policies in Canada—including municipal, provincial, and federal governments. It summarizes the evidence available on the economic and environmental benefits of ecofiscal policies, drawing from the experiences of policies implemented inside and outside Canada's borders.

This report is a starting point for Canada's Ecofiscal Commission. Future research and reports will explore specific policy opportunities that can help Canada move toward a more sustainable and prosperous future. This report therefore serves as a foundation for future work. The remainder of the report is structured as follows:

Section 2 defines the set of fiscal policy tools that Canadian decision-makers have at their disposal. It explains what we mean by ecofiscal policies and identifies concrete examples from Canada and elsewhere.

Section 3 makes the economic case for using ecofiscal policies. It shows how smart economic policy must consider the environment while also being responsible and practical. It illustrates how other environmental policies, especially direct regulations, are often more expensive than market-based ecofiscal policies. Yet it also acknowledges that in special circumstances, such policies can play an important role.

Section 4 roots the case for ecofiscal policies in the Canadian context. It benchmarks Canada's economic and environmental performance against other countries, showing that Canada has room to improve along both dimensions, as well as in its use of ecofiscal policies.

Section 5 argues that the time for ecofiscal reform is now. As the rest of the world continues moving toward a more sustainable future, Canada cannot ignore the changes in international markets and the increased market access that improvements in our own environmental stewardship would provide.

Section 6 concludes with a brief discussion of the Commission's future reports.





2. Smart Policy Makes Markets Work Better

Smart policy harnesses the power of markets to achieve objectives. Markets play a remarkable role in coordinating economic activity and allocating resources. They provide incentives for the innovation that drives long-run improvements in living standards. Yet smart policy also recognizes the limitations of markets.

Too often in a market economy, essential environmental resources are unpriced and, not surprisingly, overused. The pollution of our land, water, and air is free to polluters, even though it imposes costs on society. It falls to governments to implement appropriate policies to ensure that market forces align private actions with society's environmental objectives.

Markets work best when assets are properly valued. Putting a price on environmental damage helps to value Canada's natural assets.

This section introduces ecofiscal policy tools as central elements of smart policy. By shifting away from taxing things we desire (such as jobs, investment, and innovation) toward taxing things we dislike (such as pollution and greenhouse gas emissions), governments at all levels can propel their jurisdictions on the path toward greater and more enduring prosperity (Ekins, 2009; Speck, 2007). An ecofiscal policy package thus contains two main elements: increasing the price of pollution and environmental damage, and recycling revenue back to the economy through mechanisms such as reducing existing distortionary taxes.

2.1 PRICING POLLUTION ALIGNS ECONOMIC AND ENVIRONMENTAL GOALS

The ecofiscal tool-kit includes several types of policy instruments that can be used to alter market incentives in pursuit of better economic and environmental outcomes.

Pricing pollution improves market signals

Polluters are not usually required to pay a price for their polluting activities, even though the associated environmental damage imposes real costs on society. Since individuals and companies respond to incentives, more pollution gets produced in the absence of any price "penalty." When firms or households add excessive greenhouse gas emissions and pollution to our water, air, and land, society as a whole is worse off.

When each of us pollutes our environment, society as a whole is worse off.

Ecofiscal tools make markets work better by establishing a price for actions that result in environmental damage. They incorporate the costs of environmental damage into market prices, thus improving market signals. Firms and households respond to these signals by finding innovative and cost-effective ways to reduce pollution.

Governments can use different pricing instruments to improve these market signals. Two of the most important are *cap-and-trade systems* and *environmental taxes*. The former provides certainty as to the quantity of pollution reduced, while the latter provides certainty regarding the price on pollution. Each is discussed below.

Cap-and-trade systems establish a market for pollution reduction by setting a limit on the total allowable level of pollution, issuing permits equal to this level, and then allowing firms to trade the permits among themselves in an active market. Under this approach, companies that can reduce pollution cheaply can take more action and sell their excess permits to those that can only reduce pollution at higher costs. If permits are auctioned to

2. Smart Policy Makes Markets Work Better *continued*

polluters, cap-and-trade systems generate revenue that can then be “recycled” back to the economy (discussed in detail below). The Quebec cap-and-trade system for greenhouse gases, for example, auctions a share of its permits and invests the revenue in green technology. Otherwise, initial allocations of permits are provided to polluters for free, similar to the SO₂ trading system implemented in the United States in the 1990s to combat acid rain.

Alternatively, environmental taxes can be used to align environmental and economic objectives by taxing activities that lead to environmental damage. European nations such as Denmark, Norway, Sweden, and Ireland have introduced taxes on air

pollutants, greenhouse gas emissions, and even plastic bags. British Columbia implemented a carbon tax in 2008, starting at \$10 per tonne of CO₂ emissions and currently at \$30 per tonne.

Cap-and-trade and tax systems are similar in that both put a price on pollution and both can generate revenue that enables reductions in other taxes. The two instruments can even be combined to compromise between providing certainty on the price of pollution and the quantity of pollution reduction. The United Kingdom, for example, implemented a kind of hybrid system in the pricing of solid waste (see Box 1).

Box 1: Waste Pricing in the United Kingdom

Putting a price on solid waste helped the UK to reduce commercial and industrial landfill waste by more than 40%.

Disposal of waste in landfills has various environmental impacts, including methane emissions, an important greenhouse gas, emissions of common air pollutants, which can result in damages to human health and ecosystems, and leachate, which can contaminate water and soil.

To create incentives for reducing the volume of solid waste, the UK has used two different pricing policies. In 1996, it introduced landfill taxes of £7 per tonne of active (i.e., organic) waste and £2 per tonne of inactive (i.e., non-biodegradable) waste. These taxes applied to all sources of waste delivered to landfill sites, whether commercial, industrial, or residential.

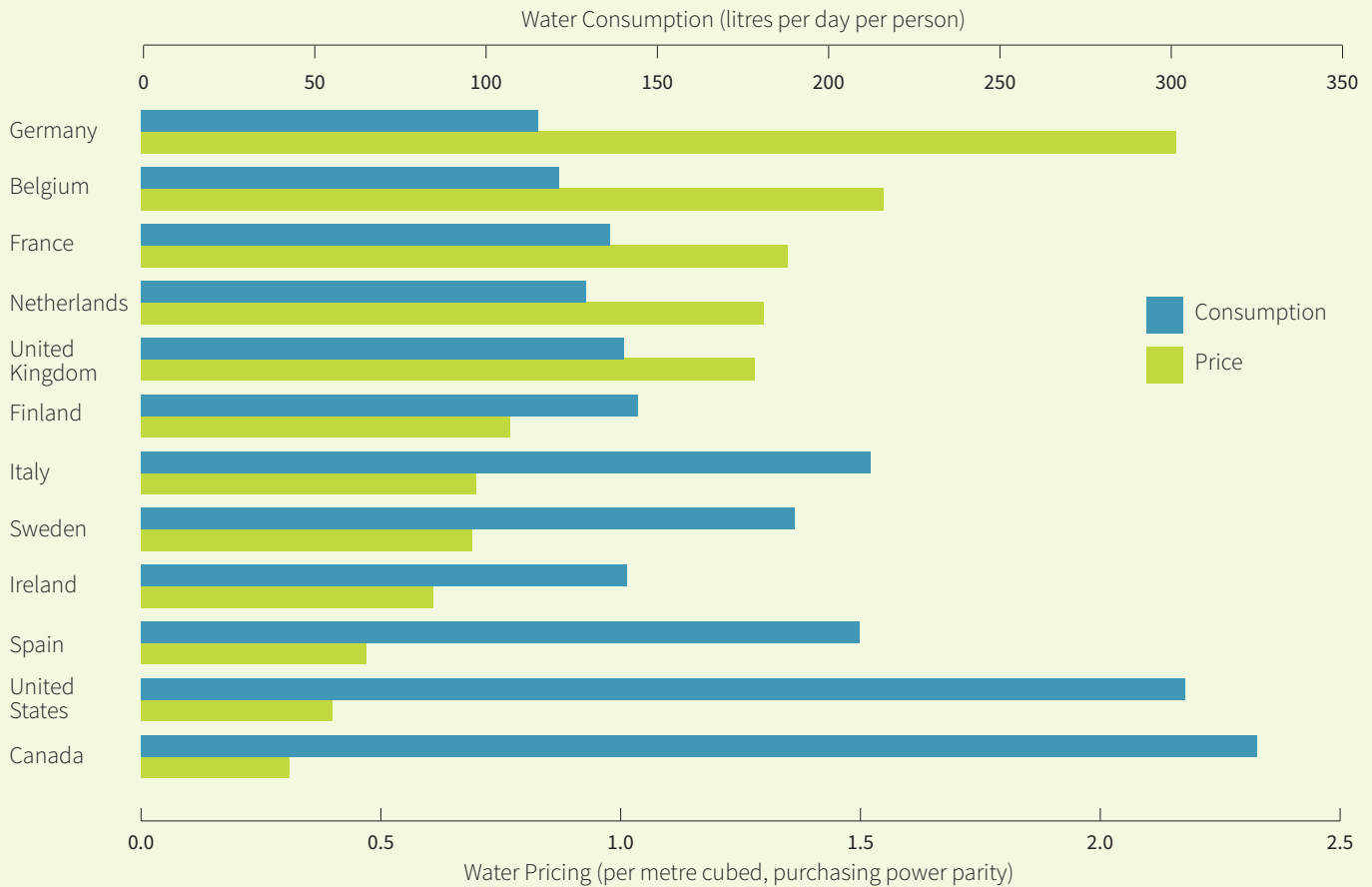
To further reduce the amount of active waste landfilled, in 1999 the UK increased its active waste rate to £10 per tonne. Further yearly raises were implemented; the present rate is £80 per tonne of active waste landfilled.

To complement the landfill tax, the UK also implemented a cap-and-trade system from 2005 to 2013. The system applied to municipal waste (but not to most businesses and industry), and it freely allocated disposal rights to local authorities based on waste targets for each period. The cap-and-trade system provided certainty as to total levels of waste reductions to be achieved, helping the UK to meet its commitments under the European Landfill Directive. Yet the landfill tax continued to play an important role in ensuring a minimum price on waste. It also had broader coverage than the cap-and-trade scheme, because it applied to commercial and industrial waste producers, most of which were not covered by a municipal authority.

Between 2005 and 2010, the combination of the cap-and-trade scheme and the landfill tax led to a reduction in the amount of landfill waste of over 30% (Department for Environment, Food & Rural Affairs [DEFRA], 2012). Over the same period, the volume of commercial and industrial landfill waste, which was covered only by the tax, dropped by more than 40% (DEFRA, 2012).

2. Smart Policy Makes Markets Work Better *continued*

FIGURE 1: International Municipal Water Prices and Consumption



Higher water prices correspond with less water use; Canada has relatively low prices and relatively high per capita water consumption.

Source: Based on data from the Council of Canadian Academies (2009).

User fees create incentives for conservation

User fees provide incentives for environmental conservation by charging the true user cost of public infrastructure such as roads, water and sewer systems, and waste collection and disposal. Users naturally tend to overuse these systems if they are not required to pay the full cost of their use, and this leads to an increased environmental impact as well as a need for additional infrastructure.

We overuse when we don't have to pay. Charging the full user costs for roads, water, and waste disposal creates incentives for environmental conservation.

Figure 1 shows a striking correlation across countries between daily per capita water consumption and the average price paid by users. While the figure does not make any suggestion as to the optimal price of water, it does illustrate that countries with higher consumption tend to have lower prices. Consistent with the underlying logic of ecofiscal policies, Canadians pay very low prices for their water and are very heavy water users (Brandes et al., 2010; Council of Canadian Academies, 2009).

Similarly, roads tend to be financed from general government revenues; individual drivers rarely pay fees based on their usage of roads. As a result, they face incentives to drive more, thus increasing demand for road infrastructure. At the same time, more driving leads to more traffic as well as greater air pollution and greenhouse gas emissions. In the United Kingdom, London uses congestion pricing to effectively address these challenges (see Box 2).

Box 2: Congestion Pricing in London, UK

In London, congestion pricing helped reduce traffic in a high-congestion area by as much as 36% while raising critical revenue for transit improvements.

Introduced in 2003, the London congestion charge is designed to reduce traffic congestion inside a special “congestion zone” located in central London. Non-exempted vehicles entering the zone on weekdays from 7:00 to 18:00 must pay a fixed £10 daily charge. Penalties of £65 to £195 are charged to owners of vehicles that enter the zone without paying the fee. Payment is verified using automatic licence plate recognition. Vehicles with very low emissions and public buses are exempt, while those who reside inside the zone receive a 90% discount.

Revenue from the program is significant, with £222 million raised in the 2012-13 fiscal year, roughly 5% of Transport for London’s gross income (Transport for London [TfL], 2013a). The revenues raised from the congestion charge are invested in local transit improvements.

The congestion charge has been highly effective in reducing the volume of vehicle traffic entering, leaving, and travelling in the congestion zone. Traffic in the zone fell almost immediately after the program was introduced, and by between 22% and 36% over the first 10 years of the program. Traffic in the whole of London decreased by 11% between 2000 and 2012 (TfL, 2008, 2013b).

Canadian municipalities are increasingly moving toward full-cost-recovery models, with users paying for infrastructure. In a 2012 survey of Ontario municipalities, for example, half the local governments surveyed were phasing in full-cost-recovery funding models for waste and wastewater infrastructure.

Even so, rate structures need to be designed carefully to create appropriate incentives for conservation. With flat fees, users have no incentive to reduce their usage. With declining block rates, users actually pay less, the more water they use, potentially exacerbating problems of overuse (Watson & Associates, 2012). Some Canadian municipalities have successfully moved toward better incentive structures. The City of Halifax, for example, charges service fees for water, wastewater, and stormwater based on volume used. Similarly, the City of Guelph seeks to reduce its water use by 20% by 2025. To achieve this goal, it increased water and wastewater rates by 19% in 2008, with charges based on volume (Brandes et al., 2010).

User fees can also be used to value environmental resources that are otherwise unpriced. Fresh water, for example, is obviously essential for human well-being, for a productive economy, and for healthy ecosystems. Yet in some situations in Canada, users of fresh water face very low prices even though our water is under increasing pressures, with diminishing supplies underpinning threatened ecosystems (Brandes et al., 2010; Baltutis & Shah, 2012; Council of

Canadian Academies, 2009). Even if users pay for the infrastructure required to deliver water, the value of the resource itself is not being reflected in its price (Sawyer et al., 2005). Appropriate fees applied to the use of water can help prevent the waste of this invaluable Canadian resource.

Phasing out subsidies helps get prices right

Finally, reforming some existing policies can create both environmental and economic benefits. Subsidies provide preferential treatment for specific sectors, organizations, or individuals—usually through financial transfers or tax credits. While some subsidies make economic sense, poorly designed ones can be environmentally harmful, economically costly, or both.

Subsidies for pollution-intensive activities distort the economy and lead to higher levels of pollution, with associated costs for society. For example, the Ontario Clean Energy Benefit program provides a 10% rebate on the first 300 kWh of all electricity consumed by owners of residential buildings, small businesses, and farmers, thereby creating disincentives for energy conservation (Commission on the Reform of Ontario’s Public Services, 2012). At the federal level, Canada has already taken steps to reduce subsidies for fossil fuel producers (see Box 3).

Box 3: Fossil Fuel Subsidy Reform in Canada

Since 2009, the Canadian government has honoured its G20 commitments by reducing financial support for fossil fuel production by an estimated \$400 million per year.

At the Pittsburgh G20 summit in 2009, Prime Minister Harper and other G20 leaders agreed to “phase out and rationalize over the medium term inefficient fossil fuel subsidies while providing targeted support for the poorest [individuals]” (Office of the Auditor General of Canada [OAG], 2013). Since then, Canada has continued to make progress toward these objectives (Olewiler, 2012).

Recent reforms align tax treatment of the oil sands with that for conventional oil and gas production. Given that oil sands technologies have matured considerably, preferential support for oil sands development is no longer required:

- The 2007 federal budget eliminated eligibility for the accelerated rate for capital cost allowance for the tangible capital costs of oil sands projects, moving from 100% to 25% over several years.
- The 2011 federal budget removed eligibility of intangible capital costs of oil sands exploration, reducing support for development expenses and resource property expenses.

It is too soon to know how these budgetary changes will influence the development of resources or the level of greenhouse gas emissions in Canada. But they clearly reduce incentives for economically inefficient, emissions-intensive activity. A recent report estimates the reduction in government financial support to fossil fuel producers of approximately \$400 million per year based on changes contained in Canada’s 2007, 2011, and 2012 budgets (Green Budget Coalition, 2013).

2.2 “RECYCLING” REVENUE CREATES ADDITIONAL ECONOMIC BENEFITS

Pollution taxes and user fees clarify market signals and improve environmental outcomes. But they also generate revenues for governments. By “recycling” these revenues, further economic benefits are achievable.

