

# CARBON TAX GUIDE

## A Handbook for Policy Makers

### APPENDIX: CARBON TAX CASE STUDIES





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## LIST OF ACRONYMS

<b>BAU</b>	Business As Usual
<b>BTU</b>	British Thermal Unit
<b>CCL</b>	Climate Change Levy (UK)
<b>CCS</b>	Carbon, Capture and Sequestration
<b>CDM</b>	Clean Development Mechanism
<b>CER</b>	Certified Emission Reduction
<b>CfD</b>	Contract for Difference (UK)
<b>CGER</b>	Centre for Global Environmental Research
<b>CHP</b>	Combined Heat and Power
<b>CPI</b>	Consumer Price Index
<b>CPF</b>	Carbon Price Floor (UK)
<b>CPM</b>	Australian Carbon Pricing Mechanism
<b>CPS</b>	Carbon Price Support (UK)
<b>DCT</b>	Domestic Consumption Taxes
<b>EITE</b>	Emission-Intensive Trade-Exposed
<b>ETS</b>	Emissions Trading System
<b>EU ETS</b>	European Union Emissions Trading System
<b>EU</b>	European Union
<b>DGP</b>	Gross Domestic Product
<b>GHG</b>	Greenhouse Gas
<b>GIO</b>	Greenhouse Gas Inventory Office Japan

<b>IEEP</b>	Institute for European Environmental Policy
<b>IETA</b>	International Emissions Trading Association
<b>IMF</b>	International Monetary Fund
<b>LPG</b>	Liquefied Petroleum Gas
<b>LULUCF</b>	Land Use, Land Use Change, and Forestry (emissions)
<b>NDC</b>	Nationally Determined Contribution
<b>NIES</b>	National Institute for Environmental Studies
<b>MW</b>	Megawatt
<b>MRV</b>	Measuring, Reporting and Verification
<b>NAEIS</b>	National Atmospheric Emissions Inventory System
<b>NO<sub>x</sub></b>	Nitrogen Oxide
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PMR</b>	Partnership for Market Readiness
<b>R&amp;D</b>	Research and Development
<b>SARS</b>	South Africa Revenue Service
<b>SAT</b>	Tax Administration Service (Mexico)
<b>tCO<sub>2</sub>e</b>	Metric tons of carbon dioxide equivalent
<b>UNDP</b>	United National Development Programme
<b>UNFCCC</b>	United National Framework Convention on Climate Change

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Australia

British  
Columbia

Chile

Denmark

Finland

France

Iceland

India

Ireland

Japan

Mexico

Norway

Portugal

South  
Africa

Sweden

Switzerland

United  
Kingdom





# INTRODUCTION

The development of the Carbon Tax Guide drew heavily on experience in developing and implementing carbon taxes in countries and subnational jurisdictions across the world. While research was undertaken on the full range of carbon taxes that have been implemented globally, specific attention was paid to 17 jurisdictions whose experience was considered particularly relevant for informing the analysis. For each of these carbon taxes, a detailed case study was carried out that assessed all the central design elements of the tax in question and sought to understand how effective it had been (if it had already been implemented); what challenges had been faced, and how these had been overcome.

In addition to extensive desk research, these case studies were made possible by the generous collaboration of government and non-government experts from the jurisdictions studied. The experts' input took various forms, including questionnaire responses, in-person and telephone interviews and review, and comments on draft versions of the case studies. In all but two of the jurisdictions studied, experts involved in the development and/or implementation of the carbon tax provided some form of input, and in several cases experts provided input at multiple stages. These experts—to whom we are extremely grateful—are named in the acknowledgments section of the Carbon Tax Guide.

The wealth of information gathered through the case studies has informed every part of this guide, serving as illustrations of the variety of approaches taken to addressing the different design elements that comprise a carbon tax, but also providing valuable lessons on the implications of different approaches and the ways they can be adapted to match individual contexts and policy goals. The present appendix complements the references to the cases in the main document, and presents each of the 17 case studies in full.

The full case studies—arranged below in alphabetical order—each contain five sections. They begin with an overview, indicating the jurisdictional level (national or subnational), the year of adoption (and, where relevant, abolishment), and a narrative summary of the carbon tax. The following section provides context data on the jurisdiction in question, which aim to help the reader understand the context in which the tax was adopted, while the third section sets out the objective of the carbon tax, as defined by the government. The fourth section summarizes the various “design elements” of the carbon tax, including its sectoral coverage, tax rate, and use of revenues, as well as including, where available, information on why certain decisions were made. The final section provides information on challenges that were reported in the development or implementation of the tax and, to the extent available, information on evaluations of the impacts of the tax. Each case study is also accompanied by a bibliography.



# AUSTRALIA

## CARBON PRICING MECHANISM (2012–14)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 2012

#### BRIEF DESCRIPTION OF TAX:

The Australian Carbon Pricing Mechanism (CPM) went into effect in July 2012. The CPM was supposed to be implemented in two steps: (i) from 2012 to 2015, a fixed price was to be in place for every ton of CO<sub>2</sub> emitted by liable entities; and (ii) after 2015, the price was no longer to be fixed but a cap on emissions was to be set. Therefore, Australia intended to have a fixed-price period for three years and then switch to an emissions trading scheme in which the carbon price would be determined by the market. The Australian emissions trading scheme was set to be linked to the European Union Emissions Trading System (EU ETS) by 2015. However, the CPM was repealed in July 2014 (Ludovino Lopes Advogados et al. 2014; Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 2). The tax was replaced by the Direct Action Plan, through which the government purchases emission reductions through a reverse auction under the Emissions Reduction Fund (Miller 2014; Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 2).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**23,490,736 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$37,834.5 (2014)**

(World Bank, 2015b)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**0.4% (2014)**

(World Bank, 2015a)

##### MAJOR SOURCES OF GHGs (2014) With Land Use, Land-Use Change and Forestry (LULUCF)

**Energy (77.5%); Agriculture (13.8%); Industrial Process and Product Use (6.2%); Waste (2.3%); LULUCF (0.13%)**

(Australian government, Department of the Environment and Energy 2016, xi)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS

(CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 418,623,000 (1990); 522,397,000 (2014)**

**With LULUCF: 546,839,000 (1990); 523,107,000 (2014)**

**Change: +25.0% from 1990 levels (without LULUCF); -4.3% from 1990 levels (with LULUCF)**

(Australian government, Department of Environment and Energy 2016, 31)

##### TOTAL GHG EMISSIONS (METRIC TONS OF CO<sub>2</sub>E PER CAPITA)

**WITHOUT LULUCF: 24.5 (1990); 22.2 (2014)**

**WITH LULUCF: 32.0 (1990); 22.3 (2014)**

(World Bank 2015c; Australian government, Department of Environment and Energy 2016, 31)

**ENERGY CONSUMPTION BY SOURCE (2014)****Coal (40%); Oil (34%); Gas (24%); Hydroelectricity (1%)***(The Shift Project Data Portal, 2016)***TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy production: 0.541 quadrillion BTUs****Primary energy consumption: 5.931 quadrillion BTUs****Deficit: -5.39 quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.935/1.00****Rank: 2/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 79/100****Rank: 13/167***(Transparency International, 2015)***GOVERNMENT CAPACITY** *(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 93.6****Political Stability and Absence of Violence/Terrorism: 87.4****Government Effectiveness: 91.8****Regulatory Quality: 98.1****Rule of Law: 96.2****Control of Corruption: 95.2***(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The CPM was introduced through the Clean Energy Future Package, which included the Clean Energy Act 2011, the Clean Energy Regulator Act 2011, and the Climate Change Authority Act 2011. The stated objectives of the Clean Energy Act, which specifically established the Carbon Pricing Mechanism, were to help meet Australia's emissions reduction targets of 5% reduction below 2000 levels by 2020 and an 80% reduction below 2000 levels by 2050, encouraging investments in clean technology, supporting job creation, maintaining international competitiveness, and decoupling economic growth from emissions growth (Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 1–2; Peel 2014, 442; Department of Climate Change and Energy Efficiency, Australian government 2012; and Australian government 2011).

## DESIGN

### COVERED SOURCES AND SECTORS

Australia's carbon tax covered all direct (scope 1) emissions of GHGs—that is, carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, and hydrofluorocarbons—from large emitters (approximately 60% of the nation's total GHG emissions) (World Bank 2014, 78). An equivalent carbon price was applied to some business transport emissions and nontransport uses of fuels through changes in fuel tax credits or fuel excise, as well as to the import of synthetic GHGs.

**COVERED SECTORS**

Power stations using nonrenewable energy sources, other stationary electricity generation sources, fugitive emissions, industrial processes, transportation, and landfills (Department of Climate Change and Energy Efficiency, Australian government 2012).

## NON-COVERED SECTORS

Agriculture, forestry, fishing, on-road and light transport, land use, legacy landfills, legacy industrial processes, and fugitive emissions from closed underground mines (Department of Climate Change and Energy Efficiency, Australian government 2012).

## POINT OF REGULATION

**Midstream and downstream.** Electricity and gas were taxed midstream. Other emissions were taxed downstream.

## TAX RATE (in AUD and USD per tCO<sub>2</sub>e)

For the period 2012–14, a fixed price was set, starting at A\$23 (US\$23.39) per metric ton of CO<sub>2</sub>e (tCO<sub>2</sub>e) for 2012, and to be followed by a 2.5% annual increase. From 2015 on, the price was intended to be flexible but incorporated both a price ceiling and a price floor. A price ceiling of A\$20 (US\$20.34) above the international price (increasing 5% annually) was planned. A price floor of A\$15 (US\$15.25) (rising annually by 4%) was initially set by law for a period of three years. The price floor was removed, however, when the agreement was signed with the European Union to link the Australian ETS with the EU ETS (Ludovino Lopes Advogados et al. 2014, 50).

## METHODOLOGY USED TO ESTABLISH TAX RATE

The Australian Treasury modeled the impacts of two different carbon tax rates, respectively starting at A\$20/tCO<sub>2</sub>e (US\$20.34/tCO<sub>2</sub>e) and A\$30/tCO<sub>2</sub>e (US\$30.51/tCO<sub>2</sub>e) for 2012. In its modeling exercise, the Australian government assumed that atmospheric concentrations of CO<sub>2</sub> would be limited to 450–550 ppm by 2100. From there, the Australian obligation was modeled, which then translated into the estimated range for the carbon price variable. The model suggested a marginal impact of the carbon tax on overall price levels. Employment and consumption by private households were expected to increase, with or without the tax (Ludovino Lopes Advogados et al. 2014, 13). The final starting carbon price of A\$23/tCO<sub>2</sub>e (US\$23.39/tCO<sub>2</sub>e) was established through political negotiations within the Multi-Party Climate Change Committee established to build consensus on Australian climate change policy (Peel, 2014, 453; Taberner and Zorzetto, 2014, 10).

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

The CPM provided significant assistance to Emissions-Intensive, Trade-Exposed (EITE) entities through a system of free permit allocation known as the Jobs and Competitiveness Program. Some activities marked by very high carbon costs and limited price pass-through capacity received very high levels of assistance (covering 94.5% of the industry average carbon costs), whereas other “moderately” emissions-intensive industries received lower levels of assistance (covering 66% of the industry average carbon costs). The recipients could use the free permits for compliance, sell the credits back to the Clean Energy Regulator through the buy-back option, or trade the permits in the carbon market. The EITE assistance was intended to taper off (by 1.3% each year) to encourage pollution reduction by EITE entities and was subject to review by the Productivity Commission (Peel 2014, 454–456; Ludovino Lopes Advogados et al. 2014, 50; Clean Energy Regulator 2015b).

Emissions-intensive coal-fired electricity generators received two kinds of assistance. Nine coal-fired generators received one-time cash payments in 2012 totaling A\$1 billion (US\$1.02 billion) (Peel, 2014, 456). Additional assistance was given in the form of free carbon units from the Energy Security Fund, which aimed to help generators adjust to the carbon price and transition to cleaner technologies. Recipients could choose to use the free carbon units for compliance, sell them back to the Clean Energy Regulator, or trade them in the carbon market (Ludovino Lopes Advogados et al. 2014, 50; Clean Energy Regulator 2015a).

Offsets from the Carbon Farming Initiative (CFI), which encouraged a shift in land management practices to store carbon or reduce GHG emissions on the land, could be used for compliance under the CPM, subject to a 5% limit during the fixed-price period (Ludovino Lopes Advogados et al. 2014, 52).

## IMPLEMENTING AGENCIES AND APPROACHES

Three main agencies administered the CPM and provided advice for the future: the Productivity Commission; the Climate Change Authority; and the Clean Energy Regulator (Department of Climate Change and Energy Efficiency, Australian government 2012).

The Clean Energy Regulator was the main regulatory body responsible for administering the CPM. The Clean Energy Regulator's responsibilities included allocating carbon units (under the flexible ETS phase), determining entities' liability, operating the Australian National Registry of Emission Units, and ensuring compliance and enforcement of the CPM (Peel 2014, 444).