Reducing existing taxes creates economic gains

Reducing other taxes as part of an overall “tax shift” can generate large economic gains. Boadway and Tremblay (2014) suggested that Canada’s current corporate tax system is discouraging investment and hindering innovation and productivity growth. Chen and Mintz (2013) argued that maintaining low corporate rates is essential for attracting business investment in Canada, and highlighted recent provincial policy actions in the opposite direction. Similarly, payroll and personal income taxes reduce the incentives for work and acquiring education and skills. Shifting taxes away from employment, income, and profit can lead to greater investment, higher wages, and ultimately more economic growth.

Subsidies are often both ineffective and costly, and thus represent a poor use of scarce public funds. Many kinds of subsidies suffer from what are called “free-ridership” challenges—when the subsidized activities would have occurred even without the subsidy (Olewiler, 2012). In these situations, the public funds are spent, but little of the stated objective is achieved.

Ecofiscal policies can generate revenue that creates space for governments to reduce costly taxes on employment, income, and profits.

In the 1990s, for example, Denmark implemented a series of tax shifts that imposed new taxes on air pollutants, water, and greenhouse gases, while simultaneously reducing income taxes and employers’ contributions to social security and pension funds (see Box 4). Similarly, the British Columbia carbon tax embedded revenue recycling in the legislation, with the government legally

2. Smart Policy Makes Markets Work Better *continued*

required to ensure that overall tax revenues did not increase as a result of the carbon tax. In fact, from 2008 to 2013, revenue reductions from personal income and business tax cuts exceeded the revenue raised by the carbon tax by \$760 million (Government of British Columbia, 2010, 2011, 2012, 2013, 2014a). These income tax reductions were a key element of B.C.'s carbon tax. The economic benefits of revenue recycling are revisited in Section 3.

Other options for revenue recycling can also create economic benefits

While reducing corporate and personal income taxes may be the most growth-friendly method of recycling revenues, other options exist. The benefits of using revenue in alternative ways must be weighed against the potential gains from reducing existing distortionary taxes. Whether economic benefits emerge from these alternative approaches are to a much greater extent contingent on the details of implementation. Three other options are:

- ▶ **Reducing government deficits.** Recent studies in both the United States and Europe have explicitly considered how carbon taxes could be used to address fiscal challenges (e.g., Ramseur et al., 2012; Marron & Toder, 2013; Vivid Economics, 2012). Indeed, for governments faced with a need for greater revenues, increasing pollution taxes is arguably a far better choice than increasing corporate or personal income taxes.
- ▶ **Supporting infrastructure and technology.** Revenues from user fees and pollution taxes can also be earmarked for public investment. If done wisely, such investments could also lead to economic benefits. Investing in critical infrastructure can improve productivity; investing in research and development can boost innovation. Both can potentially enhance long-run growth.
Governments can also choose to invest in environmental technologies—either in the use of existing technologies to reduce environmental damage or expenditures on research and development aimed at creating new technologies. Existing programs such as the Regional Greenhouse Gas Initiative (a cap-and-trade system in the northeastern United States) and the Quebec cap-and-trade system use revenue from auctioned permits to support the development of new environmental technologies.
It is worth noting, however, that targeted public investments come with risks. The wrong investments, or even sensible projects pursued poorly, will waste scarce public funds. In Canada and elsewhere, governments have often been poor at identifying and carrying out worthwhile investment projects,

We need a better fiscal system, not higher taxes.

An effective and efficient Canadian fiscal system for the 21st century will promote innovation and growth while reducing pollution and environmental damage. This requires redesigning our current fiscal system, but it need not increase Canadians' overall tax burden or the size of government.

“Smart policy means using revenue from pollution fees to reduce taxes in a way that enables job creation and gives money back to families. Our job at Canada's Ecofiscal Commission is to show Canadians across the country the economic and environmental benefits of this approach.”

Jean Charest

Partner, McCarthy Tétrault; former premier of Quebec

especially when short-term political considerations dominate the pursuit of long-term priorities.

- ▶ **Protecting vulnerable segments of the population.** Revenues can also be used to insulate low-income households from the burden of pollution pricing. In British Columbia, for example, the design of the carbon tax allows for the provision of low-income tax credits. The Australian carbon pricing system (now repealed) similarly included a mechanism to provide cash supplements to low-income households. Costa Rica uses 3.5% of the revenue from its carbon tax to provide incentives for forest conservation to landowners and indigenous communities, indirectly offsetting costs of the policy to rural populations (International Council of Mining and Metals, 2013).

Pricing pollution is better than taxing income

Whatever a government's overall fiscal situation, whether it is seeking to increase or decrease its overall level of taxation, the logic of ecofiscal policies offers a genuine opportunity. User fees



Box 4: Ecofiscal Policies Have Reduced Pollution in Denmark

Ecofiscal policies in Denmark helped reduce personal income taxes as well as employers' contributions to pensions and social security, while supporting investments in energy efficiency.

Denmark introduced a tax on CO₂ emissions in the early 1990s. The tax was levied on the consumption of fuel by both firms and households, based on carbon content. It was designed to offset an existing energy tax on oil products, coal, and electricity consumption; energy taxes were reduced as the carbon tax was introduced. Over subsequent years, Denmark phased in a broader program for ecofiscal reform.

In the first phase of reform (1994-1998), Denmark introduced a range of other environmental taxes, including taxes on tap water, wastewater, and paper and plastic bags. Reducing income tax rates was also a key aspect of the policy. In 1998, the income tax reductions were equivalent to about 2.3% of GDP.

In the second phase (1996-2000), energy taxes were increased and SO₂ and natural gas taxes were introduced. The focus of the second phase was recycling revenue to industry. Revenue was used to reduce employers' pension and social security contributions, and to subsidize commercial investments in energy efficiency.

The third phase of the Danish reforms (1999-2002) was designed to increase revenue through increased environmental taxes over the short term, but to be revenue neutral in the long run (emissions would be reduced over time, reducing the revenue from the tax). Revenue was used to reduce personal income taxes as well as taxes on pension savings.

These reforms have been effective. Recent analysis comparing the actual Danish outcomes with a hypothetical baseline (without policy changes) suggests that the carbon taxes led to declines in greenhouse gas emissions (of 3.4%) but increases in both national income and employment (of 0.4% and 0.5%, respectively) (Barker et al., 2009). Water pricing contributed to reductions in water use of about 13% over the first five years of the policy. Similarly, the discharge of water pollutants from sewage treatment plants declined by about 20% (ECOTEC, 2001).

and pollution taxes can always be used as a substitute for more distortionary and growth-retarding taxes. Shifting away from income taxes and toward pollution taxes can generate significant economic and environmental benefits.

2.3 SMART POLICY MATTERS FOR ALL LEVELS OF GOVERNMENT

Ecofiscal policies present an opportunity for all levels of government in Canada. But depending on the issue, different levels of government may have different options.

User fees are an essential fiscal tool for municipalities

User fees present an especially important option for municipal governments. Municipalities have limited means of generating revenue to fund infrastructure investments. As a result, cash-strapped local governments rely on property taxes or transfers from provincial governments. User fees (e.g., fees for solid waste disposal, water use, or wastewater treatment) can generate revenue that

allows municipalities to avoid increasing property taxes. At the same time, it establishes incentives for conservation, reducing the need for infrastructure spending.

Ecofiscal tools are particularly well suited to provinces.

For three reasons, Canada's provincial governments should seriously consider a greater use of ecofiscal policies. First, we must not forget that provinces have long been policy innovators in the Canadian context, and this is equally true in the case of ecofiscal policies. British Columbia's carbon tax is now internationally regarded as a model of smart environmental policy. Alberta has priced carbon emissions, and uses the revenues to finance green technological development. Quebec has implemented a cap-and-trade system. Following these leads, there is a clearer path ahead for ecofiscal reform in other Canadian provinces.

Second, the provinces have a strong constitutional basis for taking the lead in the use of ecofiscal policies. Responsibility for the environment is shared between provincial and federal governments,

2. Smart Policy Makes Markets Work Better *continued*

but the provinces have sole jurisdiction over natural resources. How Canadians develop and use natural resources such as water, fossil fuels, minerals, forests, and land have major implications for environmental sustainability.

Third, each province has a unique economic and environmental profile. As a result, there is a strong case for designing ecofiscal policies customized to each provincial context. In terms of climate and energy, for example, electricity generation in British Columbia, Manitoba, Quebec, and Newfoundland and Labrador relies strongly on low-emissions hydroelectric capacity; in contrast, electricity grids in Alberta, Saskatchewan, and Nova Scotia are largely supplied by emissions-intensive coal-fired electricity plants. At the same time, capital-intensive resource sectors play a critical role in Alberta, Saskatchewan, and Newfoundland and Labrador, with relatively labour-intensive manufacturing and service sectors being more important in central Canada and other Atlantic provinces. These differences underline the importance of effective ecofiscal policies being designed with close regard to provincial and sectoral context.

Coordination can avoid a patchwork of policies

For environmental challenges that are national (or even global) in scope, there is a strong case in principle for policy to be designed and implemented at the national (or multinational) level. In Canada's case, this principle must confront the practical constraint that the various provincial contexts be incorporated into the policy design. Over the years, these provincial and regional differences have presented serious challenges for federal governments aiming to produce uniform national policy, especially in areas that encroach on provincial jurisdictions.

For early steps in policy development, provinces can take the lead; there is much to be done and no need to rely on actions from the federal government. Over the longer term, however, some coordination of provincial policies is necessary to avoid a costly patchwork of policies that leads to overall inefficiency. Differences in policies across provincial borders can increase complexity and costs for firms that operate in many regions. And aggressive policy in one province can lead to expensive reductions in pollution, while the absence of policy in other provinces may leave low-cost improvements unrealized.

Eventual coordination of various provincial systems is therefore crucial, especially for those environmental challenges that are broadest in scope. This coordination could be facilitated by federal involvement or by active efforts by the various provinces, possibly through the Council of the Federation.

There are many precedents for this kind of provincial coordination. At the 2014 meeting of the Council of the Federation,

Ecofiscal policies are good for Canada's regions.

Well-designed ecofiscal policies will enable provinces to recycle revenue back into their own economies, in ways that have the biggest impact and make the most sense on the ground. Ecofiscal policies need not transfer wealth between provinces or regions.

“This isn’t about robbing Peter to pay Paul; it must not be. It’s about showing governments that sensible policy tools can reduce pollution and greenhouse gas emissions while helping the economy—and also be consistent with their provincial priorities.”

Jim Dinning

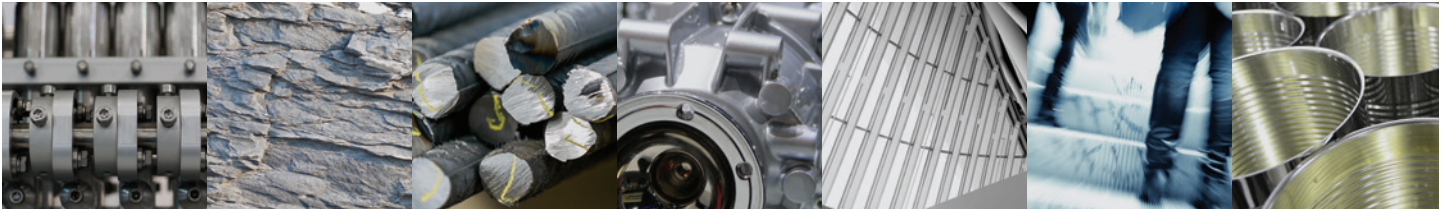
*Chair of Western Financial Group;
former treasurer of Alberta*

for example, premiers discussed a coordinated national energy strategy, and agreed on the importance of “transitioning to a lower-carbon economy through appropriate initiatives such as carbon pricing, carbon capture and storage, and other technological innovations”(Council of the Federation, 2014).

Similarly, in 2009, the Canadian Council of Ministers of the Environment (CCME) sought to harmonize wastewater treatment across Canada by establishing national effluent quality standards. While most Canadian provinces agreed to these standards, the CCME has no authority over their enforcement. To demonstrate commitment to the strategy, in 2012, the Canadian government implemented the Wastewater Systems Effluent Regulations (WSER) under the Fisheries Act, thereby making the limits binding (CCME, 2014).

In summary, Canadian policies need not be federal to be national. Ecofiscal policies can be designed and implemented by individual provinces and municipalities, mindful of their own specific contexts and priorities. But in those cases where coordination or alignment across jurisdictions is in the national interest, coordination and harmonization can lead in the long-run to a coherent and effective national system of ecofiscal policies.





3. Smart Environmental Policy Is Smart Economic Policy

This section lays out the many economic benefits and the relative advantages of ecofiscal policies as compared with other policy approaches. Recognizing that smart policy must also be fair for all Canadians, it shows how ecofiscal policies can be designed to address the diversity of regions, sectors, and households.

3.1 ECOFISCAL POLICIES HAVE MANY ECONOMIC BENEFITS

Ecofiscal policies create economic benefits in three ways: protecting natural assets, recycling revenues by reducing other taxes, and driving innovation. Each is discussed below.

Ecofiscal policies can protect Canada's natural assets

A prosperous Canadian economy *relies* on well-functioning Canadian ecosystems. Olewiler (2012) noted, "Our lands, atmosphere, and water are essential to economic activity and our quality of life." Preventing environmental damage can have many economic benefits, though quantifying them is admittedly challenging. While most are not captured by conventional measures of GDP, others directly affect economic activity. The benefits of protecting the environment come in two general forms: avoiding the costs that directly result from environmental damage and avoiding the costs of having to clean up environmental damage.

► **Damage to ecosystems reduces Canadians' income and health.** The Canadian Medical Association (2008) estimated that human health impacts from air pollution reduce worker productivity, with associated losses of around \$18 billion (in 2006 dollars) between 2008 and 2031. Air pollutants such as ozone can also negatively affect the market value of food crops (Sawyer, Steibert, & Welburn, 2007). Warmer winters as a result of climate change have led to a pine beetle infestation in British Columbia, reducing the supply of marketable timber (Natural Resources Canada, 2014). Climate change will similarly have major implications for natural resource sectors, food production, biodiversity, and human health. Remote and Northern

communities are likely to experience particularly large changes (Warren & Lemmen, 2014). Toxic effluents released into our waterways reduce the economic potential of fisheries and tourism.

\$18 billion = lost worker productivity from illnesses related to air pollution

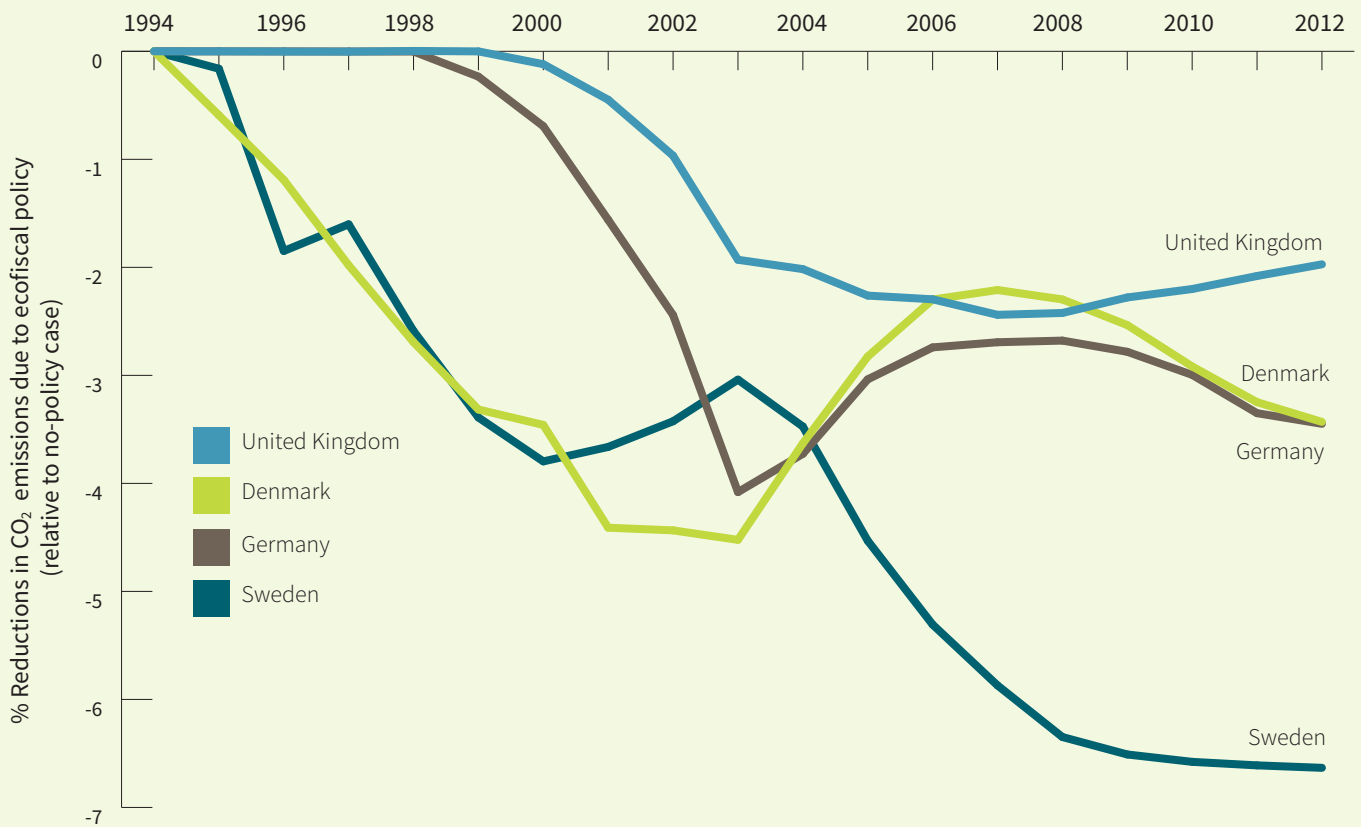
\$228 billion = health costs from illness and premature deaths caused by air pollution

Since clean air and water are obviously important for our well-being, reducing pollutants can improve health and reduce mortality (e.g., Matus et al., 2008). The OECD (2014a) recently estimated that among its member countries in 2010, air pollution from road transportation alone imposed costs of close to US\$1 trillion from health impacts (including death and illness). In Canada, the Canadian Medical Association (2008) estimated that between 2008 and 2031, air pollutants will impose costs of around \$228 billion in terms of premature deaths and reduced health. Environment Canada (2010) estimated that a 10% reduction in air pollutants (such as ozone and fine particulate matter) would generate benefits valued at \$4 billion.