The Climate Change Authority (CCA) was an expert advisory body charged with conducting a wide range of reviews of the carbon tax policy. The CCA was responsible for reviewing the policy and offering advice on the annual emissions caps, which were to be established on a 5-year rolling basis. This agency was also responsible for reviewing the Renewable Energy Target and CFI (Peel 2014, 444).

The Productivity Commission was responsible for reviewing international pollution reduction actions, the Jobs and Competitiveness Program, and the fuel excise and taxation regime (indirect carbon taxes) (Department of Climate Change and Energy Efficiency, Australian government 2012).

## MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

During the 3-year "fixed-price" period, liable entities reported their emissions to the Clean Energy Regulator under the National Greenhouse and Energy Reporting (NGER) Act and purchased corresponding Australian Carbon Units (ACUs). These entities had to acquire and surrender units by a particular date or face significant financial penalties if there was a shortfall in surrendered units. Covered entities were also subject to audits (Walters and Martin 2012, 11).

Compliance and enforcement were also the responsibility of the Clean Energy Regulator. The National Greenhouse and Energy Reporting Act gives the Regulator the authority to enter and inspect the property of regulated entities if he suspects efforts to violate the Act. In addition, the Regulator has the authority to order an audit of the reporting of a regulated entity's emissions (Walters and Martin 2012, 15).

## USE OF TAX REVENUES

Australia introduced its carbon pricing mechanism with the objective of being fiscally neutral and placed special emphasis on dedicating carbon revenues to families and businesses. At least 50% of the revenues generated went toward a Household Assistance Package—financial assistance for pensioners and low-income households to compensate for the increase in cost of living caused the carbon price. Around 40% of the revenues generated from the carbon tax were to be allocated toward a Jobs and Competitiveness Package—a number of assistance measures for the business community to make the transition to a clean energy future. These measures targeted EITE industries, other areas of manufacturing, food processing, foundries, and small businesses (Ludovino Lopes Advogados et al. 2014, 51).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The carbon tax was linked to several relevant policies:

- Covered entities were required to report their GHG emissions to the Clean Energy Regulator under the National Greenhouse and Energy Reporting Act (Walters and Martin 2012, 9).
- The Clean Energy Regulator Act established the office and associated responsibilities of the Clean Energy Regulator (Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 2).
- The Climate Change Authority Act established the Climate Change Authority advisory board and made it responsible for reviewing the results of the Clean Energy Package and making recommendations to Parliament (Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 2).
- Emissions offsets generated from the CFI could be used for compliance with the CPM (Ludovino Lopes Advogados et al. 2014, 52). After the repeal of the CPM, existing CFI projects were transitioned into the Emissions Reduction Fund (Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 2).

- The National Carbon Offset Standard (NCOS) voluntary program was released by the Australian government in 2012 to help ensure the integrity of carbon offsets (Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 6).
- While transport fuels were excluded from the CPM, an equivalent carbon price was applied to some business transport emissions and nontransport uses of fuels through changes in fuel tax credits or fuel excise. Users of specified fuels could choose to opt into the CPM instead of having to pay the equivalent carbon price through the fuel tax system (Ludovino Lopes Advogados et al. 2014, 52).
- A carbon tax equivalent was applied to synthetic GHGs through the Ozone Protection and Synthetic Greenhouse Gas Management legislation (Australian government, Department of Environment and Energy 2014).

## EVALUATION

### OUTCOMES

Australia's emissions were broadly the same in 2012 as they were in 1990. However, given that the economy doubled within that same time frame, the emissions intensity of the economy was effectively halved. While broad economic forces accounted for some of the reduction in emissions intensity, the Australian government believes the carbon tax also played an important role (Climate Change Authority, Australian government 2014, 76).

Between 2012 and 2014, estimates suggest the CPM led to a modest increase in electricity prices, fuel switching from coal to less polluting energy sources, and a reduction in energy intensity of the country's power supply. The combined environmental impact attributable to the carbon price is estimated to be 11–17 million metric tons of CO<sub>2</sub> emissions (O'Gorman and Jotzo 2014, 1). Despite the initial emission reductions from the CPM, evidence suggests that emissions have increased again since the repeal of the carbon tax (Christoff 2015).

### CHALLENGES

The CPM was an extremely contentious measure from the beginning, as opposition warned of rising energy prices and the loss of jobs. The Clean Energy Act passed in Parliament by only two votes in 2011. The opposition Liberal Party leader, Tony Abbott, vowed to rescind the legislation if elected, which was achieved when his party came into power in 2014. The CPM has been replaced by a Direct Action Plan, through which the government conducts a reverse auction for emission reductions projects (Ludovino Lopes Advogados et al. 2014, 52).

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# BRITISH COLUMBIA CARBON TAX (2008)

## OVERVIEW

**LEVEL OF TAX:** Provincial | **YEAR OF ADOPTION:** 2008

### BRIEF DESCRIPTION OF TAX:

While the British Columbia (BC) carbon tax is a subnational tax, it is useful for national governments to review, as it is considered by many to be a “textbook” example of a broad-based, revenue-neutral carbon tax. The carbon tax was implemented in 2008 and gradually raised through 2012 to allow families and businesses time to reduce their emissions. The tax is paid by all individuals and businesses that purchase or use fuel in the province. The tax rate was initially set at C\$10 (US\$10.19) per metric ton of CO<sub>2</sub>e (tCO<sub>2</sub>e) of emissions and increased by C\$5/ton annually, until reaching C\$30/tCO<sub>2</sub>e (US\$29.35/tCO<sub>2</sub>e) in 2012. The revenues from the carbon tax are used to fund reductions in other taxes on area citizens and businesses. Various studies suggest the tax has reduced GHG emissions by between 5 and 15 percent, and had an insignificant impact on the province’s economic conditions.

In May 2013, the government froze carbon tax rates until 2018. In May 2015, the government established a Climate Leadership Team to develop climate change policy recommendations for meeting the province’s 2050 goals. The recommendations of the committee include a C\$10/ton (US\$7.55/ton) annual increase in the carbon tax beginning in 2018 (Hui 2016). In March 2016, 130 British Columbian businesses signed an open letter to the government calling for a lift on the carbon tax freeze in 2018 and supporting the annual C\$10/ton (US\$7.55/ton) carbon tax rise recommended by the Climate Leadership Team (Meissner 2016). In August 2016, the government released the Climate Leadership Plan. The Plan outlines 21 initial action items to further address climate change; it will be updated based on the work being undertaken by the federal government and the provinces and territories to develop a pan-Canadian approach to climate action and clean growth under the Vancouver Declaration (British Columbia Ministry of Finance 2016d).

## CONTEXT

### CONTEXT FOR POLICY DESIGN

#### POPULATION

**4,751,612 (2016)**

(BCStats 2016)

#### PER CAPITA GDP (based on constant 2005 U.S. dollars) – Canada

**\$38,259 (2014)**

(World Bank, 2015a)

#### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars) – Canada

**1.1% (2014)**

(World Bank, 2015b)

#### MAJOR SOURCES OF GHGs (2014) Without Land Use, Land-Use Change and Forestry (LULUCF) but including net deforestation per BC practice

**Transport (38.4%); Stationary Combustion Sources (31.0%); Fugitive Sources (8.5%); Industrial Processes (5.4%); Afforestation/Deforestation (4.6%); Agriculture (3.6%); Waste (8.6%)**

(British Columbia 2016)

#### TOTAL GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 58,252,000 (1990); 64,464,000 (2014)**

**With LULUCF: -832,000 (1990); 126,446,000 (2014)**

**Change: +10.7% from 1990 levels (without LULUCF); +15303.7% from 1990 levels (with LULUCF)**

(British Columbia 2016a)

**TOTAL GHG EMISSIONS** (metric tons of CO<sub>2</sub>e per capita)

Without LULUCF (but including net deforestation per BC practice): 17.7 (1990); 13.9 (2014)

With LULUCF: NA (1990); 27.3 (2014)

Change: +10.7% from 1990 levels (without LULUCF); +15303.7% from 1990 levels (with LULUCF)

(BCStats 2016; British Columbia 2016)

**ENERGY CONSUMPTION BY SOURCE (2014) – Canada**

Oil (40%); Gas (32%); Hydroelectricity (11%); Nuclear (9%)

(The Shift Project Data Portal 2016)

**TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007) – Canada**

Primary energy consumption (2007) – Canada: 13.753 Quadrillion BTUs

Primary energy production (2007) – Canada: 19.537 Quadrillion BTUs

Surplus: 5.784 Quadrillion BTUs

(U.S. EIA 2016a; U.S. EIA 2016b)

**HUMAN DEVELOPMENT INDEX**

(United Nations Development Program 2014 – Score/1.00, Rank/188) – Canada

Score (Canada): 0.913/1.00

Rank (Canada): 9/188

(United Nations Development Programme 2015)

**LEVEL OF PERCEIVED CORRUPTION**

(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167) – Canada

Score (Canada): 83/100

Rank (Canada): 9/167

(Transparency International, 2015)

**GOVERNMENT CAPACITY**

(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100) – Canada

Voice & Accountability (Canada): 95.6

Political Stability and Absence of Violence/Terrorism (Canada): 91.3

Government Effectiveness (Canada): 95.2

Regulatory Quality (Canada): 97.6

Rule of Law (Canada): 94.7

Control of Corruption (Canada): 93.8

(World Bank, 2015c)

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The stated goals of the carbon tax were to:

- Encourage individuals and businesses to use less fuel and reduce their GHG emissions
- Send a consistent price signal
- Ensure those who produce emissions also pay for them (polluter pays principle)
- Make clean energy alternatives more economically attractive (British Columbia Ministry of Finance, 2016c)

The legislated emission reduction targets in the **Greenhouse Gas Reduction Targets Act, 2007** are:

- At least 33% below 2007 levels by 2020
- At least 80% below 2007 levels by 2050

The carbon tax is only one of many measures the province has implemented to achieve its emission targets.

## DESIGN

### COVERED SOURCES AND SECTORS

The tax base includes 23 fuels (e.g., coal, oil, and natural gas) used by individuals and businesses (representing approximately 70% of the province's GHG emissions) (Murray and Rivers 2015, 4).

The BC tax is a broad tax, covering most economic sectors, with only a few exceptions.

**Uncovered sectors and exemptions are the following:**

- Wood /biomass
- Biomethane (subject to blends rule)
- Fuel for interjurisdictional commercial marine and aviation purposes
- Fuel to be exported
- Methane emissions from natural gas extraction (unrelated to fuel use)
- Emissions resulting from industrial processes (unrelated to fuel use)
- Methane and nitrous oxide emissions from agriculture (unrelated to fuel use)
- Emissions from forestry (unrelated to fuel use)
- Commercial greenhouse operations eligible for partial grants (beginning in 2012)
- Colored gasoline and colored diesel used by farmers for listed farm purposes (beginning January 1, 2014) (Borden, Ladner, Gervais, LLP 2008; Murray and Rivers 2015, 4; Duff 2008, 94–95).

### POINT OF REGULATION

**Downstream.** The tax is payable by end purchasers and end users

### TAX RATE (in CAD and USD per tCO<sub>2</sub>e)

The carbon tax was implemented in 2008, with tax rates for each fuel equal to C\$10/tCO<sub>2</sub>e (US\$10.19/tCO<sub>2</sub>e) of emissions. The rates were increased by C\$5 per metric ton annually, until reaching C\$30/tCO<sub>2</sub>e (US\$29.35/tCO<sub>2</sub>e) in 2012. In 2013 the tax rates were frozen until 2018 (Bailey 2013). The value of C\$30 had declined to US\$21.61 (as of January 1, 2016). The current tax rate is one of the highest carbon taxes in practice and is in line with estimates of the “social cost of carbon” (Murray and Rivers 2015).

### METHODOLOGY USED TO ESTABLISH TAX RATE

Although the methodology to establish the initial tax rate has not been made explicit by the BC government, the 2008 budget explains that future changes in tax rates will depend on the level of emission reductions achieved, the impact of other BC policies, actions taken by other Canadian governments to reduce GHG emissions, and the advice of the Climate Action Team (Duff 2008, 97).

### MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

A revenue-neutral carbon tax design with broad-based tax reductions for businesses helps address carbon leakage and promote cost containment.

The phased approach to the carbon tax (2008–12) followed by the tax freeze (2013–18) gave businesses and individuals time to adjust to the tax (Duff 2008, 98). The fact that some emissions are not covered by the tax and the exemptions described above give tax relief to vulnerable industries (Duff 2008, 94–95).

## IMPLEMENTING AGENCIES AND APPROACHES

The BC carbon tax is administered by the Ministry of Finance (British Columbia Ministry of Finance 2016a).

## MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

Wholesalers that sell domestically produced or imported fuel must register with the Ministry of Finance as collectors. As of 2014, carbon taxes can be paid online using the province's eTaxBC system (British Columbia Ministry of Finance 2016a).

The Ministry of Finance has been given significant inspection and audit powers, with the ability to assess interest and penalties (ranging from 10–100% of the tax amount owed). Board members of corporations may also be held jointly and severally liable for unpaid taxes, penalties, and interest (Carbon Tax Act 2008).

## USE OF TAX REVENUES

Each year, the Ministry of Finance is required to submit a 3-year plan for recycling revenue from the carbon tax to households and businesses, to ensure the carbon tax is revenue-neutral. If the Minister fails to fully recycle the revenue, he/she may be assessed a personal penalty, in the form of a 15% ministerial salary reduction (Duff 2008, 99).

Current personal tax reductions include the Low Income Climate Action Tax Credit, a 5% reduction in the first two personal income tax rates.

Northern and rural homeowners, seniors undergoing home renovation projects, children's fitness and art programs, small business venture capital programs, and training programs for individuals have also benefited from personal tax reductions.

Business tax reductions have included general corporate income tax rate reductions, an increase in the corporate income tax small business threshold, and industrial property tax credits for school property taxes payable by major industries (British Columbia Ministry of Finance 2013).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

In 2010, carbon tax rates for gasoline and diesel were adjusted to integrate the tax with the Renewable and Low Carbon Fuel Requirement Regulation.

## EVALUATION

### OUTCOMES

Murray and Rivers (2015) conclude that studies show the tax will reduce GHG emissions by between 5 and 15 percent by the year 2020 compared to the business as usual (BAU) scenario (Murray and Rivers 2015, 1). However, emissions have started to increase over the last few years, as the carbon tax rate was frozen in 2013 (and has effectively declined since then, when taking into account inflation) and the application of the tax was narrowed because of the grants and exemptions provided in 2012 and 2014.

While there was widespread public concern about the impacts of the carbon tax on international competitiveness, only a small percentage of industries were found to be vulnerable to this potential issue (Sustainable Prosperity 2012, 5). The carbon tax has had insignificant impacts on the economy. While the impact on labor markets in emission-intensive and trade-exposed (EITE) sectors has been slightly negative, the impact on non-EITE sectors has been positive (Murray and Rivers 2015, 11).

### CHALLENGES

To increase the public acceptability of the carbon tax, the tax was designed to be revenue-neutral and the Ministry of Finance was required to submit a 3-year plan each year to communicate to the legislature how the revenues would be used (Sustainable Prosperity 2012, 5; British Columbia Ministry of Finance 2016b). Representatives from emissions-intensive industries and farmers have continued to oppose the tax (P.F. 2014). Partial grants for commercial greenhouse growers were provided in 2012 and exemptions for colored gasoline and diesel used by farmers for listed farm purposes were added, effective January 2014 (Murray and Rivers 2015, 5).

Initially, citizens in the northern and rural areas of the province objected to the carbon tax, arguing that they bore a disproportionate burden of the carbon tax because of the higher transportation and heating costs they faced. The government responded to these objections by introducing a Northern and Rural Homeowner benefit of up to US\$200s beginning in 2011 (*Sustainable Prosperity 2012, 5; British Columbia Ministry of Finance 2016b*).

There were also concerns the carbon tax could prove to be regressive. To address this concern, the tax incorporated a Low Income Climate Action Tax Credit. When the Low Income Climate Action Tax Credit was first introduced, the credit was designed to more than offset the carbon tax for lower-income households (*Sustainable Prosperity 2012, 5*). The tax credit was raised in 2011. Although the amount of the tax credit has increased by a smaller percentage than the carbon tax, the tax credit still fully offsets the estimated cost of the carbon tax for lower-income households.

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# CHILE

## CARBON TAX – LAW NO. 20780 (2014)

### OVERVIEW

LEVEL OF TAX: National | YEAR OF ADOPTION: 2014

#### BRIEF DESCRIPTION OF TAX:

In 2014, Chile adopted a carbon tax as part of a larger tax reform, which included changes to other taxes. The carbon tax targets plants with boilers and turbines whose emission sources sum 50MW or more of nominal thermal power generation (emissions from biomass are exempt). The tax rate is set at US\$5/tCO<sub>2</sub>e in 2017. In addition, Chile will impose a tax on SO<sub>2</sub>, NO<sub>x</sub>, and PM for the same sources. Although no concrete plans have been developed yet, Chile is considering the introduction of an ETS in the future, and therefore the implementation of the tax and the Monitoring, Reporting and Verification (MRV) system will be ETS compatible (Kosoy et al. 2015; Pinto 2015).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**17,762,647 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$9,853.50 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**1.9% (2014)**

(World Bank, 2015b)

##### MAJOR SOURCES OF GHGs (2010) Without changes for Land Use, Land-Use Change and Forestry (LULUCF) Energy (74.7%); Waste (3.9%); Industrial Processes (6%); Agriculture (15%)

(Ministry of the Environment of Chile 2014, 18)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 49,896,600 (1990); 91,575,900 (2010)**

**With LULUCF: -925,000 (1990); 41,698,500 (2010)**

**Change: +83.5% from 1990 levels (without LULUCF); Not available (with LULUCF)**

((Ministry of the Environment of Chile 2015, 18)

##### TOTAL GHG EMISSIONS (metric tons of CO<sub>2</sub>e per capita)

**Without LULUCF: 3.8 (1990); 5.4 (2010)**

**With LULUCF: Not available (1990); 2.5 (2010)**

(World Bank 2015c; Climate Change Office, Ministry of the Environment of Chile 2015)

##### ENERGY CONSUMPTION BY SOURCE (2014)

**Oil (54%); Coal (24%); Gas (14%); Hydroelectricity (6%); Biomass (2%)**

(The Shift Project Data Portal 2016)



**TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy consumption (2007): 0.337 Quadrillion BTUs****Primary energy production (2007): 1.302 Quadrillion BTUs****Deficit: -0.965 Quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.832/1.00****Rank: 42/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 70/100****Rank: 23/167***(Transparency International, 2015)***GOVERNMENT CAPACITY***(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 80.3****Political Stability and Absence of Violence/Terrorism: 63.1****Government Effectiveness: 84.1****Regulatory Quality: 91.8****Rule of Law: 88.0****Control of Corruption: 90.9***(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

Since the Chilean carbon tax was part of a tax law, it is necessary to look beyond the enacting legislation to assess the policy's goals and objectives.

A presentation by the Chile Ministry of the Environment on the carbon tax indicated specific goals of the legislation:

- To recognize the social cost of environmental damage caused by climate change
- To correct perverse incentives to pollute
- To apply principles of environmental policy (e.g., polluter pays principle, efficiency, and responsibility)
- To recognize the health impacts of climate change
- To reduce GHG emissions (Rojas 2015)

## DESIGN

### COVERED SOURCES AND SECTORS

The carbon tax applies to boilers and turbines with the summation of sources to have a thermal plant capacity equal to or greater than 50 MW. This includes oil, natural gas, and coal (approximately 55% of the country's total carbon emissions). Biomass is excluded (Badenier 2014). A major share of the tax will be paid for by the electricity sector. However, facilities from other industries will also pay the tax.

### POINT OF REGULATION

**Midstream.** The point of regulation is the power producers (Kossoy et al. 2015, 42).



## TAX RATE (in USD per tCO<sub>2</sub>e)

The tax rate is set at US\$5/tCO<sub>2</sub>e. Although no concrete plans exist to date, by upgrading Chile's reporting capacity, in the future it will be possible to develop more sophisticated policy instruments either by scaling up the taxes or developing an Emissions Trading Scheme (ETS) (Pinto 2015).

## METHODOLOGY USED TO ESTABLISH TAX RATE

The carbon tax rate was in principle supposed to be estimated based on the "social price of carbon," published by the Ministry of Social Development (Rojas 2015). However, the Ministry felt that there was no consensus on the social price of carbon, and thus determined to use the international market price of one tCO<sub>2</sub>e as a proxy for the social price of carbon. The government has stated that the relevant price in this case is the price of certified emission reductions (CERs), though in reality the price is more closely tied to the price of EU emission allowances (Ministry of Social Development 2015).

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

Since Chile's carbon tax is relatively limited and focused primarily on the power sector, and since there is no electrical interconnection between Chile and other countries, no significant direct risk of carbon leakage actually exists. Because the regulatory system has created a relatively slow price pass-through process from the electricity generators to the end users, concerns about carbon leakage and competitiveness effects have been limited (Partnership for Market Readiness 2015, 73).

## IMPLEMENTING AGENCIES AND APPROACHES

The Ministry of Environment will each year publish a list of facilities subject to the tax. It will also establish the administrative procedures for the implementation of the tax (Law No. 20.780, Article 8).

The Superintendence of the Environment is responsible for establishing MRV procedures, consolidating emissions reports, and ensuring compliance with requirements for monitoring and reporting (Law No. 20.780, Article 8).

Tax payments are made to the Ministry of Finance's General Treasury of the Republic (Law No. 20780, Article 8).

The Ministry of Social Development is responsible for determining the social price of carbon (which has been determined by proxy, see above), which is used as a reference for setting the tax rate (Pizarro 2016).

## MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

Facilities are responsible for annually submitting their emissions monitoring report, in the year following the actual emissions (beginning in 2018). The Superintendence of the Environment certifies and consolidates the emissions, and the taxes are to be paid to the Ministry of Finance's General Treasury of the Republic (Pizarro 2016). Since the tax is expressed in U.S. dollars, the tax liabilities in the local currency will depend on the exchange rate on the day of payment (Kossoy et al. 2015, 42).

The Internal Tax Revenue Service can order audits of taxpayers suspected of evasion (Law No. 20.780, Article 59). The Tax Court and Customs can assess penalties and interest on companies that try to evade the carbon tax (Law No. 20.780).

## USE OF TAX REVENUES

The government expects to collect roughly US\$160 million from the carbon tax and roughly US\$8.3 billion in revenue from the broader tax reform. Taxes are paid to the General Treasury and it has been proposed that the largest share of the revenues be spent on improvements to the education systems (Pinto 2015).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The Chilean CO<sub>2</sub> tax is part of a broader tax reform adopted in 2014. The tax reform includes substantial modifications, including limits on goodwill amortization, additional corporate taxes, amendments to the thin capitalization rules, broad anti-avoidance rules, and several other provisions (International Tax Services 2014). The green taxes that have been introduced include taxes on CO<sub>2</sub> and taxes on both diesel and non-diesel powered vehicles based on their SO<sub>2</sub>, NO<sub>x</sub>, and PM content (Pizarro 2016; Rojas 2015). A recent study analyzed links to a range of environmental regulatory instruments and complementary energy policies (World Bank, Ministry of Energy Chile 2016b).

## EVALUATION

### OUTCOMES

Initial studies have been conducted to assess the potential impacts of the carbon tax, specifically on the electricity sector (World Bank, Ministry of Energy Chile 2016a). However, there is insufficient evidence to predict in a more definitive way the impacts of these green taxes on different variables such as GHG reductions and GDP.

### CHALLENGES

The main challenges at this stage are the design and implementation of a robust MRV system and the institutional arrangements to support the implementation of these new taxes.

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# DENMARK

## CARBON TAX (1992) & GREEN ENERGY PACKAGE (1996)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 1992

#### BRIEF DESCRIPTION OF TAX:

In 1990, Denmark adopted its “Energy 2000” plan, which called for a 20% reduction in CO<sub>2</sub> emissions, relative to 1988 levels, by 2005. To meet its goal, the Danish government introduced a carbon tax of Dkr 100/tCO<sub>2</sub>e (US\$16.91/tCO<sub>2</sub>e) on fossil fuels used for heat production in 1992. While the CO<sub>2</sub> tax was levied on all energy consumers, businesses generally paid a lower rate and could establish energy efficiency agreements with the Danish Energy Agency to limit their tax liability.

Soon after the introduction of this carbon tax, the government realized it needed to take more aggressive action to achieve its environmental objectives. A more comprehensive Green Energy Package—including an extra CO<sub>2</sub> tax for businesses, in addition to a new SO<sub>2</sub> tax and energy taxes on space heating—was introduced in 1996. The CO<sub>2</sub> tax was accompanied by reductions in the energy tax and labor/employment taxes. Energy-intensive companies that participated in the Danish Energy Agency’s Long Term Energy Efficiency Agreements voluntary program could receive a partial refund on their CO<sub>2</sub> tax payments (Ericsson 2006, 7–8).