► **Cleaning up environmental damage is costly.** Remediating impacts of pollution and climate change has opportunity costs: funds spent on remediation could be invested in other productive activities (Olewiler, 2012). For example, the federal

3. Smart Environmental Policy Is Smart Economic Policy *continued*

FIGURE 2: The Effect of Ecofiscal Policies on GHG Emissions in Europe



Ecofiscal policies in Denmark, Germany, Sweden, and the United Kingdom reduced greenhouse gas emissions relative to what would have occurred in the absence of those policies.

Source: Based on data from Barker et al. (2009).

government budgeted \$1 billion between 2012 and 2014 to remediate contaminated sites (Canada, 2012). In some cases, damage to ecosystems may be irreversible. Once critical biological thresholds are crossed, remediation is more than costly; it may be impossible.

With respect to climate change, Natural Resources Canada notes the growing scientific consensus that the rising atmospheric concentration of greenhouse gases is increasing the frequency and intensity of some extreme weather events (Warren & Lemmon, 2014). The Insurance Bureau of Canada (IBC) estimates that the “terrible effects of new weather extremes” cost insurers a record-breaking \$3.2 billion in 2013 (IBC, 2014).

► **Ecofiscal policies are effective.** Evidence from other jurisdictions shows that ecofiscal policies can protect vital

environmental assets. The UK Green Fiscal Commission concluded that evaluations of European experience “overwhelmingly suggest that environmental taxes are environmentally effective” (Green Fiscal Commission, 2009, p. 24). The COMETR (Competitiveness effects of Environmental Tax Reforms) project is one of the most comprehensive economic analyses of the impacts of ecofiscal policies. It applied a detailed economic model to assess the impacts of pollution-pricing policies implemented in various European countries. This analysis found that in each country emissions fell relative to what would have occurred in the absence of the policies (Barker et al., 2009). Figure 2 illustrates these results for four countries, showing in each case the estimated reductions in greenhouse gas emissions during the period when ecofiscal policies were in place. The figure plots emissions reductions relative to the (counterfactual) case in



Box 5: Environmental Impacts of the British Columbia Carbon Tax

Per capita fuel use in B.C. has dropped by 16% since the province's carbon tax was instituted in 2008, while it has increased by 3% in the rest of Canada.

In 2008, British Columbia implemented a revenue-neutral carbon tax. The tax initially applied to the use of carbon-based fuels at a rate of \$10 per tonne CO₂e, and subsequently increased to its current level of \$30 per tonne. The tax covers 77% of B.C.'s greenhouse gas emissions, applying to residential, commercial, and industrial sources. The revenue generated by the tax is substantial; it raised \$1.2 billion in 2013-14, roughly 18% of the province's personal income tax revenue, or over half its corporate income tax revenue (Government of British Columbia, 2014b). The tax is legally required to be revenue neutral, with all revenue from the tax used to reduce other taxes, including reductions in corporate and personal income taxes and targeted reductions for vulnerable households and communities. The shift has turned out to be revenue *negative*, with total tax cuts being larger than the revenue raised by the carbon tax (Harrison, 2013).

Though the tax is still young, trends in B.C. relative to the rest of Canada provide early evidence as to its effectiveness. Fuel use per capita declined by 16% in B.C. in the first six years, but increased by 3% over the same period in the rest of Canada. These provincial differences cannot be explained by differences in economic growth: sales of refined petroleum products per unit of GDP decreased by 15% from 2008 to 2011 in B.C., but grew by 2% in the rest of the country. Neither are they explained by provincial population trends: per capita sales of gasoline in B.C. decreased by 4% from 2008 to 2011, but grew by 3% in the rest of Canada (Elgie and McClay, 2013).

Other province-specific trends could also be factors in the province's shift toward less fuel consumption. This period also saw, for example, investments in public transportation in the Lower Mainland. Yet additional analysis further supports the idea that the carbon tax played a central role in driving emissions reductions. For example, Rivers and Schaufele (2012) assessed the impact of the carbon tax and estimate that the tax led to a reduction of more than 3 Mt of gasoline-related greenhouse gas emissions. They also rejected alternative factors such as cross-border shopping and other vehicle efficiency policies as unlikely to explain the emissions reductions.

Analysis so far has focused on the short-term impacts of the B.C. carbon tax. In the longer term, the carbon tax is likely to drive even deeper emissions reductions as firms and households respond more fully to the new market signals by investing in new equipment, electricity-generating projects, and vehicles. Long-term policy certainty, however, is important. Clear, predictable policy can create a sufficiently strong price signal to enable these investments.

which ecofiscal policies were not implemented. It suggests that policy in Sweden, for example, reduced 2007 emissions by 6%.

Experience closer to home similarly suggests that market-based policies can achieve environmental objectives. Early analysis suggests that the British Columbia carbon tax is reducing both fuel use and greenhouse gas emissions (see Box 5). Federally, Canada successfully implemented cap-and-trade systems for ozone-depleting substances in the 1990s in accord with the Montreal Protocol. The various systems covered ozone-depleting substances, including chlorofluorocarbons (commonly referred to as "CFCs"), as well as methyl chloroform, hydrochlorofluorocarbons, and methyl bromide. For the last, total permissible use was capped, and tradable quotas were distributed to the many firms that used methyl bromide. The

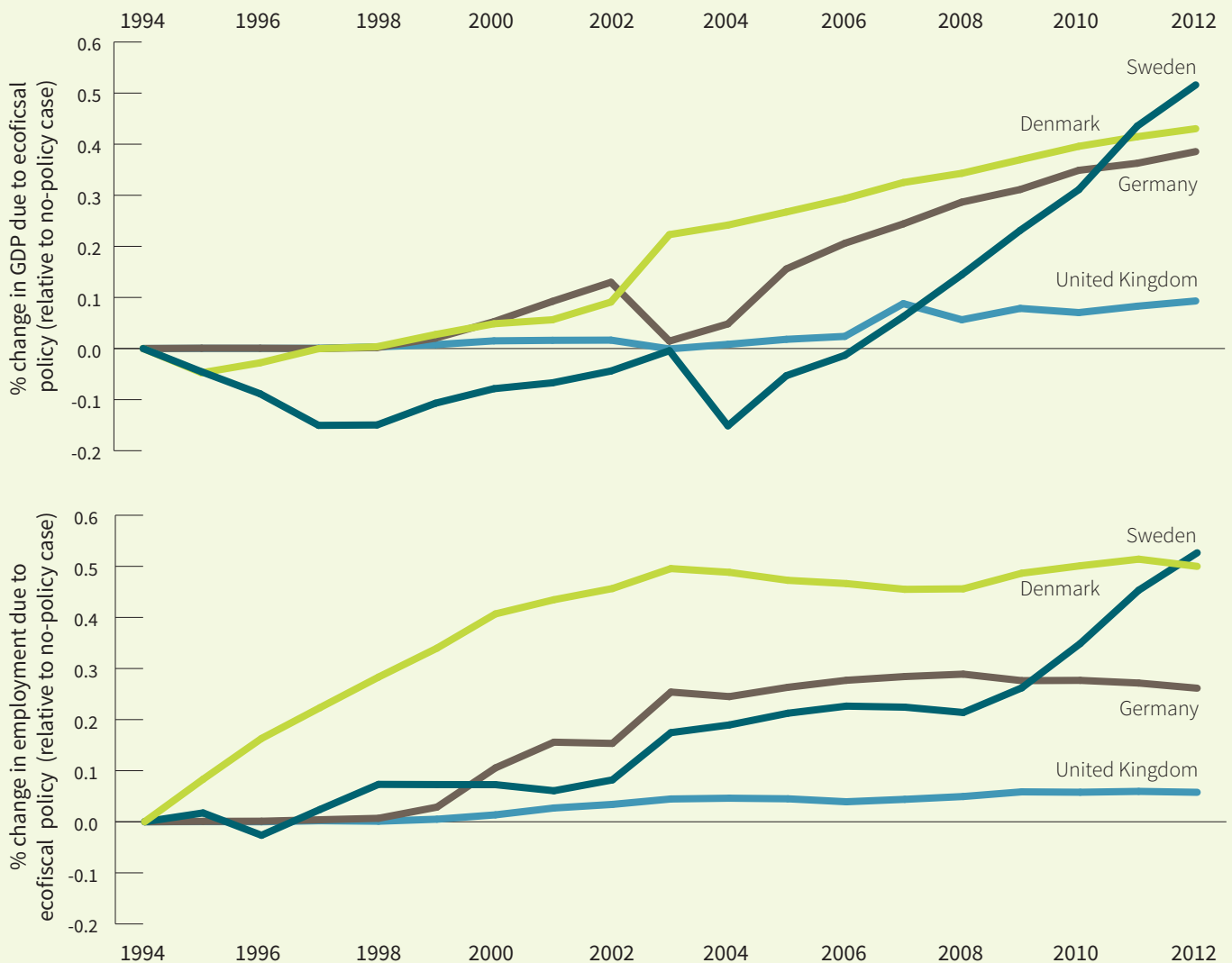
system was designed to eliminate the substance for all but non-critical uses (*Canada Gazette*, 2011).

Reducing taxes on employment and income can drive better economic performance

Pricing environmental damage using ecofiscal tools allows government to simultaneously reduce other tax rates (among other possible options for revenue recycling). And reducing the taxes that are most damaging to the economy can lead to the largest benefits. Reducing personal, corporate, and payroll taxes, for example, can create stronger incentives for investment, profit, and hiring. Revenue recycling is central to the case for ecofiscal reform.

3. Smart Environmental Policy Is Smart Economic Policy *continued*

Figure 3: GDP (top) and Employment (bottom) Impacts of Ecofiscal Policies



Ecofiscal policies in Denmark, Germany, Sweden, and the United Kingdom bolstered economic growth, leading to more jobs and higher GDP.

Source: Based on data from Barker et al. (2009).

The potential benefit of reducing taxes is a key issue for Canada. As we discuss in Section 4, Canada has shown persistently low productivity growth—a key driver of long-term economic growth—over the last 20 years, particularly relative to the United States and other OECD countries (Rao, 2011; OECD, 2014b). Canadian business investment, another driver of productivity and growth, is similarly lagging, with historic lows in Ontario and Quebec in particular (Dachis et al., 2014). Lower taxes are one important factor that could lead to investment and productivity gains (Parsons, 2008), although admittedly, the empirical importance of this link remains debated.

The aforementioned analysis of ecofiscal policies in six European countries suggests that emissions reductions could be achieved with generally positive economic impacts both in terms of employment and GDP. Revenue was recycled in different ways in each country, with some combination of mechanisms including (1) reductions in income tax; (2) reductions in employer contributions to social security; and (3) public investment in energy-saving technologies. The results indicate that the European ecofiscal policies led to employment gains and positive GDP impacts in all six countries (Barker et al., 2009).



3. Smart Environmental Policy Is Smart Economic Policy *continued*

Figure 3 shows the estimated economic impacts of the ecofiscal policies used in Denmark, Germany, Sweden, and the United Kingdom. The two charts illustrate gains in GDP and employment resulting from ecofiscal policies, in each case showing the effect on the measure relative to the (counterfactual) case in which no policy change occurred. The analysis reveals that ecofiscal policies modestly improved economic outcomes over the medium term, though in some cases short-run adjustment costs are apparent.

Ecofiscal policies drive innovation

Innovation includes both the invention of new technologies and processes and the improvement of existing ones, and it is essential for improving economic and environmental performance. Innovations in processes allow the economy to produce more with less, thus improving productivity and driving economic growth.

Pricing pollution provides an important incentive for such innovation, as it leads firms to strive to avoid polluting activities (Fischer, 2009). At the same time, reductions in existing taxes (particularly corporate taxes) also drive innovation. Both “halves” of ecofiscal policies can increase the expected returns on research and development, and can stimulate innovation that reduces the costs of achieving environmental improvements (Newell et al., 1998; OECD, 2010).

Ecofiscal policies provide an enduring, consistent incentive to develop new ways to reduce costs: if pollution has a price, innovations to reduce pollution are valuable. In contrast, prescriptive regulatory approaches that mandate specific technologies or levels of performance typically provide incentives to reduce pollution only up to a required performance standard. Ecofiscal policies therefore provide an impetus for ongoing gains in productivity.

If pollution has a price, innovations to reduce pollution are valuable.

A growing body of evidence supports the link between ecofiscal policies and innovation. A comprehensive review from the European Environment Agency (2011) found that market-based environmental policies increase innovation and the diffusion of environmental technologies. OECD (2009) analysis suggested that a carbon price designed to stabilize global GHG emissions would lead to more than a four-fold increase in energy-related research and development expenditures. Analysis of patent data from 1978-2008 for 11 OECD countries suggests that increases in fossil fuel prices (a proxy for a price on carbon) lead to increased inventive activity around renewable technologies relative to fossil fuel technologies (Lanzi et

al., 2012). Similarly, analysis of around 4,200 firms in seven OECD countries suggests that flexible performance standards have an impact on research and development expenditures, while rigid, prescriptive technology standards do not (Lanoie et al., 2011).

A global price on carbon that stabilizes GHG emissions would quadruple global investment in energy-related research and development.

In terms of evidence from specific policy examples, reductions of SO₂ emissions in the electricity sector in the United States came at a significantly lower cost than expected under the cap-and-trade system implemented in the 1990s. Innovations in fuel blending and in industrial organization emerged that led to lower costs for emissions reductions (OECD, 2010). The program provided incentives that accelerated technological change, even if some of the innovation was already happening (Burtraw, 2000).

Similarly, Sweden’s policy to price emissions of nitrogen oxides in the 1990s appeared to drive increased innovation. The timing of the policy correlated with a sharp increase in patents for technologies to reduce NO_x emissions. Moreover, both the costs of reducing pollution and the emissions intensity of regulated Swedish facilities continued to decline after the policy was implemented, suggesting the policy continued to create incentives for emissions-reducing innovations (OECD, 2010).

The countries that signed the Montreal Protocol implemented a variety of effective and flexible policies to achieve reduction goals (such as Canada and the United States using cap-and-trade systems), which led to the commercialization of various inventions for reducing ozone-depleting substance pollution (Stavins, 2007).

A survey of multiple studies finds clear evidence of a link between environmental policy and innovation, but the strength of this link admittedly varies (Ambec et al., 2011). Lanoie et al. (2011) found evidence both that environmental policy stimulates innovation and has a positive effect on business performance, offsetting some of the costs of complying with environmental policy.

3.2 ALTERNATIVE POLICY APPROACHES CAN BE EXPENSIVE

Environmental policies in Canada have largely relied on approaches that are less cost-effective than ecofiscal policies. While regulatory approaches and subsidies can be useful in some circumstances, ecofiscal tools generally offer a more cost-effective way to achieve environmental objectives. We focus on two types

3. Smart Environmental Policy Is Smart Economic Policy *continued*

of costs: those to the economy in terms of reduced income and productivity, and those to governments in terms of fiscal impacts. Each is discussed below.