The initial carbon tax has gone through several adjustments over the years, including reductions to take into account increases in the energy tax, increases to align with expected prices in the EU ETS, and increases to reflect the inflation rate (Institute for European Environmental Policy 2013, 25).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**5,639,565 (2014)**  
(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$47,534 (2014)**  
(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**1.1% (2014)**  
(World Bank, 2015b)

**MAJOR SOURCES OF GHGs (2014)** Without changes for Land Use, Land-Use Change and Forestry (LULUCF) Energy Industries (31%); Transport (24%); Agriculture (21%); Nonindustrial Combustion (9%); Manufacturing, Industries, and Construction (8%); Industrial Processes and Product Use (4%); Waste (2%); Fugitive Emissions from Fuels (1%)

(Danish Centre for Environment and Energy 2016, 17)

**TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS** (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 70,623,000 (1990); 56,392,830 (2013)**

**With LULUCF: 77,395,180 (1990); 58,392,830 (2013)**

**Change: -20.7% from 1990 levels (without LULUCF); -24.6% from 1990 levels (With LULUCF)**

(World Bank 2015c; Danish Ministry of Energy, Utilities, and Climate 2016, 50)

**TOTAL GHG EMISSIONS** (metric tons of CO<sub>2</sub>e per capita)**Without LULUCF: 13.7 (1990); 10.0 (2013)****With LULUCF: 15.1 (1990); 10.4 (2013)***(World Bank 2015c; Danish Ministry of Energy, Utilities, and Climate 2016, 50)***ENERGY CONSUMPTION BY SOURCE (2014)****Oil (53%); Gas (21%); Coal (14%); Wind (8%)***(The Shift Project Data Portal 2016)***TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy production: 1.12 Quadrillion BTUs****Primary energy consumption: 0.875 Quadrillion BTUs****Surplus: 0.245 Quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.923/1.00****Rank: 4/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 91/100****Rank: 1/167***(Transparency International, 2015)***GOVERNMENT CAPACITY***(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 97.0****Political Stability and Absence of Violence/Terrorism: 79.6****Government Effectiveness: 96.2****Regulatory Quality: 94.7****Rule of Law: 99.5****Control of Corruption: 99.5***(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The stated goals of the Denmark Green Energy Package were:

- To reduce CO<sub>2</sub> emissions by 20% (from 1988 levels of 61.1 million tons to 48.9 million tons) by 2005
- To fulfill its Kyoto obligation to reduce GHG emissions to a level 21% lower than the 1990 levels by 2012
- To provide industry with subsidies for energy efficiency improvements through revenues from carbon taxes
- To limit the effects on industry competitiveness
- To encourage individual citizens to reduce their energy usage
- To replace taxes on labor and income
- To raise revenue to cover budget deficits (Danish Energy Agency 2000b)

## DESIGN

### COVERED SOURCES AND SECTORS

The carbon tax applies to oil, gas, coal, and electricity use (approximately 45% of the country's total GHG emissions) (World Bank 2014, 79).

ETS industries are generally exempt from the C<sub>2</sub> tax on fuel use for industrial processes and electricity production. Energy-intensive companies not covered by the EU ETS receive carbon tax exemptions. District heating plants, which are covered by the EU ETS, are also required to pay the carbon tax. Since 2013, waste incineration plants have likewise been regulated by the Denmark carbon tax and the EU ETS (World Bank 2014, 79).

## POINT OF REGULATION

**Midstream.** While the carbon tax is ultimately paid by downstream users, it is collected by distributors.

## TAX RATE (in DKK and USD per tCO<sub>2</sub>e)

The initial tax rate in 1992 was DKK 100/tCO<sub>2</sub>e (approximately US\$16.91/tCO<sub>2</sub>e), although businesses generally received a 50% refund on the tax (Sumner, Bird, and Smith 2009, 12).

The CO<sub>2</sub> tax rate adopted in 1996 as part of the Green Energy Package was phased in over time and reduced rates were given to energy-intensive businesses.

The table below shows the tax rates given to different business sectors, based on their participation in voluntary energy efficiency agreements with the Danish Energy Agency, through which participating companies implement an energy management system and profitable energy efficiency projects. While the full rate was charged for household energy use and business space heating, business processes enjoyed the reduced rates listed below from 1996 to 2005 (Danish Energy Agency 2000b, 4; Jamet 2012, 11).

Type of energy use	Year/tax rate in DKK/tCO <sub>2</sub>							
	1996	1997	1998	1999	2000	2005	2008	2015
Household	100	100	100	100	100	90	150	170
Space Heating	100	100	100	100	100	90	150	170
Light Process (No Agreement)	50	60	70	80	90	90	150	170
Light Process (With Agreement)*	50	50	50	58	68	68	150	170
Heavy Process (No Agreement)	5	10	15	20	25	25	150	170
Heavy Process (With Agreement)*	3	3	3	3	3	3	150	170

The tax rate was decreased to DKK 90/tCO<sub>2</sub>e (US\$16.48/tCO<sub>2</sub>e) in 2005, when the energy tax was increased. The tax rate was again increased in 2008, to DKK 150/tCO<sub>2</sub>e, in anticipation of an EU ETS carbon price of €20, and the reduced rates for emissions from business processes were eliminated. The tax rate increased by 1.8% between 2008 and 2015, reaching its current level of approximately DKK 170/tCO<sub>2</sub>e (US\$27.72/tCO<sub>2</sub>e) (Institute for European Environmental Policy 2013, 25).

Note: Denmark's CO<sub>2</sub> tax rate is expressed in DKK/tCO<sub>2</sub>, by voluntary agreement participation.

\*Rate includes subsidies provided from participation in a voluntary agreement.

**Heavy processes** include energy-intensive industries, such as food products, sugar, paper, cement, glass, and the heating of greenhouses (Ericsson 2006, 6).

**Space heating** involves electricity used for heating office space and for heating water used for handwashing, cleaning, dishwashing, and bathing (Danish Energy Agency 2000b 14).

**Light processes** are generally those process activities that do not involve space heating or heavy processes, as described above (Danish Energy Agency 2000b, 15).

## METHODOLOGY USED TO ESTABLISH TAX RATE

While various modeling exercises were done in the years preceding the passage of the Green Energy Package, the Danish tax rates were established through political negotiations within a cross-ministerial committee involving the Ministry of Finance, the Tax Ministry, and the Ministry of the Environment. The Danish government also paid close attention to German tax rates in establishing its tax practices, as it recognized citizens could choose to avoid Danish taxes by moving their businesses or buying products south of their border (Andersen 1994, 47–50).



## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

Efforts to address carbon leakage included:

- Phased increases to tax rates
- Recycling of revenues back to industry through reductions in contributions to social insurance and pensions
- Compensation for small businesses to cover the associated administrative expenses, in light of relatively low wage costs
- Lower tax rates for industries subject to international competition
- Tax rebates for companies that participate in the voluntary industrial energy efficiency agreements (Krarup and Millock 2007, 86–104; Danish Energy Agency 2000b)

## IMPLEMENTING AGENCIES AND APPROACHES

The Central Customs and Tax Administration (CCTA) collects taxes and issues refunds associated with voluntary agreements. When the Danish Energy Agency notifies CCTA that a voluntary agreement has been signed, the CCTA works with the participating business to issue the rebate (Ericsson 2006, 9).

The Danish Energy Agency was initially responsible for working with companies and sectors to increase awareness of the voluntary agreements program, develop energy efficiency agreements, and monitor business participation in the agreements. When the process for voluntary agreements was simplified in 2000 (to lower its administrative costs), some of the monitoring responsibilities for the voluntary program were transferred from the Danish Energy Agency to the organizations that were accrediting the participating companies' energy management systems (Danish Energy Agency 2000b, 11; Ericsson 2006, 9).

## MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

Businesses are responsible for installing, maintaining, and ensuring the accuracy of meters that differentiate between fuel used for production processes and for space heating. Standards for electricity meters are regulated by the Danish Energy Regulatory Authority, while standards for gas and oil meters are regulated by the Ministry of Trade and Industry.

Companies that have entered into energy efficiency agreements with the Danish Energy Agency must report annually on projects, and the Agency has the authority to cancel the agreement if reports are not submitted and/or results are not achieved. Furthermore, it can require subsidies be returned to the Central Customs and Tax Administration (Danish Energy Agency 2000b).

To receive subsidies offered under the Danish Industrial Energy Efficiency Agreement, companies must complete paperwork. Any subsidy requests for amounts exceeding Dkr 100,000 must be certified by an accountant. Requests for subsidies exceeding Dkr 500,000 must be audited according to standards established by the Danish Energy Agency (Danish Energy Agency 2000a, 41).

## USE OF TAX REVENUES

Revenue from the carbon tax has been used to reduce taxes on labor, subsidize energy efficiency investments, and subsidize the associated administrative costs of small companies. Approximately 40% of the tax revenue is used for environmental incentives, while the remaining 60% is returned to industry through reduced social insurance, reduced pension contributions, and compensation of administrative expenses for small businesses with limited payrolls (Sumner, Bird, and Smith 2009, 13).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The Denmark CO<sub>2</sub> tax was part of a broader Ecological Tax Reform that was implemented in Denmark during the 1990s, which sought to lower employment taxes and capital gains taxes and raise green taxes.

The Green Tax Package that took effect in 1994 included:

- A tax increase on gasoline
- A tax increase on coal and electricity use
- A tax increase on household water use
- An increase in the national waste tax
- A tax on the use of plastic bags
- An increase in vehicle registration taxes (Andersen 1994, 48)

Furthermore, the Danish CO<sub>2</sub> tax introduced in 1996 was part of the nation’s Green Energy Package and included:

- A CO<sub>2</sub> tax
- A sulfur dioxide tax
- An energy tax on space heating
- Reductions in labor taxes and employer contributions to supplementary labor market pensions
- Subsidies for industrial energy efficiency improvements (Danish Energy Agency, 2000b)

## EVALUATION

### OUTCOMES

Early evaluations of the Green Energy Package suggested the policy resulted in a 5% decrease in CO<sub>2</sub> emissions between 1996 and 2005 (Danish Energy Agency 2000a, 26). Furthermore, Denmark’s CO<sub>2</sub> emissions decreased by 14% between 1990 and 2012, and are expected by 2035 to fall to levels 23% below the 1990 levels (International Centre for Creativity 2013). However, data on the specific environmental impacts of the CO<sub>2</sub> tax separate from the impacts of the comprehensive Green Tax Package are unavailable.

A 2000 study suggested impacts on energy costs were offset by reductions in taxes on labor and subsidies for energy efficiency improvements. Impacts on employment, private consumption, and the balance of payments were not found to be significant (Danish Energy Agency 2000b, 10).

### CHALLENGES

Because Denmark is such a small country, there was significant concern about possible loss of competitiveness and employment impacts, so steps were taken to address these concerns.

Businesses were required to develop processes and systems for distinguishing between fuel used for production processes and for space heating. While this process was relatively simple for a majority of businesses (approximately 100,000 companies), it was a more complicated process for about 5,000 companies. About 3,500 companies had to install separate meters to differentiate between space heating and production processes. Approximately 1,500 companies (500 manufacturers and 1,000 greenhouses) had to differentiate between light and heavy production processes, and install separate meters to monitor fuel use (Danish Energy Agency 2000a, 9).

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# FINLAND

## HIILIDIOKSIDIVERO CO<sub>2</sub> TAX (1990)

### OVERVIEW

LEVEL OF TAX: National | YEAR OF ADOPTION: 1990

#### BRIEF DESCRIPTION OF TAX:

In 1990, Finland became the first country to introduce a carbon tax. The tax originally covered fuel oil, natural gas, coal, and peat at a rate of €1.12/tCO<sub>2</sub> (US\$1.34/tCO<sub>2</sub>) and has since undergone several changes—the tax rate has been increased many times, its structure has been changed, and refund systems have been included.

In 2008 a CO<sub>2</sub> component was also added to vehicle taxation through the annual “motor vehicle tax” paid to the Finnish Transport Safety Agency for vehicle usage and a one-time “car tax,” paid to Finnish Customs to register a vehicle (Finlex Data Bank 2007a; Finlex Data Bank 2007b).

Since the 2011 energy tax reform, the taxation of heating and transport fuels has been based primarily on the CO<sub>2</sub> emissions associated with their combustion. The current excise tax on fossil fuels consists of three components: an energy component, a CO<sub>2</sub> component, and a strategic stockpile fee (Tulli 2016).

Several tax refund systems have been incorporated in Finnish energy taxation, and the National budget estimated their total amount in 2016 at approximately €2.1 billion (US\$2.29 billion) (Ministry of Finance 2016b). The tax refund system for energy-intensive industries was introduced in 1998, and in 2012 it was altered in a way that significantly increased the total amount spent on refunds and the number of firms receiving them. The refunds given to approximately 140 energy-intensive companies in 2015 amounted to more than €200 million (US\$242 million) (Ministry of Finance 2016a; Harju et al. 2016, 9). The amount of refunds given in 2016 has been estimated at €221 million (US\$240 million) (Ministry of Finance 2016b). Additional energy tax refunds include a reduced electricity tax rate for energy-intensive industries, a reduced tax rate for diesel, and a reduced tax rate for fuel peat (Ministry of Finance 2016b). All these refund systems could be reducing the effectiveness of CO<sub>2</sub> taxation.

In 2016, the tax rate for heating fuels was raised from €44/tCO<sub>2</sub> (US\$48/tCO<sub>2</sub>) to €54/tCO<sub>2</sub> (US\$59/tCO<sub>2</sub>), and will be raised again in 2017, to €58/tCO<sub>2</sub> (US\$61/tCO<sub>2</sub>) (Finlex Data Bank, 2015; Finlex Data Bank, 2016). The tax for transport fuels will be raised in 2017 to €62/tCO<sub>2</sub> (US\$65/tCO<sub>2</sub>) (Finlex Data Bank 2016).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**5,463,596 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$38,802.70 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**-0.4% (2014)**

(World Bank, 2015b)

##### MAJOR SOURCES OF GHGs (2010) With Changes for Land Use, Land-Use Change and Forestry (LULUCF)

**Energy industries (33%); Manufacturing industries and construction (14%); Transport (19%); Heating of buildings, other fuel use in agriculture, forestry and fisheries (7%); Fugitive emissions from fuels (0.2%); Other fuel uses (2%); Agriculture (11%); Industrial processes and product use (10%); Waste management (4%); Indirect CO<sub>2</sub> emissions (0.1%); LULUCF (-35%)**

(Statistics Finland 2016, 9–10)

**TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS** (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

Without LULUCF: 71,300,000 (1990); 59,100,000 (2014)

With LULUCF: 55,300,000 (1990); 38,300,000 (2014)

Change: -17.1% from 1990 levels (without LULUCF); -30.7% from 1990 levels (with LULUCF)

(Statistics Finland 2016, 9)

**TOTAL GHG EMISSIONS** (metric tons of CO<sub>2</sub>e per capita)

Without LULUCF: 14.2 (1990); 10.8 (2014)

With LULUCF: 11.1 (1990); 7.0 (2014)

(Statistics Finland 2016, 9; World Bank 2015c)

**ENERGY CONSUMPTION BY SOURCE (2014)**

Oil (42%); Nuclear (25%); Gas (12%); Coal (11%); Hydroelectricity (5%)

(The Shift Project Data Portal 2016)

**TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)**

Primary energy production: 0.47 Quadrillion BTUs

Primary energy consumption: 1.336 Quadrillion BTUs

Deficit: -0.866 Quadrillion BTUs

(U.S. EIA 2016a; U.S. EIA 2016b)

**HUMAN DEVELOPMENT INDEX**

(United Nations Development Program 2014 – Score/1.00, Rank/188)

Score: 0.883/1.00

Rank: 24/188

(UNDP 2015)

**LEVEL OF PERCEIVED CORRUPTION**

(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)

Score: 90/100

Rank: 2/167

(Transparency International, 2015)

**GOVERNMENT CAPACITY**

(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)

Voice & Accountability: 98.0

Political Stability and Absence of Violence/Terrorism: 95.6

Government Effectiveness: 99.0

Regulatory Quality: 98.6

Rule of Law: 100

Control of Corruption: 98.1

(World Bank, 2015d)

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The stated goals of the carbon tax have been:

- To improve environmental conditions
- To prepare for an impending EU energy tax (which was never implemented) (IEEP 2013, 39)
- To at least partially offset tax reductions elsewhere, such as cuts in income tax
- To achieve commitments in the reduction of GHG emissions
- To achieve the EU energy and climate objectives by 2030
- To lead Finland toward a coal-free, clean, and renewable energy-based society by 2050, which is the main goal of the new National Energy and Climate Strategy (Prime Minister's Office 2016; Ministry of Economic Affairs and Employment 2016)

## DESIGN

### COVERED SOURCES AND SECTORS

The CO<sub>2</sub> tax covers fossil fuels with some exemptions or refund systems. Since 2008, a CO<sub>2</sub> tax has also been applied to automobile registration (Finlex Data Bank 2007a; Finlex Data Bank 2007b; Finlex Data Bank 2010; Finlex Data Bank 2015; Finlex Data Bank 2016).

The carbon tax covers a portion of business and household use of fossil fuels (responsible for approximately 15% of the country's total GHG emissions), as fuel used for electricity production, commercial aviation, and commercial yachting are not covered by the tax (World Bank 2014, 79). In addition, reduced carbon tax rates are offered for combined heat and power production (CHP) plants and biofuels that meet certain sustainability criteria (IEEP 2013, 40–41).

### POINT OF REGULATION

**Downstream.** The tax is administered as an excise tax.

### TAX RATE (in EUR and USD per tCO<sub>2</sub>e)

The initial rate in 1990 was €1.12/tCO<sub>2</sub> (US\$1.34/tCO<sub>2</sub>) and it has since been gradually increased. In 2013, the tax for heating fuels reached €35/tCO<sub>2</sub> (US\$48/tCO<sub>2</sub>) and the rate for liquid traffic fuels reached €60/tCO<sub>2</sub> (US\$83/tCO<sub>2</sub>) (World Bank 2014, 79).

### METHODOLOGY USED TO ESTABLISH TAX RATE

Information not available.

### MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

The tax includes the following measures to address carbon leakage and cost containment:

- Several tax refund systems have been incorporated in Finnish energy taxation, and the total amount refunded in 2016 is estimated at €2.1 billion (US\$2.29 billion) (Ministry of Finance, 2016b)
- Since 1997 the fuels used for electricity production have been exempted from taxation because electricity has since been levied as an end product (Finlex Data Bank, 1996)
- Tax refunds for certain energy-intensive companies: The tax refund system for energy-intensive industries was introduced in 1998, and in 2012 it was altered in a way that significantly increased the total amount of refunds and the number of firms receiving them. The refunds in 2015 amounted to more than €200 million (US\$242 million) and 2016 refunds have been estimated at €221 million (US\$240 million) (Ministry of Finance 2016a; Harju et al. 2016, 9)
- Reduced tax rates for electricity apply to industry, professional greenhouse cultivation, and machine rooms; and will also apply to the mining industry beginning in 2017 (Finlex Data Bank 1996; Finlex Data Bank 2013; Finlex Data Bank, 2015)
- Reduced tax rates for fuel peat (Finlex Data Bank 1996; Finlex Data Bank 2015)
- Reduced tax rates for biofuels that meet sustainability criteria (IEEP 2013, 41)
- Reduced tax rates for CHP plants (IEEP 2013, 41)

### IMPLEMENTING AGENCIES AND APPROACHES

The energy taxes are collected by Finnish customs on behalf of the Ministry of Finance. The collection duty will be transferred from Finnish customs to the tax administration in 2017.

## MONITORING AND ENFORCEMENT &amp; EFFORTS TO PREVENT FRAUD AND CORRUPTION

Information not available.

## USE OF TAX REVENUES

As a matter of principle, all energy tax revenues are collected into the general state budget. However, there has been a general commitment by the government to shift taxation from labor taxes to other taxes, and partly to environmental taxation. According to Government Bills, this shift in taxation from labor taxes to energy taxes has been an explicit goal of the 1997 and 2011 energy tax reforms (Finlex Data Bank 1995; Finlex Data Bank 2010).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The Finnish CO<sub>2</sub> tax has been closely tied to other energy taxes. The current fuel duty consists of three different tax levies: a carbon tax, an energy content tax, and a strategic stockpile fee. While the carbon tax does not cover electricity use, there is also an electricity tax based on output (IEEP 2013, 40–41).

## EVALUATION

## OUTCOMES

Since the Finnish CO<sub>2</sub> tax is difficult to measure, as it is combined with energy taxation, it is difficult to say whether the emission reductions achieved have derived from the CO<sub>2</sub> tax or other factors (such as energy taxation) (Ludovino Lopes Advogados et al. 2014, 59). An early study estimated that between 1990 and 1998, carbon and energy taxes reduced CO<sub>2</sub> emissions by approximately 7% and fuel use by 4.8% (IEEP 2013, 44). Furthermore, Finland's GHG emissions decreased by 13.3% between 1990 and 2012 (UNFCCC 2016).

## CHALLENGES

The Finnish CO<sub>2</sub> tax has been adjusted on an “ad hoc” basis, in response to political and economic concerns (Ludovino Lopes Advogados et al. 2014, 60). The energy tax system has also been criticized for its distributional impacts, particularly its burden on individuals of low income and limited mobility, and on those living in rural areas (IEEP 2013, 44).

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# FRANCE

## CARBON TAX – DOMESTIC CONSUMPTION TAX ON ENERGY PRODUCTS (2013) AND LAW ON THE ENERGY TRANSITION TO GREEN GROWTH (2015)

### OVERVIEW

LEVEL OF TAX: National | YEAR OF ADOPTION: 2013

#### BRIEF DESCRIPTION OF TAX:

In 2012, a Committee for Environment Tax, led by economist Christian de Perthuis, was formed to assess the “green” taxation system and it recommended that a carbon component be incorporated into the Domestic Consumption Taxes (Government of France 2016). In the Finance Bill for 2014 (December 2013), the French government adopted a carbon tax of €7/tCO<sub>2</sub>e (US\$9.70/tCO<sub>2</sub>e) in 2014; €14.5/tCO<sub>2</sub>e (US\$17.60/tCO<sub>2</sub>e) in 2015; and €22/tCO<sub>2</sub>e (US\$24.00/tCO<sub>2</sub>e) in 2016 for the use of fossil fuels not covered by the EU ETS. In August of 2015, France enacted its Law on the Energy Transition to Green Growth, which called for a 40% reduction in GHG emissions relative to 1990 levels by 2030. The Law on Energy Transition to Green Growth set a trajectory for the tax rate to gradually increase until 2030, up to €100/tCO<sub>2</sub>e (Kosoy et al. 2015, 45; Szabo 2015).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**66,495,940 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$35,660.90 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**0.2% (2014)**

(World Bank, 2015b)

##### MAJOR SOURCES OF GHGs (2014) Without changes for Land Use, Land-Use Change and Forestry (LULUCF)

Transport (29%; Residential, Commercial, Agriculture (19%); Industry, Manufacturing, and Construction (13%); Energy Combustion (9%); Direct Emissions from Agricultural Soil Management (7.6%); Enteric Fermentation (7.4%); Use of Halocarbons (4.2%); Non-Hazardous Waste Combustion (3.1%); Industrial Processes (2.4%); Agricultural Management of Animal Waste (1.8%); Other Sources (4.8%) (Ministry of Environment, Energy, and the Seas; Caisse des Dépôts; and CITEPA 2016, 90)

(Ministry of Environment, Energy, and the Seas; Caisse des Dépôts; and CITEPA 2016, 90)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 548,000,000 (1990); 459,000,000 (2014)**

**With LULUCF: 517,000,000 (1990); 408,000,000 (2014)**

**Change: -16.3% from 1990 levels (without LULUCF); -21.1% from 1990 levels (with LULUCF)**

(Ministry of Environment, Energy, and the Seas; Caisse des Dépôts; and CITEPA 2016, 27)



### TOTAL GHG EMISSIONS (metric tons of CO<sub>2</sub>e per capita)

Without LULUCF: 9.6 (1990); 6.9 (2014)

With LULUCF: 8.8 (1990); 6.1 (2014)

(World Bank 2015c; Ministry of Environment, Energy, and the Seas; Caisse des Dépôts; and CITEPA 2016, 27)

### ENERGY CONSUMPTION BY SOURCE (2014)

Nuclear (43%); Oil (35%); Gas (14%)

(The Shift Project Data Portal 2016)

### TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)

Primary energy production: 5.094 Quadrillion BTUs

Primary energy consumption: 11.221 Quadrillion BTUs

Deficit: -6.127 Quadrillion BTUs

(U.S. EIA 2016a; U.S. EIA 2016b)

### HUMAN DEVELOPMENT INDEX

(United Nations Development Program 2014 – Score/1.00, Rank/188)

Score: 0.888/1.00

Rank: 22/188

(UNDP 2015)

### LEVEL OF PERCEIVED CORRUPTION

(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)

Score: 70/100

Rank: 23/167

(Transparency International, 2015)

### GOVERNMENT CAPACITY

(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)

Voice & Accountability: 89.2

Political Stability and Absence of Violence/Terrorism: 59.2

Government Effectiveness: 88.9

Regulatory Quality: 82.2

Rule of Law: 88.5

Control of Corruption: 88.0

(World Bank, 2015d)

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The stated goals of the Energy Transition for Green Growth Act, relevant for the carbon tax, are:

- To reduce total GHG emissions by 2030 by 40% relative to 1990 levels
- To reduce fossil fuel consumption by 2030 by 30% relative to 2012 levels
- To reduce final energy consumption by 2050 by 50% relative to 2012 levels (Ministry of Ecology, Sustainable Development and Energy 2015, 7)

## DESIGN

### COVERED SOURCES AND SECTORS

The carbon tax applies to natural gas, heating oil, coal, and transport fuels not covered by the EU ETS. In 2014, the tax only applied to natural gas, heating oil and coal. Since 2015, it also covers transport fuels (Ayrault, Moscovici, and Cazeneuve 2013, 82; Szabo 2015; Kossoy et al. 2015, 45; World Bank 2014, 80).

The tax is applied to a significant proportion of energy use by households and businesses, although businesses regulated by the EU ETS are exempt (Szabo 2015). Moreover, partial or complete exemptions may be given to vulnerable sectors, such as truck drivers, public transport operators, taxi drivers, farmers, river shipping, air transportation, fishing, and marine transport (Elbeze 2014, 9).

## POINT OF REGULATION

**Midstream.** The tax on petroleum products is paid by the supplier upon delivery to the consumer (Ministry of Finance and Public Accounts 2013).