Ecofiscal policies are more cost-effective than regulatory approaches

Ecofiscal policies are said to be *cost-effective* when environmental objectives can be achieved at lower costs to the economy than when using alternative policies. For three reasons, ecofiscal policies tend to be cost-effective.

First, ecofiscal policies are flexible and rely on market forces. Unlike *command-and-control* regulatory approaches, market-based approaches can ensure all polluters covered by the policy are led to reduce pollution overall at the least possible cost (e.g., Goulder and Parry, 2008). Establishing a price on pollution gives households and firms the incentive and flexibility to reduce pollution in a way that best suits their own situation. In contrast, regulations require specific actions or the use of specific technologies, even though the costs of taking these actions may vary between different firms or different households. Such prescriptive regulations usually result in higher total costs for any given amount of pollution reduction.

Ecofiscal policies give people and businesses the flexibility to find the least expensive solution that works for them.

Second, unlike direct regulations, ecofiscal tools generate revenues that can be used to reduce existing taxes. Corporate and personal income taxes impose a drag on the economy. Reducing these taxes encourages more economic activity and so further reduces the costs of environmental policy.

Third, direct regulations generally provide less incentive for innovation. Under a regulatory standard, polluters have incentives only to achieve the required level of performance. With ecofiscal policies, on the other hand, the price on pollution provides continuous incentives for deeper reductions and for creating new technologies that drive greater environmental improvements.

Policy experience supports these arguments. For example, the cap-and-trade system for SO₂ in the United States did not include revenue recycling (permits were provided to emitters for free). Even so, the flexibility provided by permit trading resulted in massive cost savings (estimated at around \$800 million per year) when compared with costs under regulatory alternatives for achieving the same reductions in acid rain (Stavins, 2007; Carlson et al., 2000).

Despite the higher total costs associated with direct regulations, they are politically attractive because the costs are often hidden from public view—regulations usually have no direct impact on a government’s budget, but nonetheless impose real costs on businesses and consumers. This helps to explain their ongoing popularity with governments. The irony, of course, is that ecofiscal policies such as pollution taxes, which impose explicit costs on polluters, end up leading to lower overall costs to society for any given amount of pollution reduction.

Direct regulations to reduce pollution cost businesses and consumers more than policies that put an explicit price on pollution.

Environmental subsidies are often unnecessarily expensive

Canada has often relied on *subsidies* to create incentives for actions that reduce environmental impacts. For example, until 2012, the federal government provided tax credits to homeowners who increased the energy efficiency of their homes by improving insulation or upgrading furnaces. It continues to provide a tax credit to users of public transit.

For two reasons, subsidies of this type are often unnecessarily costly to government, using funds that could be better spent elsewhere. First, subsidies identify and target specific prescriptive actions to reduce pollution. Yet governments have shown limited success in identifying the best opportunities for reducing pollution. For example, in the case of ethanol subsidies, Canadian governments have provided levels of support equivalent to 20% to 70% of the market value of the product. But the average costs of the associated GHG emissions reductions have been very high—on the order of \$200 to \$430 per tonne (Auld, 2008; Laan et al., 2011). In contrast, ecofiscal tools generally provide broad incentives to reduce pollution and rely on market signals to best identify the least-cost options available for reducing pollution.

Second, subsidies can be problematic because they may reward companies or individuals for taking actions they would have taken even in the absence of the subsidy. While some commuters might choose to take public transit only because of the incentive provided by the tax credit, many others would have done so—those without cars, for example—even without the tax credit. In these cases, there is a fiscal cost of providing the subsidy but no associated environmental benefit.



3. Smart Environmental Policy Is Smart Economic Policy *continued*

Subsidies can therefore be much more expensive in achieving pollution reductions than ecofiscal policies. For example, four provinces in Canada provide rebates for purchases of hybrid electric vehicles (British Columbia, Ontario, Prince Edward Island, and Quebec) as a technology that can reduce greenhouse gas emissions. Analysis suggests that the associated emissions reductions have an average cost of \$195 per tonne (Chandra et al., 2010). These are very expensive reductions; British Columbia's carbon tax is successfully driving emissions reductions at a current cost of only \$30 per tonne.

Ecofiscal policies are not the best tool for *all* policy problems

While ecofiscal policies are generally the most cost-effective, other instruments can play a useful role in certain circumstances.

A regulatory approach may be more appropriate when critical thresholds or extreme damage from pollution exist (e.g., health risks). In these cases, command-and-control policies may be required to ensure no local area exceeds the threshold (e.g., some toxics). Similarly, when environmental improvements are required very quickly, regulations might be more appropriate. In some situations, immediate reductions are required, such as with new risks identified from toxic substances. In contrast, ecofiscal instruments create incentives by changing relative prices, and so their impacts occur gradually over time as individuals and companies respond to the policy by changing their behaviour.

Further, subsidies or command-and-control regulations can sometimes usefully complement ecofiscal tools. Multiple policy instruments may sometimes be required. For example, while ecofiscal policies can drive innovation, broad subsidies to research and development can complement pollution-pricing policies. Regulations might also be useful when consumer behaviour is particularly insensitive to price changes, especially in the short run. Vehicle efficiency standards, for example, shift manufacturers toward supplying fuel-efficient vehicles more quickly than price instruments affect drivers' demand. Finally, firms often have insufficient incentives to innovate, and public support for research can be justified in these cases. In conjunction with ecofiscal policies, these subsidies can accelerate the development of new technologies to reduce pollution and environmental damage, providing more options for individuals and companies looking for ways to respond to the prices on pollution.

3.3 WELL-DESIGNED ECOFISCAL POLICIES ARE FAIR

Polluters impose costs, ranging from the health effects from dirty air and water to lost worker productivity and output, on the rest of society. Of course, all of us cause some amount of pollution every day, but some cause far more pollution than others. It's only fair that

polluters be required to pay for these costs, and ecofiscal policies automatically generate this outcome.

Ecofiscal policies can also be designed to ensure an acceptable level of fairness in other dimensions—fairness to future generations, to regions, to low-income households, and to vulnerable sectors.

We are accountable to future generations

Future generations should not be left worse off as a result of actions taken now, yet environmental damage occurring today represents a genuine threat to their living standards. Impacts from climate change, for example, are expected to have major economic implications for Canada. The National Round Table on the Environment and the Economy (NRTEE) (2011) found that the costs of climate change in Canada could rise from around \$5 billion annually in 2020 to between \$21 billion and \$43 billion annually by 2050 (in 2006 dollars). As discussed earlier, environmental resources cannot be depleted indefinitely without threatening Canadian prosperity.

Ecofiscal policies need not lead to interprovincial wealth transfers

As already discussed, some ecofiscal policies are probably best implemented at a provincial or municipal level. Decentralized policies can better reflect the unique circumstances of each region, and can also ensure that wealth is not transferred between provinces. Even if a Canada-wide policy is preferred because of the desire for policy uniformity across the country, it can be designed to ensure that all new revenues are recycled within the province in which they are generated (Peters et al., 2010).

**Well-designed ecofiscal policies
need not create financial transfers
across provinces or regions.**

Ecofiscal policies can be designed to protect low-income households

Ecofiscal policies can be designed to avoid excessive burdens being placed on lower-income households. Since lower-income households tend to spend a larger share of their income than higher-income ones on transportation and fuels for heating and cooking, it is not surprising that studies often show environmental taxes (especially those on energy) to be regressive (Blobel et al., 2011; OECD, 2006; World Bank, 2005).

Careful policy design can address these distributional impacts. Using a portion of revenue generated by ecofiscal policies to directly compensate low-income households—for example, through

Box 6: Water Pricing in Singapore

Equitable pricing helped Singapore achieve a 9% reduction in water consumption without hurting low- and middle-income families.

As an island with high population density, Singapore faces various resource challenges. Its supply of fresh water is so limited that Singapore purchases a large share of its water from Malaysia via pipeline. With current demand (approximately 1.5 billion litres per day) projected to double by 2060, Singapore seeks to become increasingly self-sufficient (Singapore Government, 2013).

A water-pricing system designed to recover costs associated with both water provision and wastewater handling, as well as to create incentives for conservation, is central to this strategy. Prior to 1997, households in Singapore paid a significantly lower price than businesses for water use. Singapore implemented a revamped water tariff system in 1997, with water prices between households and industry more closely aligned, and designed to better reflect the full economic and ecological cost of the water provision and treatment. A water bill in Singapore includes explicit line items for water and infrastructure use, highlighting costs per unit of water used by households and businesses alike. A system of block pricing means that greater consumption costs more, creating incentives for water conservation.

These fees, however, take up a disproportionate share of budgets for lower-income households. To address such regressive impacts, the Singaporean government provides a subsidy for low- and middle-income households. It provides a quarterly sales-tax rebate that reflects water and electricity expenditures based on the number of rooms in a household (Singapore Government, 2014). The design of this rebate ensures that vulnerable households have an incentive to reduce water consumption while still mitigating the negative impact on their purchasing power.

Singapore's water-pricing reforms are highly effective. Per capita water consumption decreased from 176 to 160 litres per day between 1994 and 2005, with a target of 140 litres per day by 2030.

Canada's HST transfers—the overall equity of the policy can be improved. Mathur and Morris (2012) found that redirecting 11% of the revenue from a \$15 per tonne carbon tax to the poorest 20% of U.S. households would leave them no worse off as a result of the tax. Rivers (2012) found in the Canadian context that less than 10% of revenue from a \$30 per tonne carbon tax would be required to avoid regressive impacts for low-income households. Analysis of ecofiscal policies used in the Netherlands and Sweden suggests that similar transfers almost totally neutralized the regressive impacts (Blobel et al., 2011). See Box 6 for details on how water-pricing policies in Singapore have been designed to avoid undesirable impacts on low-income households.

Ecofiscal policies need not harm firms' competitiveness

If Canadian firms are subjected to increased costs from unilateral domestic policies while foreign firms do not face similar policies in their countries, concerns are rightly raised about the threat to Canadian firms' competitiveness. Investment and production might shift to countries with less stringent policies, in which case there

may be no net improvement in global environmental performance. In such situations, Canada would merely be “exporting” its pollution abroad, and suffering economic costs in the process. At a national scale, this risk is particularly pertinent with respect to the United States, given the close integration of many North American markets. Similar risks could also exist at the provincial level if policy in some provinces advanced much further ahead than others.

Concerns regarding competitiveness are most justified for sectors that are both pollution intensive and active in international commodity markets (Reinaud, 2008; Aldy & Pizer, 2007). For example, in the case of ecofiscal policies to reduce greenhouse gas emissions, firms producing aluminum, cement, pulp and paper, and steel have relatively high costs of mitigation and little or no influence on their pricing, because they compete in global commodity markets. The result is potential vulnerability to ecofiscal policies.

In contrast, sectors that are less pollution intensive and have well-established brands and pricing power—such as high-end clothing, furniture, prepared foods, and professional and financial services—are far less vulnerable to the effects of ecofiscal policies.

3. Smart Environmental Policy Is Smart Economic Policy *continued*

Perhaps surprisingly, current evidence suggests that, though the impact on specific sectors may be significant, ecofiscal policies tend to have only small implications for the economy as a whole (e.g., Reinaud, 2008; Barker et al., 2009; Quirion & Hourcade, 2004; NRTEE, 2011). One study, for example, estimates that a small carbon price (\$15 per tonne) in the United States would shift less than 1% of manufacturing production overseas and have no discernable impact on manufacturing employment (Aldy & Pizer, 2007). These short-term costs are analogous to the transitional adjustments under trade liberalization. In both cases, the economy adjusts to new prices over time; capital gets reinvested appropriately, and jobs shift to alternative industries.

Similarly, recent research in the United Kingdom finds no evidence that the competitiveness of firms has been negatively affected by that country's climate-change policies, and also suggests that well-designed policies can *create* business opportunities for UK firms by improving productivity relative to that in other countries (Bassi & Zenghelis, 2014). Positive competitiveness impacts are increasingly relevant as other jurisdictions implement their own ecofiscal policies. For example, while some Ontario sectors (e.g., cement and petroleum product manufacturing) might face risks under carbon-pricing policies, other Ontario sectors (e.g., electricity, pulp and paper, and food manufacturing) could have a carbon *advantage* relative to North American competitors in a carbon-constrained market (Sawyer, 2013).

Despite this evidence, the potential threats to competitiveness cannot be dismissed. Two issues deserve mention. First, the adoption of poorly designed environmental policies can harm firms' competitiveness. Parts of German industry are concerned, for example, that high energy prices (caused by subsidies for renewable electricity and the closure of nuclear plants) will undermine their competitiveness (Karnitschnig, 2014). Second, given the limited stringency of ecofiscal policies implemented in most jurisdictions, there remains considerable uncertainty regarding the magnitude of competitiveness impacts. It is possible that more aggressive policy changes could lead to disproportionate impacts on firms' competitiveness.

Whatever impacts might be created from a stand-alone pollution-pricing policy, however, the advantage of using a well-designed package of ecofiscal policies is that there is scope to adjust other taxes in an effort to mitigate these effects. For example, higher taxes on pollution can be offset with rebates, transfers, or reductions in

Ecofiscal policies align with a competitive economy

Innovation and efficient use of our natural resources are critical to improving Canada's productivity, and ultimately our competitive position in the 21st-century economy. While ecofiscal policies will impact different sectors in different ways, evidence shows that they have little impact on the overall economy. Countries that have already adopted ecofiscal policies show no tendency for their firms to relocate elsewhere. As other nations continue in this direction, Canadian industries have an opportunity to benefit from increased global demand for cleaner technologies.

“We need to be thinking about how to stay competitive not just in five or 10 years, but also in 20 and 50 years. The Ecofiscal Commission is focusing on solutions that would better position Canadian industries to achieve a competitive advantage in a rapidly evolving global economy.”

Steve Williams

President & CEO, Suncor Energy

corporate tax rates. Providing free allocation of permits in a cap-and-trade system can also counteract incentives for moving production abroad (Fischer & Fox, 2009, 2004). Border adjustments can level the playing field with firms based in unregulated jurisdictions. And the gradual introduction of policy can give firms time to adjust. All of these approaches have advantages and disadvantages in addressing competitiveness issues, but all of them, if designed properly, can be used to address the legitimate concerns regarding the competitiveness of Canadian firms.



4. Canada Can Do Better

Canadians have come to enjoy a standard of living envied around the world. Yet we can do even better. Putting ecofiscal policies in place is a key step for Canada to improve its management of natural assets and ensure a sustained prosperity.

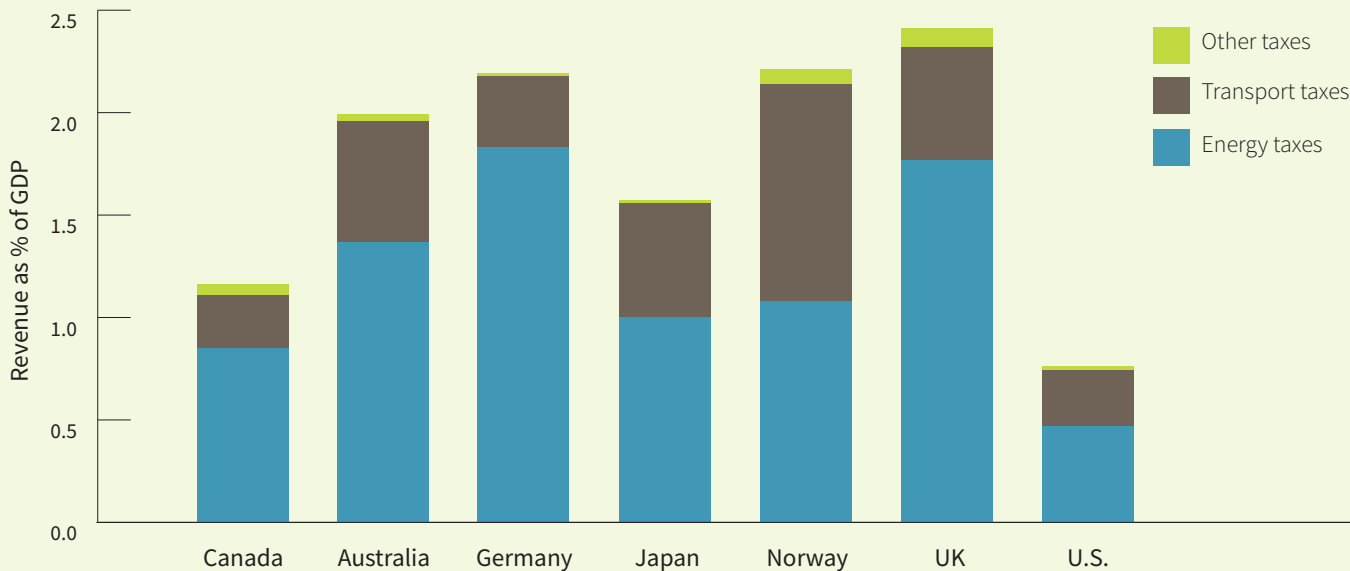
Measurement is crucial for policymakers: it helps identify gaps, as well as the best policies to address them. This section benchmarks Canada’s performance against a group of comparable jurisdictions, including select countries from the G7 (Germany, Japan, the United Kingdom, the United States), plus two other small, resource-rich advanced economies (Australia and Norway). First, we assess the extent to which Canadian governments have implemented ecofiscal policies. Second, we benchmark Canada’s economic performance.