TAX RATE  
(in EUR and USD per tCO<sub>2</sub>e)

The initial tax rate in 2014 was €7/tCO<sub>2</sub>e (US\$8/tCO<sub>2</sub>e). The tax was raised to €14.50/tCO<sub>2</sub>e (US\$17.50/tCO<sub>2</sub>e) in 2015 and further increased to €22/tCO<sub>2</sub>e (US\$24/tCO<sub>2</sub>e) in 2016. In 2017, the tax will reach €30.50/tCO<sub>2</sub>e (US\$32.15/tCO<sub>2</sub>e) (Amending Finance Law 2015). With the passage of the Law on the Energy Transition to Green Growth in 2015, the rate is expected to increase to €56/tCO<sub>2</sub>e (US\$61/tCO<sub>2</sub>e) in 2020 and to €100/tCO<sub>2</sub>e (US\$110/tCO<sub>2</sub>e) in 2030 (Szabo 2015; Kossoy et al. 2015, 45).

## METHODOLOGY USED TO ESTABLISH TAX RATE

The carbon tax rate was established after consideration of estimates of the social cost of carbon, modeling of the impacts of the carbon tax, and with the goal of reducing GHG emissions by 2030 by 40% relative to 1990 levels. The French government has set the target price of carbon for use in setting the carbon component of the Domestic Consumption Taxes (DCT) at €56/tCO<sub>2</sub>e (US\$61/tCO<sub>2</sub>e) in 2020 and €100/tCO<sub>2</sub>e (US\$110/tCO<sub>2</sub>e) in 2030. Members of Parliament discuss the rate of the carbon component of the DCT every year during adoption of the Finance Bill (Government of France 2016; Centre d'analyse stratégique 2009).

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

Efforts to address carbon leakage include:

- Phased increases to tax rates
- Individual income tax credits for energy efficiency improvements
- Recycling of revenues through decreases in other taxes
- Energy efficiency tax incentives for low-income households
- Exemptions for sectors covered by the EU ETS
- Partial or complete exemptions for vulnerable sectors
- Reduced corporate income taxes (Elbeze 2014; Government of France 2016)

## IMPLEMENTING AGENCIES AND APPROACHES

The Ministry of Finance and Public Accounts collects revenues from the carbon tax.

## MONITORING AND ENFORCEMENT &amp; EFFORTS TO PREVENT FRAUD AND CORRUPTION

The French government makes use of interest charges, fines, and the potential for filing criminal charges to encourage compliance with tax payments, in line with the regular tax adjustment procedure (Government of France 2016).

## USE OF TAX REVENUES

The carbon tax is designed to be revenue-neutral, with reductions in other taxes (Patel, 2015; Kossoy et al. 2015, 45). Reports have suggested the government plans to use at least a portion of the revenue to reduce corporate income taxes and provide energy assistance to low-income individuals (Elbeze 2014, 11; Fabert, 2015, 6). More recent correspondence with the French government indicates a significant portion of the revenues is used to decrease labor taxes through the “tax credit for encouraging competitiveness and jobs” (Government of France 2016).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

Instead of creating a completely new, separate tax, the carbon tax was implemented by adding a carbon component to the Domestic Consumption Taxes (DCTs) (Elbeze, 2014, 5). In fact, the carbon tax was passed as part of broader tax reform incorporated in the Finance Bill for 2014 (Moccovici and Cazeneuve 2014, 137).

In addition, the Law on Energy Transition for Green Growth (2015) created a roadmap for France's transition to a low-carbon economy focused on decreasing carbon dioxide emissions, improving energy efficiency, and promoting the use of renewable energy technologies (Planète Énergies 2015; Ministry of Ecology, Sustainable Development, and Energy 2015; Law No. 2015-992).

## EVALUATION

## OUTCOMES

By 2016, the carbon component of the DCTs is expected to generate close to €4 billion in cumulative revenues. The carbon tax is expected to result in a 1 MtCO<sub>2</sub> emissions reduction in the transportation sector and a 2 MtCO<sub>2</sub> emissions reduction from buildings in 2017 (Government of France 2016).

## CHALLENGES

The carbon tax has been a contentious issue in France since the 2007 presidential campaign. The French government first proposed a carbon tax in 2009, which was ruled unconstitutional because the large number of exemptions and the compensation plan for low-income households were found to violate the nation's constitutional commitment to tax equality (Institute for European Environmental Policy 2013, 113).

The carbon tax still faces challenges in terms of its political acceptance by some sectors of society. One study has highlighted the potentially regressive impacts of the French carbon tax and recommends the carbon tax be accompanied by a redistributive policy that takes into account specific regional effects (Ahamada et al. 2015). However, the French government is currently making an effort to mitigate the impacts of the carbon tax on the most vulnerable citizens and businesses.

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# ICELAND

## KOLEFNISGJALD Á FLJÓTANDI JARÐEFNAELDSNEYTI – CARBON TAX ON CARBON OF FOSSIL ORIGIN (2010)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 2010

#### BRIEF DESCRIPTION OF TAX:

In January 2010, Iceland introduced a temporary carbon tax on liquid fossil fuels with a tax rate indexed to 50% of the EU ETS price. The tax was set to expire at the end of 2012; however, it was decided to continue the tax indefinitely, expand its coverage, and index the tax rate to 100% of the EU ETS price by 2012 (Daniel et al. 2011, 42; World Bank 2014, 80). The introduction of the carbon tax was part of the Icelandic government's efforts to strengthen the "green economy" in the wake of the global economic and financial crisis of the late 2000s (OECD 2014, 61).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**327,386 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$59,431.40 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**1.8% (2014)**

(World Bank, 2015b)

##### MAJOR SOURCES OF GHGs (2014) Without changes for Land Use, Land-Use Change and Forestry (LULUCF)

**Industrial processes (42%); Energy (36%); Agriculture (16%); Waste (6%)**

((Hellsing et al. 2016, XXVII)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 3,633,000 (1990); 4,597,000 (2014)**

**With LULUCF: 15,128,000 (1990); 16,465,000 (2014)**

**Change: +26.5% from 1990 levels (without LULUCF); +8.9% from 1990 levels (with LULUCF)**

(Hellsing et al. 2016, XXVI)

##### TOTAL GHG EMISSIONS (metric tons of CO<sub>2</sub>e per capita)

**Without LULUCF: 14.3 (1990); 14.0 (2014)**

**With LULUCF: 59.4 (1990); 50.3 (2014)**

(World Bank 2015c; Hellsing et al. 2016, XXVI)

##### ENERGY CONSUMPTION BY SOURCE (2014)

**Hydroelectricity (44%); Oil (34%); Geothermal (20%)**

(The Shift Project Data Portal 2016)

**TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy production: 0.118 Quadrillion BTUs****Primary energy consumption: 10.165 Quadrillion BTUs****Deficit: -0.047 Quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.899/1.00****Rank: 16/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 79/100****Rank: 13/167***(Transparency International, 2015)***GOVERNMENT CAPACITY***(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 91.4****Political Stability and Absence of Violence/Terrorism: 93.2****Government Effectiveness: 90.9****Regulatory Quality: 88.0****Rule of Law: 90.9****Control of Corruption: 94.2***(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

While the Law of Environmental and Natural Resources Taxes (NR 129) did not specify goals for the nation's carbon tax, the legislation was no doubt part of Iceland's larger climate change strategy released in 2007. The objectives of this strategy were:

- To meet emission targets under the UNFCCC and the Kyoto Protocol of no more than a 10% increase in GHG emissions by 2012, relative to 1990 levels
- To reduce GHG emissions by promoting the use of renewable energy and reducing the use of carbon fuels
- To increase carbon sequestration through afforestation, revegetation, reclamation of wetlands, and other improvements in land use practices
- To promote climate change research and related innovations, and transfer knowledge and expertise to other countries
- To prepare for necessary climate change adaptation measures (Ministry for the Environment, 2007).

## DESIGN

### COVERED SOURCES AND SECTORS

The tax covers oil, gas, and other gaseous hydrocarbons (approximately 50% of the country's total GHG emissions) (World Bank 2014, 80). Coal is exempt from the carbon tax, but most industries in Iceland that use coal are covered by the EU ETS.

### POINT OF REGULATION

**Upstream.** The tax is levied on importers and producers of fossil fuels (World Bank 2014, 80).



## TAX RATE

(in ISK and USD per tCO<sub>2</sub>e)

The tax rate was set at Íkr 1120/tCO<sub>2</sub>e (US\$10/tCO<sub>2</sub>e) in 2014 (World Bank 2014, 80).

## METHODOLOGY USED TO ESTABLISH TAX RATE

The tax rate was determined in direct relation to the EU ETS. In 2010, the tax rate was to 50% of the ETS rate; in 2011, it was set to 75% of the ETS tax rate; and in 2012, it was set to 100% of the EU ETS tax rate. In 2013, the Icelandic government decided the tax rate would increase by either 3% or parallel to inflation in 2014 (World Bank 2014, 80; Daniel, et al. 2011, 42).

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

Efforts to address carbon leakage and cost containment included:

- Phased increases in tax rates
- Exemptions for Emissions-Intensive and Trade-Exposed (EITE) sectors

## IMPLEMENTING AGENCIES AND APPROACHES

The Directorate of Customs is responsible for supervising the assessment and collection of carbon levies for the National Treasury (NR 129, Article 3).

## MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

Information not available.

## USE OF TAX REVENUES

Carbon tax revenues go to the general fund (Carl and Fedor 2016, 53).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The introduction of the carbon tax was part of broader efforts to “green” the tax system in the wake of the global economic and financial crisis. Other environmental policy initiatives passed in the last decade include

an excise tax on diesel fuel, a carbon-related excise tax on vehicle purchases, tax credits for low-emissions vehicles, deposits on recyclable beverage containers, recycling fees, introduction of water metering for hot water use, fishing fees, elimination of environmentally harmful agricultural subsidies, introduction of a green public procurement policy, and other policies to support environmental improvements (OECD 2014, 61–92).

## EVALUATION

### OUTCOMES

While no studies regarding the environmental effectiveness of the Iceland carbon tax have been completed, the nation's GHG emissions decreased by approximately 4% between 2010 and 2012 (Environment Agency of Iceland 2014, 15). However, it is important to note the nation's GHG emissions actually increased by 26.3% between 1990 and 2012 (UNFCCC 2016). Iceland's goal under the Kyoto Protocol was to limit its GHG emissions increases to 10% above 1990 levels (Ministry of the Environment 2007, 3).



## CHALLENGES

Commentary from the 2011 Iceland parliamentary debate regarding the extension of the carbon tax suggests there were concerns within the business community about carbon leakage, international competitiveness, and the capacity to attract foreign direct investment (Hilmarrsson 2011).

The carbon tax was set at a relatively low rate of 50% of the EU ETS price in 2010 and was only recently (2014) indexed to the full EU ETS price. Furthermore, the current tax only covers about 50% of GHG emissions. Reports by the OECD have suggested Iceland needs to raise its carbon tax rate and expand its coverage to be able to meet its GHG reduction goals (OECD 2014, 111).

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# INDIA

## CLEAN ENVIRONMENT CESS – CHAPTER VII, SECTION 83 OF THE FINANCE ACT (2010)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 2010

#### BRIEF DESCRIPTION OF TAX:

The Clean Energy Cess, renamed the Clean Environment Cess in 2016, is a central government-level excise tax on all domestic and imported coal, lignite, and peat. In 2010, the tax on coal was first introduced at Rs 50/metric ton (US\$1.08/metric ton) of coal (Clean Energy Cess – Carbon Tax of India; Clean Energy Cess Rules 2010). During the 2016–17 budget, the tax will be increased to Rs 400/metric ton (US\$5.86/metric ton) of coal (King 2016). The tax revenue goes into a National Clean Energy Fund that is used to finance research, clean energy projects, and environmental remediation programs (Ministry of Environment and Forests, Government of India 2010, 2).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

#### POPULATION

**1,295,291,543 (2014)**

(World Bank, 2015c)

#### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$1,233.90 (2014)**

(World Bank, 2015a)

#### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**7.3% (2014)**

(World Bank, 2015b)

#### MAJOR SOURCES OF GHGs (2000) Without changes for Land Use, Land-Use Change and Forestry (LULUCF) Energy (71%); Agriculture (18%); Industrial processes (8%) Waste (3%)

(Ministry of Environment, Forest, and Climate Change, Government of India 2015, 57)

#### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

Without LULUCF: Information not available (1990); 1,523,766,564 (2000); 2,136,841,240 (2010)

With LULUCF: Information not available (1990); 1,301,204,344 (2000); 1,884,309,460 (2010)

Change: +40% from 2000 levels (without LULUCF); +45% from 2000 levels (with LULUCF)

(Ministry of Environment, Forest, and Climate Change, Government of India 2015, 17; UNFCCC 2016)

#### TOTAL GHG EMISSIONS (metric tons of CO<sub>2</sub>e per capita)

Without LULUCF: 1.4 (2000); 1.7 (2010)

With LULUCF: 1.2 (2000); 1.5 (2010)

(World Bank 2015c; UNFCCC 2016; Ministry of Environment, Forest, and Climate Change, Government of India 2015, 17)

#### ENERGY CONSUMPTION BY SOURCE (2014)

Coal (56%); Oil (32%); Gas (8%)

(The Shift Project Data Portal 2016)

**TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy production: 13.099 Quadrillion BTUs****Primary energy consumption: 19.062 Quadrillion BTUs****Deficit: -5.963 Quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.609/1.00****Rank: 130/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 38/100****Rank: 76/167***(Transparency International, 2015)***GOVERNMENT CAPACITY***(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 61.1****Political Stability and Absence of Violence/Terrorism: 13.6****Government Effectiveness: 45.2****Regulatory Quality: 34.6****Rule of Law: 54.3****Control of Corruption: 38.9***(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The Clean Environment Cess is levied for numerous purposes:

- To help finance and promote the use of clean energy technologies
- To fund clean energy and environmental research
- To reduce the country's dependence on fossil fuels
- To reduce pollution levels associated with increasing industrialization and urbanization (Krishna 2010; Clean Energy Cess – Carbon Tax of India 2015)

## DESIGN

### COVERED SOURCES AND SECTORS

Domestically produced and imported coal (approximately 46% of all GHG emissions) (Garg et al. 2001, 2691). The coal industry (both produced domestically and imported) (Clean Energy Cess Rules 2010).