Finally, we benchmark Canada’s environmental performance.

4.1 CANADA MAKES LIMITED USE OF ECOFISCAL POLICIES

To what extent does Canada use ecofiscal policies relative to other jurisdictions? Figure 4 shows OECD estimates illustrating the revenues generated by “environmentally related taxes” as a share of GDP. (Note that the OECD’s definition includes taxes on any

FIGURE 4: Environmentally Related Tax Revenue, 2012



Canada uses environmentally related taxes less than most comparable countries.

Source: Based on data from OECD (2014c). Note that most resource royalties are excluded from these data, though some provincial data appear to be inconsistent; for example, some mineral royalties in British Columbia and Quebec are included.



4. Canada Can Do Better *continued*

activity directly related to pollution.) Canada is second lowest in the group, suggesting that it is behind the curve in shifting to policies that can more closely align its economic and environmental objectives.

Figure 4 includes three categories of environmentally related taxes: energy taxes, transport taxes, and other taxes. Energy taxes include those that apply to energy products and CO₂ emissions associated with the consumption of fossil fuels. Transport taxes refer to those relating to the ownership and use of motor vehicles. Other taxes include pollution and resource taxes, such as waste charges. In all countries shown, most environmental tax revenue is generated from energy and transport taxes. While the OECD's definition does not align perfectly with ecofiscal policies, it provides a useful metric to assess Canada's relative use of policies that price pollution and environmental damage.

For Canada, the greatest revenues come from the federal and provincial fuel taxes as well as provincial motor vehicle licence fees. None is designed to achieve environmental objectives, but indirectly they all create incentives for reduced energy use and thus generate environmental benefits. The Canadian data also include policies designed with explicit environmental objectives; British Columbia's carbon tax is the most significant in terms of revenue. Remaining pollution and resources taxes are marginal in scale or in national coverage.

Total Canadian government revenues now represent over one-third of our GDP, yet our ecofiscal revenues are just above 1% of GDP. Ecofiscal reform thus presents a tremendous untapped opportunity. Canada could raise an additional 1% to 1.5% of GDP through ecofiscal policies if it adopted rates comparable to those in the United Kingdom, Norway, and Germany. Similarly, the International Monetary Fund recently suggested that Canada could raise additional revenue equal to 1.4% of GDP, or about \$26.5 billion, with energy taxes that reflect the marginal damage caused by fossil fuel consumption and traffic congestion (Parry et al., 2014). Indeed, taxes on various kinds of pollution could be increased, or created anew where they do not yet exist; at the same time, various other, more distortionary and growth-retarding taxes could be reduced. No change in overall government revenues would be necessary to create such an ecofiscal reform.

4.2 CANADA CAN IMPROVE ITS ECONOMIC PERFORMANCE

Comparing economic performance between countries is challenging; each country has unique characteristics and its own strengths and weaknesses. A few key indicators are nonetheless suggestive.

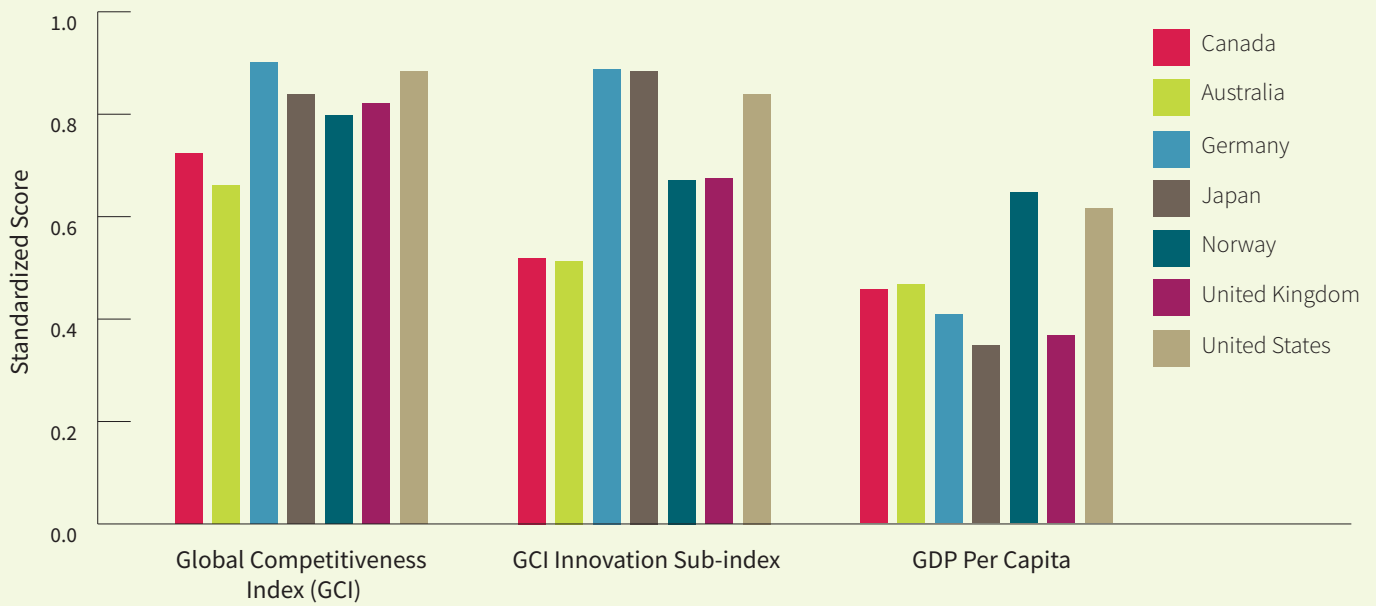
Figure 5 benchmarks Canada in terms of three complementary economic indicators:

- GDP per capita is a comprehensive measure of average income within an economy and is the most widely accepted measure of its residents' material living standards.
- The World Economic Forum's Global Competitiveness Index (GCI) considers important drivers of productivity such as the quality of institutions, infrastructure, education, and other market factors.
- The Innovation Index is a sub-index within the broader GCI that focuses specifically on innovation, including private investment in research and development, patent applications, and university-industry collaboration.

Figure 5 illustrates Canada's well-documented limitations in terms of innovation, which have contributed to anemic productivity growth in recent decades (Drummond & Bentley, 2010; Council of Canadian Academies, 2013). The World Economic Forum notes that "Canada's competitiveness would be further enhanced by improvements in its innovation ecosystem," such as increased spending by businesses in research and development and by government in technological products (WEF, 2013b). Countries ranking higher in terms of overall competitiveness systematically rank higher in the innovation component. Top-ranking countries for competitiveness such as Germany and the United States rank significantly higher than Canada in innovation.

Canada's relatively poor innovation performance is consistent with its low growth in labour productivity. Stronger labour productivity means producing more goods and services with fewer hours of work—so innovation is naturally a key long-run driver of productivity growth. Canadian labour productivity since 2000 has grown at roughly half the annual rate from the preceding three decades. In addition, Canada's performance pales in comparison with that of our most important trading partner: productivity growth in the overall U.S. economy has been about three times the Canadian rate since 2000 (Drummond, 2011; Drummond et al., 2013). If we consider only the business sector, Canadian labour productivity growth has been consistently lower than in the United States since 2008 and has even declined in some years (Statistics Canada, 2013).

FIGURE 5: Three Indicators of Economic Performance



Canada’s economic performance is in the middle of the pack; it particularly lags the comparator countries in terms of innovation.

Sources: Based on data from OECD (2014c); WEF (2013a). Figures 5 and 6 use normalized indices for the various indicators. For each indicator, the country with the highest score is rescaled to 1, and the one with the lowest score is rescaled to 0. This scale maintains both the rankings relative to other OECD countries and the relative magnitude of scores.

This productivity gap and poor innovation record could jeopardize Canada’s relatively strong current performance in terms of GDP per capita. It is often heard that the prominence of Canada’s resource sector accounts for the country’s long-standing weakness in innovation, and that our continued emphasis on resource development inevitably confines us to this path. Yet the data in Figure 5 suggest this is not the case. Norway is also a resource-intensive economy and scores 29% higher than Canada on the GCI’s Innovation Index. Resource development and innovation are not incompatible.

Improved productivity is ultimately the path to higher long-run living standards, and better management of natural resources is part of the story. Properly valuing our natural resources through smart policies will allow Canadians to reap the maximum benefits of our resource-based economy. Innovation and efficient resource use will improve Canada’s productivity and competitive position.

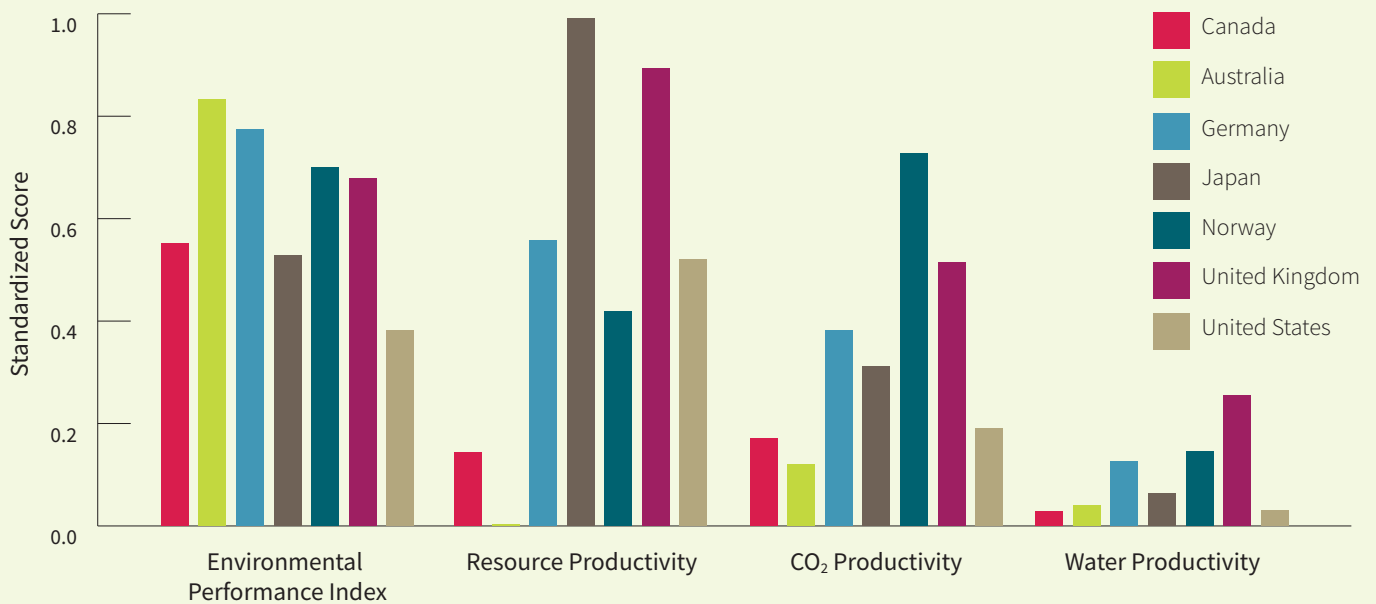
4.3 CANADA CAN BETTER MANAGE ITS NATURAL ASSETS

To what extent can Canada improve its management of natural assets? As with measures of economic performance, unique circumstances of each country make comparing environmental performance challenging. Yet benchmarking Canada against other countries can help identify gaps in Canadian performance.

Figure 6 compares Canada with the same set of countries, using four different aspects of environmental performance:

- The Environmental Performance Index (EPI) is a biennial index covering a wide range of national-level environmental data developed by Yale and Columbia universities in collaboration with the WEF. The 2014 framework combines 20 indicators focused on the protection of human health from environmental damage, ecosystem protection, and resource management. Performance is based on the extent to which various policy targets are being achieved.

FIGURE 6: Benchmarking Canada's Environmental Performance



Canada's environmental performance lags behind the comparator countries, particularly with respect to resource use, greenhouse gas emissions, and water use.

Sources: Based on data from EPI (2014), World Bank (2014a) and OECD (2014c). See the note to Figure 5 for an explanation of the construction of these indicators.

- Resource productivity is an index of GDP per unit of non-energy materials used. This indicator is Europe's headline indicator for its Resource Efficiency Roadmap (European Commission, 2011).
- CO₂ productivity is an index of GDP per unit of CO₂ emitted. It reflects the extent to which a country generates economic growth without producing carbon dioxide emissions.
- Water productivity is an index of GDP per cubic metre of fresh water used. It shows how efficiently water is used within a country's economy.

While these metrics do not represent a comprehensive analysis of all dimensions of environmental sustainability, they provide a useful window into Canada's performance as well as its ability to generate income while minimizing resource depletion. Among its peers, Canada ranks third worst on the Environmental Performance Index. While Canada scores vary highly in terms of achieving its targets for protecting human health from environmental damage, it has low scores in terms of ecosystem protection and resource

management. Based on EPI's indicators, the most pressing issues for Canada are its loss of forest cover, its failures to achieve policy targets for fish stocks and habitat conservation, and its failure to de-intensify economic growth from carbon emissions.

Canada depletes more natural assets and produces more waste per unit of GDP than comparator countries.

The three productivity indices in Figure 6 reinforce Canada's ranking under the EPI. Our average per capita income is admittedly enviable, but we lag far behind our peers in terms of *how* we choose to produce that income. Each unit of Canadian GDP depletes more natural assets, uses more material inputs, and generates more harmful greenhouse gas emissions than is the case in our comparator countries. The World Energy Council's 2013 assessment of 129 countries is further evidence of Canada's poor performance in terms of environmental sustainability. While Canada scores well

4. Canada Can Do Better *continued*

for measures of energy security and energy equity, it ranks 60th for environmental sustainability (World Energy Council, 2013). There is an opportunity here to do much better.

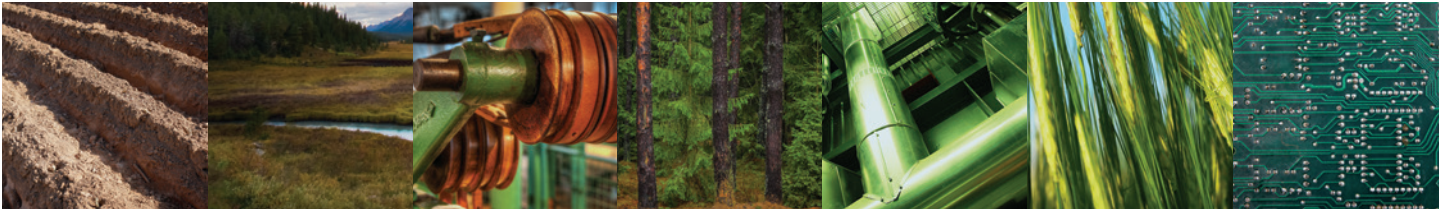
Of course, part of Canada's environmental performance is due to structural factors and national circumstance. Major Canadian sectors such as mining, and oil and gas development are typically more polluting and resource intensive than many others. Similarly, Canada's relatively abundant freshwater resources have led to weaker incentives to improve water productivity.

Yet Canada's long-held comparative advantage in the production of natural resources makes ecofiscal reform more important, not less. While it is likely that Canada will always be more resource intensive than Japan or Germany, for example, ecofiscal policy can help us make better use of our valuable resources. As pressure on our fresh water mounts from greater development and ongoing climate change, and international political pressure grows to constrain greenhouse gas emissions, Canada's environmental performance will have even closer connections to its long-run economic performance. Getting prices and incentives right is critical if we are to continue benefiting economically from our natural wealth while also easing the transition to new and cleaner technologies over time.

Australia—another highly developed, resource-intensive economy—is often compared to Canada in discussions of economics and the environment. Australia scores much higher on the EPI, having achieved more policy goals for issues related to ecosystem vitality. For example, the index suggests that Australia has better managed its forest cover and habitat conservation. However, like Canada, Australia faces challenges with respect to more aggressively reducing its carbon intensity and better protecting its fish stocks. Australia's low scores on environmental productivity indicators highlight room for improvement in creating economic growth that is decoupled from environmental damage.

Norway also ranks higher than Canada on the EPI, though it too faces challenges related to forest cover and poor management of its fisheries. However, Norway's performance on environmental productivity indicators suggests that it is possible for resource-rich countries to generate strong economic growth with lower environmental damage and depletion of natural assets. Is it only coincidence that Norway's strong performance in both environmental and economic terms aligns with its relatively greater reliance on ecofiscal policies?





5. The Time for Action Is Now

As the link between environmental assets and economic prosperity becomes clearer, ecofiscal policies grow in relevance. For several reasons, there are clear advantages to beginning now on the path to reform.

5.1 DELAY IS COSTLY

A global transition to a cleaner economy is already underway. As a small and open trading nation, Canada will eventually make the same transition. But starting now, and moving gradually, is far less costly than delaying action until much later, when sudden and dramatic policy actions will likely be necessary.

Canada must avoid “locking in” to pollution-intensive infrastructure

In the absence of ecofiscal policies, Canadian firms will continue to make investments in technologies that lead to environmental degradation. In many cases, these investments are long-lasting. Coal-fired power plants, for example, have a working life of around 40 years. Once new infrastructure is built, it becomes expensive to retire prematurely. Essentially, we become “locked in” to pollution-intensive and environmentally damaging facilities, even when better alternatives become available. The same logic applies to buildings, manufacturing facilities, and vehicles.

Continued delay in the evolution of policy creates uncertainty that hinders the ability of firms to make investment decisions. An uncertain future policy landscape leads to risks of current assets becoming “stranded” if their value falls significantly in the presence of selected future policies (Lee & Ellis, 2013). Some Canadian firms are already building “shadow” carbon prices into their investment decisions in an effort to manage these risks and anticipate the effects of future ecofiscal policies (Sustainable Prosperity, 2013). In contrast, starting now to gradually implement ecofiscal policies creates long-term and predictable incentives for making choices that are less environmentally damaging. Firms and households will make investments based on their long-term expectations regarding the price of pollution.

A cost-effective transition to a clean economy takes time

Ecofiscal policies influence investment and purchasing decisions by changing relative prices. Industrial burners that produce fewer nitrogen oxide emissions, for example, become economical when a price is placed on air pollutants. Water-efficient appliances are more desirable when water use is priced appropriately. Yet firms and households tend to make these investments only when old equipment is ready to be replaced, unless incentives are strong enough to justify an earlier switch. The changes induced by policy, therefore, take time to have their full effects.

Ecofiscal policies also create incentives for the development of new, innovative technologies that can reduce environmental damage. In the long term, innovation is an essential benefit of ecofiscal policies, but it takes time for innovations to mature and lead to reduced environmental damage.

Evidence on the costs of delay in responding to pollution is particularly strong in the context of climate change. The recent fifth assessment report from the Intergovernmental Panel on Climate Change (2014) showed a range of estimates for the costs of reducing GHG emissions, but they all grow much higher, the longer the delay in policy actions. Similarly, the OECD’s estimates suggest that for every \$1 of clean energy investment *not made* in the electricity sector before 2020, expenditures of \$4.3 would be required between 2021 and 2035 to make up for increased emissions (OECD, 2011). And in the United States, each decade of climate policy delay increases the costs of the eventual policy actions by 40% (Council of Economic Advisers, 2014).

In the Canadian context, a recent report estimates that waiting until 2020 to implement climate policies sufficient to achieve deep emissions reductions (65% below 2005 levels) by 2050 would cost

5. The Time for Action Is Now *continued*

Canadians \$87 billion more than taking equivalent action now. Costs of delay come in the form of refurbishments, retrofits, and the premature retirement of assets (NRTEE, 2012).

\$87 billion = Cost to Canadians of delaying until 2020 actions to achieve deep reductions in carbon emissions by 2050.

5.2 ECOFISCAL POLICIES CAN CREATE SOCIAL LICENCE

The concept of social license has occupied headlines in Canada since 2013, particularly in the context of pipelines. Major development projects—new pipelines, forestry projects, power plants, mines, or oil sands projects—are increasingly contingent on local stakeholders’ attitudes and approval. Without social license, organized opposition can stymie major projects. Ernst and Young (2013) suggested that a lack of social license is now one of the top business risks for the mining and metals industry.

Social license is particularly important for Canada given the importance of our natural resource sectors. Resistance to the Keystone XL and Northern Gateway pipelines, for example, largely stems from concerns about environmental impacts. As argued in a report written by the former head of the Canadian Gas Association, a more systematic approach to sustainable development can improve public support for major resource projects (Cleland, 2014).

While the need for social license might once have applied on a project-by-project basis, the challenge is now more general (McLaughlin, 2013). Public policy—and ecofiscal policies in particular—can help create the necessary social license. Resource industries struggle with social license partly because current policies in Canada provide insufficient incentives for environmental protection. In the absence of an overall policy framework that protects the environment, stakeholders oppose individual projects. Making polluters responsible for their environmental damage under effective ecofiscal policy could enable new support both domestically and internationally.

Environmental “credibility” is important for gaining access to international markets

Social license from credible environmental policy matters for Canada’s access to international markets. The Canadian Chamber of Commerce (2014) noted that clear sustainability policies are crucial, given that perceptions of environmental impacts are becoming increasingly important to the success of Canada’s natural resource

Canada can act now in good company.

Canada can drive its own policy agenda without waiting for the leadership of other nations. Canada’s economic strengths and natural assets are unique, and we require solutions specific to our national context. We cannot ignore the relationship with our closest trading partner, but we can act now and know we are in the good company of the world’s most economically competitive nations.

“Canadian competitiveness concerns require making smart ecofiscal decisions, not delaying them.”

Paul Martin

Former prime minister of Canada

sectors. For example, sustainable forest management practices are now an advantage for British Columbia’s forestry sector in terms of competing in a global market (Working Roundtable on Forestry, 2009). Improved environmental performance—and the social license that comes with it—has allowed Canada’s forestry sector to regain international market share.

On the other hand, weaker environmental performance at home can threaten market access abroad. Failing to implement policies adequate to achieve our targets for greenhouse gas emissions, for example, has exposed Canada to international criticism and left it vulnerable to international policy decisions (Cleland, 2014). Some suggest that more effective policies designed to reduce Canada’s greenhouse gas emissions could help facilitate American political approval of the Keystone XL Pipeline (e.g., Panetta, 2014).

As other countries continue implementing their own ecofiscal policies, they may choose to impose policies harmful to Canadian exports. For example, low carbon fuel standards—such as those in California and Europe—would penalize Canadian fuel exports, given their higher life-cycle emissions. Countries implementing carbon pricing could similarly implement tariffs based on carbon content in order to prevent their own firms from being disadvantaged by Canadian ones operating within a weaker policy context (NRTEE, 2012).



5. The Time for Action Is Now *continued*

Credibility also matters for domestic support

Resource development projects face related challenges across this country. First Nations communities and environmental groups are campaigning against the Northern Gateway pipeline in British Columbia, expressing concerns about potential pipeline leaks, and oil tanker traffic and spills on the Pacific coast, as well as upstream pollution from the oil sands. First Nations in New Brunswick are protesting shale gas exploration because of the associated risks to water supply and traditional land rights (McLaughlin, 2013). In Ontario, First Nations have similarly protested chromite mining inside the Ring of Fire, partially based on the possible impacts on water quality (Scofield, 2012).

It is worth emphasizing that even an aggressive use of ecofiscal policies would not be sufficient to fully address these issues. Building trust between governments, First Nations communities, and stakeholders requires a broader process of engagement and communication. Yet re-establishing confidence in public policy and regulatory systems is central (Cleland, 2014). The introduction of ecofiscal policies designed to value and protect environmental resources could play an invaluable role.

5.3 GLOBAL MARKETS ARE CHANGING, AND CANADA MUST KEEP PACE

Big investments in disruptive technologies are driving change in the global economy, particularly in terms of technologies that reduce environmental damage. Innovative policies and new business models are emerging in various jurisdictions that reflect increasingly serious environmental concerns. A recent estimate, for example, predicts that global clean technology markets will be worth \$816 billion per year by 2015 (Copenhagen Cleantech Cluster, 2012). Yet, of the 65 publicly traded companies currently listed on the Cleantech Index, only one is Canadian (Cleantech Group, 2014).

**\$816 billion = Estimated annual value
of the global cleantech market by 2015**

**1 / 65 = number of publicly traded Canadian
companies on the Cleantech Index**

The world is moving toward a cleaner economy

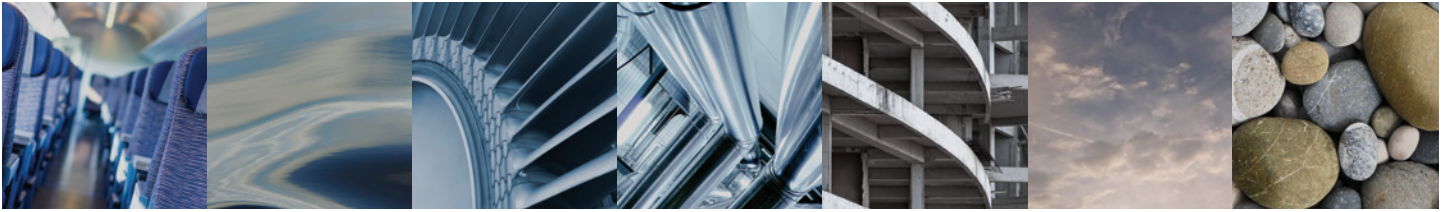
As OECD Secretary-General Angel Gurría noted in 2012, “Businesses are taking promising steps: the ‘green race’ is already on” (OECD, 2012). Globally, and across various economic sectors, clean goods and technologies are increasingly important parts of the economy. The United States and China are Canada’s two most significant trading partners. They also happen to be the world leaders for investment in renewable energy (Frankfurt School, United Nations Environment Programme, & Bloomberg New Energy Finance, 2013). Motivated by concerns over both local and global pollution, China plans to implement a national cap-and-trade system for greenhouse gas emissions in 2016, in addition to a variety of initiatives to promote the development of clean-energy technologies (Chen & Reklef, 2014).

Ecofiscal policies are increasingly part of these global trends. More and more, transitioning a clean economy by pricing pollution is becoming part of mainstream economic policy thinking. In 2014, for example, both the World Bank and the International Monetary Fund released studies emphasizing the economic, environmental, and health benefits of addressing climate change with ecofiscal tools (Parry et al., 2014; World Bank, 2014b).

Canada could benefit from being part of the transition

Canada would be well served by actively participating in the global shift to a cleaner economy. Despite its resource-intensive economy, ecofiscal policies could help Canada become an environmental and economic leader. As other jurisdictions implement environmental policies, global demand will increase for technologies and skills that reduce pollution and environmental damage, creating opportunities for Canadian industry. A study by McKinsey and Company suggests that under the right policy conditions, Canada could have comparative advantages in areas such as sustainable resource development, carbon capture and storage, uranium mining, and hydroelectricity expertise. It suggests that Canada could take the lead in emerging markets such as off-grid solar photovoltaic power, biomass energy, conventional hydro and marine power, and energy-efficient buildings (McKinsey & Company, 2012).

As with all market transitions, a shift to a cleaner economy will take time as product and factor markets adjust. Ecofiscal policies can help prepare Canadian firms for this transition through clear, predictable price signals.



6. Summary: Ecofiscal Policies Are Smart for All Canadian Governments

This report makes the economic case for reducing taxes on labour and income while increasing them on pollution and environmental damage. It draws on the growing body of experience from governments that have taken this step. And the evidence is clear: ecofiscal policies are smart—both for the economy and for the environment.

This alignment is no coincidence. Long-term, sustainable, and equitable prosperity requires managing environmental assets in an economically sensible way.

The argument for greater use of ecofiscal policy in Canada is summarized as follows:

- 1 Canada's environmental assets—from fresh water to healthy ecosystems to clean air—are essential to our continued economic prosperity.** The costs to worker health and productivity from environmental damage are significant and represent lost wealth and well-being. The financial costs associated with cleaning up environmental damage could be used on other goods and services, and thus represent a significant opportunity cost for Canadian society.
- 2 Ecofiscal policies align economic and environmental objectives.** Ecofiscal policies use market forces to align economic and environmental priorities, creating incentives for conservation. They also enable reductions in other, more distortionary and growth-retarding taxes. For both reasons, ecofiscal policies are more cost-effective than other policy approaches such as direct regulations and subsidies.
- 3 Ecofiscal policies can be designed to ensure fairness.** With prices attached to pollution, polluters are required to pay for the costs they impose on others. This is only fair, for current and future generations alike. Ecofiscal policies can also be designed to ensure that vulnerable regions, sectors, and households are treated fairly.
- 4 Ecofiscal policies drive innovation.** Pricing pollution creates incentives for the creation of new technologies to reduce pollution and environmental damage. Over the longer term,

this innovation will be essential for Canadian prosperity, particularly as our trading partners continue implementing their own ecofiscal policies.

- 5 Canadians can seize an opportunity for long-term, clean prosperity.** Despite some progress, Canada currently lags behind many other countries in implementing ecofiscal policies, in innovation and productivity performance, and in the protection of natural assets. Beginning now to move forward with ecofiscal policies will position Canada for long-term prosperity.

As we have illustrated, the range of potential ecofiscal policies is broad. From London's road-congestion charge to Singapore's water user fees to British Columbia's carbon tax, examples of successful policy are diverse. And based on a benchmarking of environmental performance, Canada has room to improve along multiple dimensions.

WHAT ARE THE GREATEST OPPORTUNITIES FOR CANADIAN POLICYMAKERS?

This report is only a starting point for Canada's Ecofiscal Commission. Our future reports will consider a range of issues and examine pragmatic policy solutions appropriate for Canadian governments in all jurisdictions. The policy issues will likely include:

- **Road congestion pricing.** Road access is free, yet leads to congestion, air pollution, greenhouse gas emissions, and lost productivity through wasted time. Congestion is becoming a significant issue in Canada's major cities. Congestion pricing could be a promising policy solution to promote efficient transportation systems.



6. Summary: Ecofiscal Policies Are Smart for All Canadian Governments *continued*

- **Municipal user fees.** Cities have limited revenue tools; they tend to rely on property taxes to fund municipal infrastructure. At the same time, users of infrastructure often have no incentive to limit their usage. User fees can create incentives for conservation while also ensuring that cities do not have to overbuild infrastructure.
- **Carbon pricing.** Global climate change will have major economic costs for Canada. Pricing carbon emissions can help achieve reductions at the lowest cost, can contribute to global emissions reductions, and can help position Canadian firms to compete in a cleaner global economy.
- **Subsidy reform.** Many existing Canadian subsidies are environmentally harmful, fiscally wasteful, or both. Biofuel subsidies for ethanol, for example, may actually increase greenhouse gas emissions, while also representing large public expenditures. Phasing out such subsidies can therefore generate both economic and environmental benefits.
- **Air pollution pricing.** Despite existing regulations, firms have insufficient incentives to reduce emissions of local air pollutants which have major impacts on ecosystems and human health. Air pollution pricing would create incentives for reducing emissions as well as for the development of new technologies to do so.
- **Water pollution pricing.** Toxic effluents released into waterways—whether from agricultural runoff, tailing ponds from mines, or other municipal and industrial wastewater—can have major implications for ecosystems, but also for human health and for economic activity. Appropriately pricing water pollution can encourage less pollution to Canada’s lakes, rivers, and streams.
- **Water use pricing.** Free or inexpensive water leads to over-consumption, putting pressure on supply. Pricing water use appropriately can create incentives for water conservation, though care must be taken to ensure the policy is applied fairly.
- **Catastrophic risk pricing.** Existing liability, insurance, and securities frameworks may not be sufficient to address environmental damages from low-probability catastrophes—such as major rail catastrophes (Lac Mégantic, Quebec) or tailing pond dam breaches (Mount Polley, BC)—and thus may provide firms with insufficient incentive for risk management. Risk pricing could fill this gap and reduce the likelihood of catastrophic damage.

As policy-minded economists, we will build on the strongest, and most recent and relevant research in these areas. We will engage with a cross-section of Canadians and experts for practical insights to develop evidence-driven solutions for ecofiscal reform. And we will contribute to the serious discussions that these issues warrant.

We share a vision for an innovative and thriving Canadian economy, now and in the future, underpinned by clean air, land, and water. We are committed to helping Canadians, and our decision-makers, identify and seize the best policy opportunities to achieve this vision.

References

- Aldy, J. E., & Pizer, W. A. (2007). *The competitiveness impacts of climate change policies*. C. D. Howe. Retrieved from <http://www.c2es.org/docUploads/competitiveness-impacts-report.pdf>
- Ambec, S., Cohen, M. A., Elgie, S., & Lanoie, P. (2011). *The Porter hypothesis at 20: Can environmental regulation enhance innovation and competitiveness?* (Resources for the Future Discussion Paper 11-01). Retrieved from <http://www.rff.org/documents/RFF-DP-11-01.pdf>
- Auld, D. (2008). *The ethanol trap: Why policies to promote ethanol as fuel need rethinking*. C.D. Howe Institute Commentary 268.
- Baltutis, J., & Shah, T. (2012). *Cross-Canada checkup: A Canadian perspective on our water future*. Proceedings from the “Northern Voices, Southern Choices: Water Policy Lessons for Canada” 2011 National Discussion Series Tour, Hosted by the Forum for Leadership on Water (FLOW). Victoria, BC: POLIS Project on Ecological Governance, University of Victoria. Retrieved from http://poliswaterproject.org/sites/default/files/CrossCanada_LowQualityOnline.pdf
- Barker, T., Junankar, S., Pollitt, H., & Summerton, P. (2009). The effects of environmental tax reform on international competitiveness in the European Union: Modelling with E3ME. In M. S. Andersen & P. Ekins (Eds.), *Carbon-energy taxation: Lessons from Europe* (pp. 147-214). Oxford, UK: Oxford University Press.
- Bassi, S., & Zenghelis, D. (2014). *Burden or opportunity? How UK emissions reductions policies affect the competitiveness of business*. Centre for Climate Change Economics and Policy and the Grantham Research Institute on Climate Change and the Environment. Retrieved from <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/07/Burden-or-opportunity.pdf>
- Blobel, D., Gerdes, H., Pollitt, H., Barton, J., Drosdowski, T., Lutz, C., ... & Ekins, P. (2011). Implications of ETR in Europe for household distribution. In P. Ekins & S. Speck (Eds.), *Environmental tax reform (ETR): A policy for green growth* (pp. 236-290). Oxford, UK: Oxford University Press.
- Boadway, R., and Tremblay, J-F. (2014). *Corporate tax reform: Issues and prospects for Canada*. Mowat Centre. Retrieved from http://mowatcentre.ca/wp-content/uploads/publications/88_corporate_tax_reform.pdf
- Brandes, O. M., Renzetti, S., & Stinchcombe, K. (2010). *Worth every penny: A primer on conservation-oriented water pricing*. POLIS Project on Ecological Governance, University of Victoria. Retrieved from http://www.allianceforwaterefficiency.org/uploadedFiles/Resource_Center/Library/rates/POLIS-Primer-on-Conservation-Rate-Structures-May-2010.pdf
- Burtraw, D. (2000). *Innovation under the tradable sulfur dioxide emissions permits program in the U.S. electricity sector*. (Resources for the Future Discussion Paper 00-38). Retrieved from <http://www.rff.org/documents/RFF-DP-00-38.pdf>
- Canada. (2011, May 21). Department of the Environment [Government Notice]. Canada Gazette. 145(21). Retrieved from <http://www.gazette.gc.ca/rp-pr/p1/2011/2011-05-21/html/notice-avis-eng.html>
- Canada. (2012, October 4). Harper government launches phase II of contaminated sites clean-up plan. (Press Release). Retrieved from <http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=DC9C7CF3-CBA1-40FA-BF69-3D6B3B272BD1>
- Canadian Chamber of Commerce. (2014). *Tackling the top 10 barriers to competitiveness 2014*. Retrieved from http://www.chamber.ca/advocacy/top-10-barriers-to-competitiveness/Booklet_Top_10_Barriers_2014.pdf



References *continued*

- Canadian Council of Ministers of the Environment (CCME). (2014). *Canada-wide strategy for the management of municipal wastewater effluent: 2014 progress report*. Retrieved from http://www.ccme.ca/files/Resources/municipal_wastewater_effluent/PN_1522_MWWE_Five_Year_Rvw_2014.pdf
- Canadian Medical Association (CMA). (2008). *No breathing room: National illness costs of air pollution*. Ottawa: Author. PN 1522.
- Carlson, C., Burtraw, D., Cropper, M., & Palmer, K. L. (2000). Sulfur dioxide control by electric utilities: What are the gains from trade? *Journal of Political Economy*, 108(6), 1292-1326.
- Chandra, A., Gulati, S., & Kandlikar, M. (2010). Green drivers or free riders? An analysis of tax rebates for hybrid vehicles. *Journal of Environmental Economics and Management*, 60(2), 78-93.
- Chen, D., & Mintz, J. (2013). *2013 annual global tax competitiveness ranking: Corporate tax policy at a crossroads*. University of Calgary School of Public Policy Research Papers 6,(35). Retrieved from <http://www.policyschool.ucalgary.ca/sites/default/files/research/mintz-2013-globtax.pdf>
- Chen, K., & Reklev, S. (2014, August 31). China's national carbon market to start in 2016—official. Reuters. Retrieved from <http://www.reuters.com/article/2014/08/31/china-carbontrading-idUSL3N0R107420140831>
- Cleantech Group. (2014, June 30). *The Cleantech Index—Companies & weightings*. Retrieved from <http://www.cleantech.com/the-cleantech-index-ctius/companies-weightings>
- Cleland, M. (2014). *From the ground up: Earning public support for resource development*. Canada West Foundation. Retrieved from <http://cwf.ca/pdf-docs/publications/From%20the%20Ground%20Up%20Report%20v8.pdf>
- Commission on the Reform of Ontario's Public Services. (2012). *Public services for Ontarians: A path to sustainability and excellence*. Retrieved from <http://www.fin.gov.on.ca/en/reformcommission/chapters/report.pdf>
- Copenhagen Cleantech Cluster. (2012). *The global cleantech report 2012: A snapshot of future global markets*. Copenhagen: Author. Retrieved from <http://www.cphcleantech.com/media/1944576/20120629%20the%20global%20cleantech%20report%202012%20assembled%20final3.pdf>
- Council of Canadian Academies. (2009). *The sustainable management of groundwater in Canada*. Expert Panel on Groundwater. Retrieved from <http://www.scienceadvice.ca/en/assessments/completed/groundwater.aspx>
- Council of Canadian Academies. (2013). *Paradox lost: Explaining Canada's research strength and innovation weakness*. Ottawa: Advisory Group, Council of Canadian Academies. Retrieved from http://www.scienceadvice.ca/uploads/eng/assessments%20and%20publications%20and%20news%20releases/synthesis/paradoxlost_en.pdf
- Council of Economic Advisers. (2014). *The cost of delaying action to stem climate change*. Executive Office of the President of the United States. Retrieved from http://www.whitehouse.gov/sites/default/files/docs/the_cost_of_delaying_action_to_stem_climate_change.pdf
- Council of the Federation. (2014). *Canadian energy strategy*. Retrieved from <http://www.councilofthefederation.com/en/component/phocadownload/category/48-2014?download=525:canadian-energy-strategy>
- Dachis, B., Robson, W. B., & Chesterley, N. (2014). *Capital Needed: Canada needs more robust business investment*. C.D. Howe Institute e-Brief No. 179. Retrieved from http://www.cdhowe.org/pdf/e-brief_179.pdf

References *continued*

- Department for Environment, Food & Rural Affairs (DEFRA). (2012). *Landfill allowance trading scheme* (IA No: Defra 1317). London, UK. Retrieved from <http://archive.defra.gov.uk/environment/waste/documents/lats-ia.pdf>
- Drummond, D. (2011). Confessions of a Serial Productivity Researcher. *International Productivity Monitor*, 22, 3-10.
- Drummond, D., & Bentley, A. (2010). *The productivity puzzle: Why is the Canadian record so poor and what can be done about it?* TD Economics. Retrieved from <http://www.td.com/document/PDF/economics/special/td-economics-special-ab0610-productivity.pdf>
- Drummond, D., Ryan, A., & Veal, M. (2013). Improving Canada's productivity performance: The potential contribution of firm-level productivity research. *International Productivity Monitor*, 26, 86-93.
- ECOTEC. (2001). *Study on the economic and environmental implications of the use of environmental taxes and charges in the European Union and its member states*. In association with CESAM, CLM, University of Gothenburg, UCD, IEEP. Retrieved from http://ec.europa.eu/environment/enveco/taxation/environmental_taxes.htm
- Ekins, P. (2009). *Resource productivity, environmental tax reform and sustainable growth in Europe*. London, UK: Anglo-German Foundation for the Study of Industrial Society. Retrieved from <http://www.petre.org.uk/pdf/FinRepFin.pdf>
- Elgie, S., & McClay, J. (2013). *BC's carbon tax shift after five years: Results—An environmental (and economic) success story*. Ottawa: Sustainable Prosperity. Retrieved from <http://www.sustainableprosperity.ca/dl1026>
- Environment Canada. (2010). *Human health costs*. Retrieved from <http://www.ec.gc.ca/Air/default.asp?lang=En&n=085A22B0-1>
- Environmental Performance Index (EPI). (2014). *EPI Data Files*. Retrieved from <http://epi.yale.edu/downloads>
- Ernst & Young Global Limited. (2013). *Business risks facing mining and metals 2013–2014*. Retrieved from [http://www.ey.com/Publication/vwLUAssets/Business_risks_facing_mining_and_metals_2013%E2%80%932014_ER0069/\\$FILE/Business_risks_facing_mining_and_metals_2013%E2%80%932014_ER0069.pdf](http://www.ey.com/Publication/vwLUAssets/Business_risks_facing_mining_and_metals_2013%E2%80%932014_ER0069/$FILE/Business_risks_facing_mining_and_metals_2013%E2%80%932014_ER0069.pdf)
- European Commission. (2011). *Roadmap to a resource efficient Europe – Communication from the Commission of the European Parliament, the Council, the European Social and Economic Committee and the Committee of Regions*. Com(2011) 571. Brussels: Author. Retrieved from http://ec.europa.eu/environment/resource_efficiency/pdf/com2011_571.pdf
- European Environment Agency. (2011). *Environmental tax reform in Europe: opportunities for eco-innovation*. EEA Technical Report No. 17/2011. Copenhagen: Author. Retrieved from <http://www.eea.europa.eu/publications/environmental-tax-reform-opportunities>
- Fischer, C. (2009). *The role of technology policies in climate mitigation*. Resources for the Future Issue Brief. 09-08. Retrieved from <http://www.rff.org/rff/documents/RFF-IB-09-08.pdf>
- Fischer, C., & Fox, A. (2004). *Output-based allocations of emissions permits: Efficiency and distributional effects in a general equilibrium setting with taxes and trades*. Resources for the Future Discussion Paper 04-37. Retrieved from <http://rff.org/rff/Documents/RFF-DP-04-37.pdf>
- Fischer, C., & Fox, A. (2009). *Comparing policies to combat emissions leakage: Border tax adjustments versus rebates*. Resources for the Future Discussion Paper 09-02. Retrieved from <http://www.rff.org/documents/RFF-DP-09-02.pdf>



References *continued*

- Frankfurt School, United Nations Environment Programme, & Bloomberg New Energy Finance. (2013). *Global trends in renewable energy investment*. Retrieved from <http://fs-unep-centre.org/publications>
- Goulder, L. H., & Parry, I. W. H. (2008). *Instrument choice in environmental policy*. Resources for the Future Discussion Paper 08-07. Retrieved from <http://www.rff.org/documents/RFF-DP-08-07.pdf>
- Government of British Columbia. (2010). *Budget and fiscal plan 2010/11 - 2012/13*. Victoria: Ministry of Finance. Retrieved from http://bcbudget.gov.bc.ca/2010/bfp/2010_budget_and_fiscal_plan.pdf
- Government of British Columbia. (2011). *Budget and fiscal plan 2011/12 - 2013/14*. Victoria: Ministry of Finance. Retrieved from http://bcbudget.gov.bc.ca/2011/bfp/2011_budget_and_fiscal_plan.pdf
- Government of British Columbia. (2012). *Budget and fiscal plan 2012/13 - 2014/15*. Victoria: Ministry of Finance. Retrieved from http://bcbudget.gov.bc.ca/2012/bfp/2012_budget_and_fiscal_plan.pdf
- Government of British Columbia. (2013). *Budget and fiscal plan 2013/14 - 2015/16*. Victoria: Ministry of Finance. Retrieved from http://bcbudget.gov.bc.ca/2013/bfp/2013_budget_and_fiscal_plan.pdf
- Government of British Columbia. (2014a). *Budget and fiscal plan 2014/15 - 2016/17*. Victoria: Ministry of Finance. Retrieved from http://bcbudget.gov.bc.ca/2014/bfp/2014_budget_and_fiscal_plan.pdf
- Government of British Columbia. (2014b). *First quarterly report, September 2014*. Victoria: Ministry of Finance. Retrieved from http://www.fin.gov.bc.ca/qrt-rpt/qr14/q1_sept_2014.pdf
- Green Budget Coalition, (2013). *Recommendations for budget 2014*. Retrieved from <http://greenbudget.ca/wp-content/uploads/2014/01/Green-Budget-Coalitions-Recommendations-for-Budget-2014-November-7-2013.pdf>
- Green Fiscal Commission. (2009). *The case for green fiscal reform: Final report of the UK Green Fiscal Commission*. London, UK: Author. Retrieved from http://www.greenfiscalcommission.org.uk/images/uploads/GFC_FinalReport.pdf
- Harrison, K. (2013). *The political economy of British Columbia's carbon tax*. OECD Environment Working Papers, No. 63. OECD Publishing. Retrieved from [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/WKP\(2013\)10&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/WKP(2013)10&docLanguage=En)
- Hill, A. (2014, January 9). Economy top priority, poll finds. *Calgary Herald*. Retrieved from <http://www2.canada.com/calgaryherald/news/business/story.html?id=fca02527-afb6-40f0-b4dd-aa004ea7c793>
- Insurance Bureau of Canada (IBC). (2014, January 20). *Canada inundated by severe weather in 2013: Insurance companies pay out record-breaking \$3.2 billion to policyholders*. (Media Release). Retrieved from http://www.ibc.ca/en/Media_Centre/News_Releases/2014/January/Canada_inundated_by_severe_weather_in_2013.asp
- Intergovernmental Panel on Climate Change. (2014). Summary for policymakers. In *Climate change 2014: Mitigation of climate change. Contribution of Working Group III to the Fifth assessment report of the Intergovernmental Panel on Climate Change*. Cambridge, UK: Cambridge University Press. Retrieved from http://report.mitigation2014.org/spm/ipcc_wg3_ar5_summary-for-policymakers_approved.pdf
- International Council of Mining and Metals. (2013). *Options in recycling revenues generated through carbon pricing: How 16 governments invest their carbon revenue*. London, UK: Author. Retrieved from <http://www.icmm.com/document/5362>

References *continued*

- Karnitschnig, M. (2014, August 26). Germany's expensive gamble on renewable energy. *The Wall Street Journal*. Retrieved from <http://online.wsj.com/articles/germanys-expensive-gamble-on-renewable-energy-1409106602>
- Laan, T., Litman, T. A., & Steenblik, R. (2011). *Biofuels—At what cost? Government support for ethanol and biodiesel in Canada*. International Institute for Sustainable Development (IISD), Global Subsidies Initiative (GSI). Winnipeg: IISD.
- Lanoie, P., Laurent-Lucchetti, J., Johnstone, N., & Ambec, S. (2011). Environmental policy, innovation and performance: New insights on the Porter hypothesis. *Journal of Economics & Management Strategy*, 20(3), 803-842.
- Lanzi, E., Haščič, I., & Johnstone, N. (2012). *The determinants of invention in electricity generation technologies: A patent data analysis*. (OECD Environment Working Papers No. 45). OECD Publishing. Retrieved from <http://dx.doi.org/10.1787/5k92v111shjc-en>
- Lee, M., & Ellis, B. (2013). *Canada's carbon liabilities: The implications for stranded fossil fuel assets for financial markets and pension funds*. Canadian Centre for Policy Alternatives. Retrieved from <http://www.policyalternatives.ca/sites/default/files/uploads/publications/National%20Office,%20BC%20Office/2013/03/Canadas%20Carbon%20Liabilities.pdf>
- Marron, D. & Toder, E. (2013). *Carbon taxes and corporate tax reform*. Washington, DC: Urban Institute and Brookings Institution Tax Policy Center. Retrieved from <http://www.taxpolicycenter.org/uploadedpdf/412744-carbon-taxes-and-corporate-tax-reform.pdf>
- Mathur, A., & Morris, A. C. (2014). Distributional effects of a carbon tax in broader U.S. fiscal reform. *Energy Policy*, 66,326-334.
- Matus, K., Yang, T., Paltsev, S., Reilly, J., & Nam, K. M. (2008). Toward integrated assessment of environmental change: Air pollution health effects in the USA. *Climatic Change*, 88(1), 59-92.
- McKinsey & Company. (2012). *Opportunities for Canadian energy technologies in global markets*. Commissioned by Natural Resources Canada. Retrieved from <http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/files/pdf/2013/McK-Report-eng.pdf>
- McLaughlin, D. (2013, November 24). The environment's worst enemy? Energy companies AND environmentalists. *Huffington Post*. Retrieved from http://www.huffingtonpost.ca/david-mclaughlin/canada-energy-companies-environmentalists-environment_b_4334224.html
- National Round Table on the Environment and the Economy (NRTEE). (2011). *Paying the price: The economic impacts of climate change in Canada*. Report 04. Retrieved from <http://collectionscanada.gc.ca/webarchives2/20130322143132/http://nrtee-trnee.ca/wp-content/uploads/2011/09/paying-the-price.pdf>
- National Round Table on the Environment and the Economy (NRTEE). (2012). *Framing the future: Embracing the low-carbon economy*. Report 06. Retrieved from http://publications.gc.ca/collections/collection_2012/trnee-nrtee/En133-40-6-2012-eng.pdf
- Natural Resources Canada. (2014). Mountain pine beetle. Retrieved from <http://www.nrcan.gc.ca/forests/insects-diseases/13381>
- Newell, R. G., Jaffe, A. B., & Stavins, R. N. (1998). *The induced innovation hypothesis and energy-saving technological change* (No. w6437). National Bureau of Economic Research. Cambridge, Massachusetts: National.
- Office of the Auditor General of Canada (OAG). (2013, February 5). Canada has taken positive steps to reduce federal subsidies for fossil fuels. Retrieved from http://www.oag-bvg.gc.ca/internet/English/mr_20130205_e_37755.html
- Olewiler, N. (2012). *Smart environmental policy with full costing*. University of Calgary School of Public Policy Research Papers, 5(6). Retrieved from <http://policyschool.ucalgary.ca/sites/default/files/research/olewiler-online.pdf>



References *continued*

- Organisation for Economic Cooperation and Development (OECD). (2006). *The political economy of environmentally related taxes*. Paris: OECD Publishing. Retrieved from <http://www.oecd.org/environment/tools-evaluation/the-political-economy-of-environmentally-related-taxes.htm>
- Organisation for Economic Cooperation and Development (OECD). (2009). *The Economics of climate change mitigation: Policies and options for global action beyond 2012*. Paris: OECD Publishing. Retrieved from <http://dx.doi.org/10.1787/9789264073616-en>
- Organisation for Economic Cooperation and Development (OECD). (2010). *Taxation, innovation and the environment*. OECD Green Growth Strategy. Retrieved from <http://www.oecd.org/greengrowth/tools-evaluation/taxation-innovation-and-the-environment.htm>
- Organisation for Economic Cooperation and Development (OECD), (2011, November 9). *World energy outlook: Locking ourselves in to an unsustainable future*. OECD Insights. Retrieved from <http://oecdinsights.org/2011/11/09/world-energy-outlook-locking-ourselves-in-to-an-unsustainable-future/>
- Organisation for Economic Cooperation and Development (OECD). (2012). *Green growth: Making it happen*. Retrieved from <http://www.oecd.org/general/greengrowthmakingithappen.htm>
- Organisation for Economic Cooperation and Development (OECD). (2014a). *The cost of air pollution: Health impacts of road transport*. Retrieved from <http://www.oecd.org/environment/cost-of-air-pollution.htm>
- Organisation for Economic Cooperation and Development (OECD). (2014b). *Economic survey of Canada 2014*. Retrieved from <http://www.oecd.org/eco/surveys/economic-survey-canada.htm>
- Organisation for Economic Cooperation and Development (OECD). (2014c). *Database on instruments used for environmental policy*. Retrieved from http://www2.oecd.org/ecoinst/queries/Query_2.aspx?QryCtx=2
- Panetta, A. (2014, May 5). Brad Wall: Carbon tax, climate action needed for Keystone approval. *Huffington Post*. Retrieved from http://www.huffingtonpost.ca/2014/03/05/brad-wall-climate-levy-keystone_n_4906318.html
- Parry, I., Heine, D., Lis, E., & Li, S. (2014). *Getting energy prices right: From principle to practice*. Washington DC: International Monetary Fund.
- Parsons, M. (2008). *The effect of corporate taxes on Canadian investment: An empirical investigation*. Department of Finance Working Paper 2008-01. Retrieved from http://www.ecn.ulaval.ca/~sgor/cit/parsons_FinanceCanadaWP_2008/wp2008-01e.pdf
- Peters, J., Bataille, C., Rivers, N., & Jaccard, M. 2010. *Taxing emissions, not income: How to moderate the regional impact of federal environment policy*. C.D. Howe Institute Commentary 314. Retrieved from http://www.cdhowe.org/pdf/Commentary_314.pdf
- Quirion, P., & Hourcade, J-C. (2004). *Does the CO₂ emission trading directive threaten the competitiveness of European industry? Quantification and comparison to exchange rates fluctuations*. EAERE, Annual Conference, Budapest. Retrieved from <http://halshs.archives-ouvertes.fr/hal-00643411/>
- Ramseur, J. L., Leggett, J. A., & Sherlock, M. F. (2012). *Carbon tax: Deficit reduction and other considerations*. Washington, DC: Congressional Research Service, Library of Congress. Retrieved from <http://archive.nationalaglawcenter.org/assets/crs/R42731.pdf>
- Rao, P. S. (2011). *Cracking Canada's productivity conundrum*. Study No. 25. Montreal: Institute for Research on Public Policy. Retrieved from <http://irpp.org/wp-content/uploads/assets/research/competitiveness/cracking-canadas-productivity-conundrum/IRPP-Study-no25.pdf>

References *continued*

- Reinaud, J. (2008). *Issues behind competitiveness and carbon leakage: Focus on heavy industry*. IEA Information Paper. Paris: Organisation for Economic Cooperation and Development / International Energy Agency. Retrieved from http://www.iea.org/publications/freepublications/publication/Competitiveness_and_Carbon_Leakage.pdf
- Rivers, N. (2012). The distribution of costs of a carbon tax among Canadian households. *Canadian Tax Journal*, 60(4), 899-915.
- Rivers, N., & Schaufele, B. (2012). *Carbon tax salience and gasoline demand*. (Department of Economics, University of Ottawa and Sustainable Prosperity Working Paper 1211E). Department of Economics, University of Ottawa and Sustainable Prosperity: Ottawa, ON, Canada. Retrieved from <http://socialsciences.uottawa.ca/sites/default/files/public/eco/eng/documents/1211e.pdf>
- Sawyer, D. (2013). *Carbon exposed or carbon advantaged? Thinking about competitiveness in carbon-constrained markets*. Sustainable Prosperity Policy Brief. Retrieved from <http://www.sustainableprosperity.ca/dl949>
- Sawyer, D., Perron, G., Trudeau, M. (2005). *Analysis of economic instruments for water conservation*. Marbek Resource Consultants Ltd. in association with Renzetti, S., prepared for Canadian Council of Ministers of the Environment Water Conservation and Economics Task Group. Retrieved from http://www.ccme.ca/files/Resources/water/ei_marbek_final_rpt_e.pdf
- Sawyer, D., Stiebert, S., & Welburn, C. (2007). *Evaluation of total cost of air pollution due to transportation in Canada*. Submitted to Transport Canada. Ottawa: Marbek Resource Consultants Ltd. and RWDI Inc. Retrieved from http://publications.gc.ca/collections/collection_2008/tc/T22-148-2007E.pdf
- Scofield, H. (2012, December 27). Northern Ontario chromite mining has first nation worried for water safety. *Globe and Mail*. Retrieved from <http://www.theglobeandmail.com/news/politics/northern-ontario-chromite-mining-has-first-nation-worried-for-water-safety/article6759045/#dashboard/follows/>
- Singapore Government. (2013). *Water pricing in Singapore*. Retrieved from <http://www.pub.gov.sg/general/Pages/WaterTariff.aspx>
- Singapore Government. (2014). *GST Voucher – Cash, Medisave and U-Save*. Retrieved from <http://www.gstvoucher.gov.sg/faqs.html#4>
- Speck, S. (2007). Overview of environmental tax reforms in EU member states. *Competitiveness effects of environmental tax reforms, final report to the European Commission*. Brussels: European Union. Retrieved from http://ec.europa.eu/economy_finance/publications/european_economy/2013/pdf/ee5_en.pdf
- Statistics Canada. (2013, September 6). Table 1: Business sector: Labour productivity and related variables for Canada and the United States—seasonally adjusted. *The Daily*. Retrieved from <http://www.statcan.gc.ca/daily-quotidien/130906/t130906b001-eng.htm>
- Stavins, R. N. (2007). *Applications of cap-and-trade mechanisms*. Appendix to *A U.S. cap-and-trade system to address global climate change*. Washington DC: Brookings Institute. Retrieved from http://www.hamiltonproject.org/files/downloads_and_links/A_US_Cap-and-Trade_System_to_Address_Global_Climate_Change_Appendix.pdf
- Sustainable Prosperity. (2013). *Shadow carbon pricing in the Canadian energy sector*. Sustainable Prosperity Policy Brief, March 2013. Retrieved from <http://www.sustainableprosperity.ca/dl1015&display>
- Transport for London (TfL). (2008). *Demand elasticities for car trips to central London as revealed by the central London congestion charge*. Policy Analysis Division. Prepared by Reg Evans for the Modelling and Evaluation Team. Retrieved from <http://www.tfl.gov.uk/cdn/static/cms/documents/demand-elasticities-for-car-trips-to-central-london.pdf>



References *continued*

- Transport for London (TfL). (2013a). *Annual report and statement of accounts 2012/13*. London: Author. Retrieved from <https://www.tfl.gov.uk/cdn/static/cms/documents/annual-report-and-statement-of-accounts-2013.pdf>
- Transport for London (TfL). (2013b). *Travel in London, report 6*. London: Author. Retrieved from <https://www.tfl.gov.uk/cdn/static/cms/documents/travel-in-london-report-6.pdf>
- Vivid Economics. (2012). *Carbon taxation and fiscal consolidation: The potential of carbon pricing to reduce Europe's fiscal deficits*. Prepared for the European Climate Foundation and Green Budget Europe. Retrieved from http://www.foes.de/pdf/2012-05_CETRiE_Carbon_Pricing_Report_web.pdf
- Warren, F J., & Lemmen, D. S. (2014). Synthesis. In F. J. Warren & D. S. Lemmen (Eds.), *Canada in a changing climate: Sector perspective on impacts and adaptation* (pp. 1-18). Ottawa: Government of Canada.
- Watson & Associates Economists Ltd. (2012). *Towards full cost recovery: Best practices in cost recovery for municipal water and wastewater services*. Prepared for the Association of Municipalities of Ontario. Retrieved from <https://www.amo.on.ca/amo-pdfs/reports/2012/towards-full-cost-recovery-best-practices-in-cost.aspx>
- Working Roundtable on Forestry. (2009). *Moving toward a high value, globally competitive, sustainable forest industry*. Retrieved from https://www.for.gov.bc.ca/mof/forestry_roundtable/Moving_Toward_a_Globally_Competitive_Forest_Industry.pdf
- World Bank. (2005). *Environmental fiscal reform: What should be done and how to achieve it*. Washington DC: The International Bank for Reconstruction and Development/The World Bank. Retrieved from <http://siteresources.worldbank.org/INTRANETENVIRONMENT/Publications/20712869/EnvFiscalReform.pdf>
- World Bank. (2014a). *World development indicators*. Retrieved from <http://databank.worldbank.org/data/views/variableSelection/selectvariables.aspx?source=world-development-indicators>
- World Bank. (2014b). *State and trends of carbon pricing 2014*. Washington, DC: Author. Retrieved from http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2014/05/27/000456286_20140527095323/Rendered/PDF/882840AR0Carbo040Box385232B00OUO090.pdf
- World Economic Forum (WEF). (2013a). *The Global Competitiveness Index data platform*. Retrieved from <http://www.weforum.org/issues/competitiveness-0/gci2012-data-platform/>
- World Economic Forum (WEF). (2013b). *The global competitiveness report 2013-2014: Country profile highlights*. Retrieved from http://www3.weforum.org/docs/GCR2013-14/GCR_CountryHighlights_2013-2014.pdf
- World Energy Council (WEC). (2013). *World energy trilemma 2013: Time to get real – the case for sustainable energy investment*. Executive Summary. London: Regency House.

Glossary

Air pollutants: Materials emitted into the atmosphere that have detrimental health and/or environmental effects, regionally or globally. Examples of air pollutants include particulate matter (PM), sulphur oxides (SO_x), nitrogen oxides (NO_x), ozone-depleting substances, and volatile organic compounds (VOCs).

Cap-and-trade system: An ecofiscal policy instrument that creates a market for pollution reduction. Such a system sets a limit on total allowable levels for a given pollutant (the “cap”) by issuing permits for emissions equal to this level, and then allows emitters to trade the permits among themselves in an active market. Under this approach, a market price for permits emerges: companies that can reduce pollution cheaply can take more action and sell their excess permits to those that can only reduce pollution at higher costs.

Carbon dioxide (CO₂): In this report, carbon refers to the greenhouse gas carbon dioxide emitted largely from the combustion of fossil fuels. Carbon dioxide is the principal greenhouse gas emitted from human activity that is responsible for climate change.

Command-and-control regulations (also referred to as “direct regulations”): Regulations that are prescriptive, explicitly setting out required performance under law; for example, in terms of required technologies to be used or maximum levels of pollution emissions allowed. Command-and-control regulations are usually more rigid (and more costly) than ecofiscal policies, though in some cases remain an appropriate policy tool.

Competitiveness: The extent to which a firm or industry can successfully participate in an international market. It is influenced by many variables, including market power, product differentiation, taxation, input prices, exchange rates, productivity, and regulations.

Cost-effective: The extent to which a given outcome is achieved at lowest cost. Cost-effectiveness is thus a criterion used to compare the relative costs of different policy options.

Direct regulations: See “command-and-control regulations.”

Distortionary taxes: Taxes that change relative prices and thereby create incentives for firms or households to change behaviour. For example, taxes on personal income reduce the after-tax return to labour and thus reduce incentives for working and hiring.

Ecofiscal policies: Policies that align economic and environmental objectives by shifting away from taxing things society wants more of (such as jobs, income, or profits) toward taxing things society wants less of (such as pollution and resource waste). Ecofiscal policy tools include subsidy reform, user-fees, and pollution pricing.

Environmental tax: An ecofiscal policy instrument whereby government taxes are imposed on actions that lead to environmental damage.

Fiscal system: The entire collection of taxes, subsidies, and spending policies used by government.

Free-ridership: Within the context of ecofiscal policy, this occurs when firms or households collect a government subsidy for taking a specific action, but would have taken the same action even in the absence of the subsidy.

Full-cost-recovery: When users of a service—such as water or sewage infrastructure—pay for the entire costs of building and using that service. User fees can be used to ensure full-cost-recovery.

Greenhouse gas (GHG): Gases present in or emitted into the atmosphere whose effect is to trap some of the incoming solar radiation. Carbon dioxide from fossil fuel combustion and land-use changes, and methane from agriculture are the two principal greenhouse gases.

Gross domestic product (GDP): The monetary value of all goods and services produced within a country during a specific period of time (usually one year).

Innovation: The process of improving existing technologies and processes, and developing new methods, devices, processes, and concepts. Innovation is critical for raising long-term living standards.

Nitrogen oxide (NO_x): An air pollutant that results largely from combustion activities in transportation, industry, and power generation.

Organisation for Economic Cooperation and Development (OECD): A multinational institution (of developed economies) that focuses on comparison, coordination, and improvement of policy and economic research.



Pollution pricing policy: An ecofiscal policy that creates economic incentives for reducing environmentally harmful activity by putting a price on pollution. Cap-and-trade systems and environmental taxes are examples of pollution pricing policies.

Productivity: The level of output created per unit of input used. For example, the labour productivity of an economy refers to GDP per unit of labour input (typically per hour of work effort).

Regressive: Referring to a policy that imposes a disproportionately high burden on lower-income taxpayers.

Revenue neutral: Describing an ecofiscal policy in which all revenue generated by the policy is returned to firms and/or households through reductions in existing taxes. Implementing a revenue-neutral policy does not lead to a change in the overall level of government revenues.

Revenue recycling: The way in which government revenues generated from an ecofiscal policy are returned back to firms and/or households.

Social license: Broad public approval for an organization or project.

Subsidy: A government policy that provides preferential financial treatment to particular groups (whether specific sectors, firms, or households) based on certain characteristics or actions.

Subsidy reform: Phasing out or redesigning existing subsidy policies (specifically, in the context of this report, existing subsidies that are environmentally or economically harmful, or both). Subsidy reform is one element of the ecofiscal policy tool kit.

Sulphur dioxide (SO₂): An air pollutant that results largely from combustion activities in transportation, industry, and power generation.

User fee: An ecofiscal policy tool requiring payment for the use of public services or infrastructure. For example, municipal households and users might pay user fees for water and sewage infrastructure based on the volume of water they consume or the volume of wastewater they produce.



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