Exemptions include: coal mined by local tribes in the State of Meghalaya is exempt from the Clean Energy Cess.

### POINT OF REGULATION

**Upstream.** The cess is applied to all domestically produced and imported coal, including washed coal (Clean Energy Cess – Carbon Tax of India 2015).

### TAX RATE (in INR and USD per tCO<sub>2</sub>e)

**2010:** Rs 50/metric ton of coal (US\$1.08/metric ton of coal)

**2014:** Rs 100/metric ton of coal (US\$1.62/metric ton of coal) (Ministry of Environment and Forests, Government of India 2015, 27)

**2015:** Rs 200/metric ton of coal (US\$3.17/metric ton of coal) (Ministry of Finance, Department of Revenue 2015)

**2016:** Rs 400/metric ton of coal (US\$5.86/metric ton of coal) (King 2016).

Since one metric ton of India's coal produces 1.782 metric tons of CO<sub>2</sub>, the effective price per metric ton of CO<sub>2</sub> in 2016 will be US\$3.29 (Ministry of Finance, Government of India 2015, 124).

### METHODOLOGY USED TO ESTABLISH TAX RATE

The cess on coal was imposed at a rate sufficiently high to raise the necessary funds required for clean energy solutions. It has been increased progressively over the years to raise funds for additional energy and environmental initiatives.

### MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

The tax rate was set low in 2010 and has been increased gradually over time.

### IMPLEMENTING AGENCIES AND APPROACHES

Coal producers regulated under the Clean Energy Cess were required to register with the jurisdictional Central Excise Officer within 30 days of the development of the Clean Energy Cess rules. The producer is responsible for determining the amount of cess due for any given month and for paying that tax to the Ministry of Finance by the fifth day of the second month after extraction. If the cess is not paid by the due date, it will accrue interest. If the cess is more than 30 days late, the producer will become subject to penalties of up to Rs 10,000 (US\$150) and/or confiscation of the product in question (Clean Energy Cess Rules 2010).

### MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

Producers are required to maintain records of coal removal and cess payments. Excise officers are allowed to inspect the premises of registered producers and audit records to determine compliance (Clean Energy Cess Rules 2010).

### USE OF TAX REVENUES

The revenues raised through the Clean Energy Cess go toward the National Clean Energy Fund to finance clean energy initiatives, environmental remediation, and research on clean energy technologies (Ministry of Environment and Forests, Government of India 2010; Clean Energy Cess – Carbon Tax of India 2015). An interministerial group approves projects for financing. Individuals and organizations in the public and private sector can apply for funding. To be considered for funding, the project must be related to clean fossil energy, renewable/alternative energy, energy infrastructure, or installation of energy-efficient technology. Moreover, the project must be sponsored by a government department, must be self-funded by the recipient individual/organization by at least 40%, and must not have received funding from another government agency (Ministry of Finance 2011).

### LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

In addition to the Clean Energy Cess, India has decreased subsidies and increased excise taxes on gasoline and diesel as a means of taxing the carbon imbedded in other fossil fuels. The most current excise tax rates (as of January 2016) are Rs 9.48/liter (US\$0.14/liter) on gasoline and Rs 11.33/liter (US\$0.17/liter) on diesel (PTI 2016).

## EVALUATION

### OUTCOMES

To date, the National Clean Energy Fund has funded 48 clean energy projects worth Rs 330.95 billion.

### CHALLENGES

Some reports suggest disbursement of National Clean Energy Funds has been slow (India Climate Dialogue 2015). However, the government of India has denied this.

One commentator suggested that efforts to impose carbon taxes will need to consider the price of electricity, so as not to interfere with India's goal of 100% village electrification (Sengupta 2016).

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# IRELAND

## CARBON TAX – BUDGET AND FINANCE ACT (2010)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 2010, 2013

#### BRIEF DESCRIPTION OF TAX:

In 2010, the Republic of Ireland placed a carbon tax on all residential and commercial use of gas and oil not covered by the EU ETS, under Part 3 of the 2010 Budget Act. In 2013, a tax was placed on residential and commercial use of solid fossil fuels not covered by the EU ETS (World Bank 2014, 80). The tax was introduced during a financial crisis after public debt had reached unprecedented levels, with the goals of simultaneously reducing GHG emissions and raising revenue (Ludovino Lopes Advogados et al. 2014, 64).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**4,615,693 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$52,218.70 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**5.2% (2014)**

(World Bank, 2015b)

##### MAJOR SOURCES OF GHGs (2014) With changes for Land Use, Land-Use Change and Forestry (LULUCF)

Road transport (15%); LULUCF (26%); Residential - Peat fuel (6%); Energy Industries (13%); Residential - Solid fuels (4%); Residential - Liquid fuels (3%); Manufacturing Industries and Construction (7%); Commercial/Institutional - Liquid fuels (4%); Refrigeration and A/C (incl. Mobile Air Conditioning or MAC) (4%); Product Uses as Substitutes for ODS - Refrigeration and A/C (incl. MAC) (4%); Commercial/Institutional - Gaseous fuels (3%); Agricultural Soils - Direct Soil Emissions (3%)

(Duffy et al. 2016, 35)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

Without LULUCF: 56,168,550 (1990); 58,253,670 (2014)

With LULUCF: 62,390,980 (1990); 63,475,050 (2014)

Change: +3.7% from 1990 levels (without LULUCF); 0.0% from 1990 levels (with LULUCF)

(Duffy et al. 2016, 40, 44)

##### TOTAL GHG EMISSIONS (metric tons of CO<sub>2</sub>e per capita)

Without LULUCF: 16.0 (1990); 12.6 (2014)

With LULUCF: 17.8 (1990); 13.8 (2014)

(World Bank 2015c; Duffy et al. 2016, 40, 44)

##### ENERGY CONSUMPTION BY SOURCE (2014)

Oil (53%); Gas (31%); Coal (11%)

(The Shift Project Data Portal 2016)

TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)

Primary energy production: 0.045 Quadrillion BTUs  
Primary energy consumption: 0.693 Quadrillion BTUs  
Deficit: -0.648 Quadrillion BTUs  
(U.S. EIA 2016a; U.S. EIA 2016b)

HUMAN DEVELOPMENT INDEX

(United Nations Development Program 2014 – Score/1.00, Rank/188)  
Score: 0.916/1.00  
Rank: 6/188  
(UNDP 2015)

LEVEL OF PERCEIVED CORRUPTION

(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)  
Score: 75/100  
Rank: 18/167  
(Transparency International, 2015)

GOVERNMENT CAPACITY

(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)  
Voice & Accountability: 92.6  
Political Stability and Absence of Violence/Terrorism: 86.4  
Government Effectiveness: 92.3  
Regulatory Quality: 95.2  
Rule of Law: 92.8  
Control of Corruption: 91.8  
(World Bank, 2015d)

OBJECTIVES

STATED POLICY GOALS/OBJECTIVES

As the taxes were introduced as part of the Finance and Budget Act, it is useful to look beyond the enacting legislation for evidence of the policy goals and objectives. The 2007–12 Programme for Government, a collaborative document prepared by the leaders of Ireland’s governing coalition, includes a commitment to reducing GHG emissions by 3% annually and establish a carbon tax as a revenue raising mechanism (Ahern, Sargent, and Harney 2007, 8). Furthermore, the tax was introduced as a condition of the EU/IMF bailout package, suggesting an important policy goal was to secure loans from these organizations in the midst of a fiscal crisis.

DESIGN

COVERED SOURCES AND SECTORS

The carbon tax covers most oil, gas, and coal not covered by the EU ETS (World Bank 2014, 80), approximately 33% of Ireland’s total GHG emissions. The tax was introduced in phases. It has covered transport fuels since December 2009, was extended to non-transport fuel in May 2010, and to solid fuels in May 2013 (IEEP 2013, 59).

The tax covers fuel use in many sectors of the economy not covered by the EU ETS (World Bank 2014, 80). The carbon tax applies primarily to residential heating, transport, commercial buildings, and small industry (Convery, Dunne, and Joyce 2014, 136). There is a reduced rate for heavy oil and liquefied petroleum gas (LPG) used for horticulture and mushroom cultivation (Convery, Dunne, and Joyce 2013, 12). Emissions from agriculture were also excluded due to difficulties in measurement (Convery, Dunne, and Joyce 2013, 11). Since 2012, a partial exemption from the carbon tax has been provided for high-efficiency combined heat and power (CHP) plants with a capacity of 50 kW or greater. In that same year, the government exempted farm diesel from any further tax increases by granting double income tax relief for additional carbon tax liabilities incurred from 1 May 2012 on (Gargan 2012; Conroy 2016).

EU ETS sectors exempt from the carbon tax are the following: power stations and other combustion installations, oil refineries, coke ovens, metal ore roasting and sintering installations, iron and steel production, cement clinker production, glass manufacturing, ceramic manufacturing, bricks, lime, and pulp and paper production (European Commission 2008).

## POINT OF REGULATION

**Midstream.** The tax is paid by the fuel suppliers. The carbon tax is included in the end price to the user and is not shown explicitly in the bill (Conroy 2016; Finance Act 2015).

## TAX RATE (in EUR and USD per tCO<sub>2</sub>e)

The initial carbon tax rate was set at €15/tCO<sub>2</sub>e (US\$21.61/tCO<sub>2</sub>e) in 2010 and the taxes on different types of fuels were increased in stages to €20/tCO<sub>2</sub>e (US\$25.88/tCO<sub>2</sub>e) in 2012 (Convery, Dunne, and Joyce 2014, 136). Since May 2014, the carbon tax has been €20/tCO<sub>2</sub>e (US\$21.77/tCO<sub>2</sub>e on January 1, 2016) on all fossil fuels (World Bank 2014, 80). The carbon tax rate is reviewed each year as part of the annual budgetary process. Any increase in the rate will be a political decision and will need to balance the positive benefits, such as emission reductions, against the negatives, such as the impact on fuel poverty (Conroy 2016).

## METHODOLOGY USED TO ESTABLISH TAX RATE

The government established a Commission on Taxation in 2009. The Commission recommended an initial tax rate of €20/tCO<sub>2</sub>e for all carbon emissions from non-ETS sectors and based on the EU ETS price in subsequent years (Convery, Dunne, and Joyce 2013, 11). Presumably, the carbon tax rate was initially set lower than the Commission's recommendation, in an effort to phase in the tax over time.

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

The carbon tax rate was gradually increased from €15/tCO<sub>2</sub>e (US\$21.61/tCO<sub>2</sub>e) to €20/tCO<sub>2</sub>e (US\$25.88/tCO<sub>2</sub>e) to provide businesses and residents time to adjust to the carbon tax. The carbon tax also allows for voluntary negotiated agreements between businesses and Sustainable Energy Ireland (Commission on Taxation 2009, 349).

Furthermore, numerous efforts were made to address the anticipated impacts of the carbon tax, including:

- **Warmer Homes Scheme**, which provides energy efficiency improvements for individuals with limited incomes
- **Better Energy Homes Scheme**, which offers funding for residential energy efficiency improvements
- **National Fuel Allowance Scheme**, to assist with home heating costs for low-income individuals (IEEP 2013, 60)
- Income tax relief for farmers for carbon taxes paid for diesel use
- Partial tax exemptions for high efficiency CHP plants with a capacity of 50 kW or greater (Gargan 2012; Conroy 2016)
- Regulations ensuring bituminous coal contained less than 0.7% sulphur to prevent the (illegal) importation of higher sulphur coal from Northern Ireland
- Phased introduction of carbon tax to solid fuels

## IMPLEMENTING AGENCIES AND APPROACHES

The carbon tax is administered by the Office of Revenue Commissioners, responsible for administering and collecting all Irish taxes.

## MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

Fuel suppliers are required to register annually with the National Excise License Office to obtain appropriate licensing (Auto Fuel Trader's License, Mineral Oil Trader's License, Marked Fuel Trader's License, and Solid Fuel Carbon Tax License). The carbon tax obligation for each fuel is determined on the basis of an emissions factor for different fuels, and rates specified in the Finance Act are calculated per 1,000 liters of fuel (Finance Act 2010).

Fuel suppliers must use equipment that accurately measures the amount of fuel dispensed, maintain records of fuel sales, provide Revenue Commissioners free access to inspect their fuel facilities, and report on fuel sales regularly (Revenue Commissioners 2015, 29–41).

The Revenue Commissioners can revoke the license of any license holders who do not comply with regulations (Revenue Commissioners 2015, 27). Furthermore, any person who tries to contravene or fails to pay the tax is subject to a penalty of €5,000 (US\$5,443.50 as of 1 January 2016) (Finance Act 2010, Part 3, Chapter 3).

USE OF TAX REVENUES

The tax revenues are being directed to the general budget to allow for flexibility in use. Although the carbon tax was originally intended to be revenue-neutral, the government has not been able to use the revenues to decrease labor costs, given the significant public deficit. However, Convery (2012) notes the revenues from the carbon tax have prevented additional increases in labor taxes.

LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The carbon tax was introduced as part of a series of measures to respond to the country’s fiscal problems. The fiscal reform measures, developed in close coordination between the International Monetary Fund, the EU, and the Irish government included restructuring of the financial sector; structural reforms; reductions in government expenditures; and the creation of additional tax revenues through lowering of personal income tax bands, the carbon tax, a domestic water charge, and changes to the vehicle taxation (European Union and International Monetary Fund 2012).

The carbon tax design allows for the possibility of voluntary negotiated agreements between individual companies and Sustainable Energy Ireland (Commission on Taxation 2009, 349).

EVALUATION

OUTCOMES

Under the Kyoto protocol, Ireland committed to keep its carbon dioxide emissions less than 13% above 1990 levels during the 2008–12 compliance period (Convery, Dunne, and Joyce 2013, 9). In 2012, its carbon dioxide emissions were just 5.9% above 1990 levels (UNFCCC 2016). Furthermore, there is some evidence of fuel switching, as recent estimates from the Ireland Environmental Protection Agency indicate that between 1990 and 2013 use of coal decreased by 16.4%, use of peat decreased by 9.5%, use of natural gas decreased by 8.3%, and use of renewables increased by 6.6% (Conroy 2016; Ireland Environmental Protection Agency 2014). However, the economic decline that accompanied the implementation of the carbon tax makes it challenging to determine how much of the carbon dioxide emissions reductions are attributable to the carbon tax.

Since its economic recession, Ireland has used the carbon tax to raise revenue instead of using other taxes thought to be more harmful to economic growth. Ireland has not had to raise its corporate tax rates. However, a Universal Social Charge (USC), a combined health levy and income levy of 7%, was introduced and Pay Related Social Insurance (PRSI) contributions have increased. Yet these tax increases would have been much higher, if not for the introduction of the carbon tax (Convery, Dunne, and Joyce 2014, 138).

The Irish carbon tax was thought to be particularly successful as a result of its effective public engagement efforts (Convery, Dunne, and Joyce 2013, 33). In 2003, Ireland solicited feedback from interested parties and received 117 submissions. A report on the submissions received was published in 2004 (Conroy 2016). The 2009 Commission on Taxation Report drew upon this feedback in developing its recommendations and made specific reference to recommendations from the National Competitiveness Council, the Environmental Protection Agency, and Revenue Commissioners in its 2009 proposal (Commission on Taxation 2009). In addition, the government held meetings with various industry groups opposed to the carbon tax to address their concerns (Conroy, 2016).

## CHALLENGES

There were concerns that the carbon tax would have regressive impacts, and numerous studies were conducted in advance of tax implementation. Many efforts to address these expected impacts, highlighted above, were made before the carbon tax implementation.

Solid fossil fuels (coal and peat) were regulated after other fossil fuels because of two policy concerns. Some concerns were related to the importation of high sulphur coal from Northern Ireland into Ireland, and the Department of Environment, Community, and Local Government wanted to prohibit the use of high sulphur coal for residential use, through amendments to the Air Pollution Act, prior to expansion of the carbon tax to cover solid fuels (Conroy 2016; Gargan 2012). Furthermore, the regulation of peat was strongly opposed by the public, particularly in rural areas and by lower-income individuals, as peat is widely used for heating (Convery, Dunne, and Joyce 2013, 13). The government held meetings with industry groups to address the public's concerns (Conroy 2016).

Since the intention of the Irish government was to link the national carbon tax to the EU ETS price, the widening gap between the EU ETS price and the price of carbon for non-ETS sectors may pose challenges in the near future (Convery, Dunne, and Joyce 2013, 11; Gargan 2012).

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# JAPAN

## TAX FOR CLIMATE CHANGE MITIGATION (2010)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 2012

#### BRIEF DESCRIPTION OF TAX:

Japan introduced the Tax for Climate Change Mitigation on all fossil fuels in October 2012 with the tax system expected to be fully fledged by April 2016. The policy was designed with the intention of generating revenue needed for the development of clean energy technology and energy-saving measures, and for reducing the use of fossil fuels. The tax base is the amount of CO<sub>2</sub> emissions from fossil fuel use (covering 70% of Japan's GHG emissions), with some exemptions for agriculture, public transportation, petrochemical industries, and coal-fired power plants in Okinawa. The tax has been phased in over time, and Japan reached its full tax rate of JPY 289/tCO<sub>2</sub> (US\$2.54/tCO<sub>2</sub>) in April 2016. The tax is applied upstream, added onto the existing Petroleum and Coal Tax. Tax revenues are earmarked for clean energy technology, energy efficiency programs, and environmental conservation (Ludovino Lopes Advogados et al. 2014,, 65–67, World Bank 2014, 80).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**127,131,800 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$37,595.20 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**-0.1% (2014)**

(World Bank, 2015b)

##### MAJOR SOURCES OF GHGs (2014) With changes for Land Use, Land-Use Change and Forestry (LULUCF) Energy (93%); Industrial processes and product use (7%); Agriculture (3%); Waste (2%); LULUCF (-5%)

(Greenhouse Gas Inventory Office of Japan (GIO), Center for Global Environmental Research (CGER), and National Institute for Environmental Studies (NIES) 2016, ES5)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 1,270,700,000 (1990); 1,363,900,000 (2014)**

**With LULUCF: 1,211,400,000 (1990); 1,302,400,000 (2014)**

**Change: +7.3% from 1990 levels (without LULUCF); +7.5% from 1990 levels (with LULUCF)**

(Greenhouse Gas Inventory Office of Japan (GIO), Center for Global Environmental Research (CGER), and National Institute for Environmental Studies (NIES) 2016, ES5)

##### TOTAL GHG EMISSIONS (metric tons of CO<sub>2</sub>e per capita)

**Without LULUCF: 10.0 (1990); 11.0 (2014)**

**With LULUCF: 9.5 (1990); 10.5 (2014)**

(Greenhouse Gas Inventory Office of Japan (GIO), Center for Global Environmental Research (CGER), and National Institute for Environmental Studies (NIES) 2016, ES5)



**ENERGY CONSUMPTION BY SOURCE (2014)****Oil (49%); Gas (29%); Coal (19%)***(The Shift Project Data Portal 2016)***TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy production: 4.001 Quadrillion BTUs****Primary energy consumption: 22.695 Quadrillion BTUs****Deficit: -18.694 Quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.891/1.00****Rank: 20/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 75/100****Rank: 18/167***(Transparency International, 2015)***GOVERNMENT CAPACITY***(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 89.2****Voice & Accountability: 79.3****Political Stability and Absence of Violence/Terrorism: 84.5****Government Effectiveness: 97.1****Regulatory Quality: 84.1****Rule of Law: 89.4****Control of Corruption: 93.3***(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The stated policy goals of the Tax for Climate Change Mitigation were:

- To reduce energy-related CO<sub>2</sub> emissions
- To generate revenue needed for the development of clean energy technology and energy-saving measures (Ministry of the Environment, Japan 2012a, 1)

## DESIGN

### COVERED SOURCES AND SECTORS

The Tax for Climate Change Mitigation covers most use of oil, gas, and coal (approximately 70% of the country's GHG emissions) (Ludovino Lopes Advogados et al. 2014, 66; World Bank 2014, 80).

Exemptions include: coal used for electricity generation on the island of Okinawa; volatile oil used for the production of petrochemical products; domestic oil asphalt; oils used for the agriculture, forestry, and fisheries industries; fuel for domestic flights; oils used by railways; oils used for domestic cargo and passenger ships; and imported coal used for the home generation of caustic soda and salt production (Ministry of the Environment, Japan 2012a, 7).

### POINT OF REGULATION

**Upstream.** The tax is applied upstream, added onto the existing Petroleum and Coal Tax (Ludovino Lopes Advogados et al. 2014, 67).

## TAX RATE (in JPY and USD per tCO<sub>2</sub>e)

The tax has been phased in over time, and Japan will reach its full tax rate of ¥289/tCO<sub>2</sub> (US\$2.54/tCO<sub>2</sub>) in April 2016 (Ludovino Lopes Advogados et al. 2014, 66).

## METHODOLOGY USED TO ESTABLISH TAX RATE

Information not available.

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

The tax rate is being phased in gradually over a 4-year period and exemptions are made for certain industries.

## IMPLEMENTING AGENCIES AND APPROACHES

The Ministry of Finance is responsible for collecting the tax revenues.

## MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

The tax is collected as part of the Petroleum and Coal Tax. Taxpayers are required to pay a penalty and interest for late payment. Tax officials are allowed to conduct audits of individuals suspected of tax evasion and file criminal charges and seize assets for nonpayment (Ministry of Finance 2010, 214–234).

## USE OF TAX REVENUES

Tax revenues were expected to be ¥39.1 billion (US\$500 million) in FY2012 and ¥262.3 billion (US\$2.18 billion) in FY2016. Tax revenues are to be used to promote low-carbon technologies, energy efficiency improvements, and renewable energy (Ministry of the Environment, Japan 2012a, 5).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The carbon tax was originally introduced as part of the Basic Act on Global Warming Countermeasures in 2010. However, the draft of this basic act failed to pass the Diet in August 2010. Since then, this basic act has never been discussed in the Diet. The Japanese government decided to introduce the Climate Change Mitigation Tax and Feed-in Tariff (FIT) for renewable energy by the ministerial meeting's decision (December 22, 2010).

The Tax for Climate Change Mitigation was added to the existing upstream tax on fossil fuels, which was originally set at the following rates:

- Crude Oil and Petroleum Products: ¥2,040/kl (US\$22.00/kl)
- Gaseous hydrocarbon (LPG/LNG): ¥1,080/ton (US\$11.68/ton)
- Coal: ¥700/ton (US\$7.57/ton) (Ludovino Lopes Advogados et al. 2014, 67; Ministry of Finance, Japan 2010, 204-206)

The Tax for Climate Change Mitigation was implemented in 2012, against the backdrop of broader efforts to “green” the tax system (Ministry of the Environment 2012b).

## EVALUATION

### OUTCOMES

The Japan Ministry of the Environment expects the Tax for Climate Change Mitigation to result in a CO<sub>2</sub> emissions reduction of 0.5% (6 million tons) to 2.2% (24 million tons) by 2020 compared to 1990 levels (Ministry of the Environment, Japan 2012a, 5).

The tax is expected to cost the average household an extra ¥1,200 per year (approximately US\$10) once the tax rate has been fully implemented, though the government thought that impact could be mitigated through promotion of energy efficiency improvements and use of renewable energy (Ministry of the Environment, Japan 2012a, 3).

## CHALLENGES

Industry groups in Japan have opposed efforts to price carbon in the past, with nine industry groups having showed up at the Conference of the Parties (COP) in Copenhagen in 2009 to protest a carbon tax (Reuters 2009).

Since the introduction of the tax, the Japan Business Federation (Keidanren) has made numerous requests for the review and potential abolishment of the Tax for Climate Change Mitigation and the FIT out of concern for their economic impacts (Keidanren 2013; Keidanren 2014; Keidanren 2015).

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# MEXICO

## CARBON TAX – LEY DEL IMPUESTO ESPECIAL SOBRE PRODUCCIÓN Y SERVICIOS (2014)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 2014

#### BRIEF DESCRIPTION OF TAX:

The Mexican government introduced a carbon tax on fossil fuels under its 2013 amendments to the Ley del impuesto especial sobre producción y servicios (Special tax on production and services), which took effect in 2014 (World Bank 2014, 81).

The carbon tax covers sales and imports of propane, butane, gasoline, kerosene and other jet fuels, fuel oil, petroleum coke, carbon coke, and coal by upstream producers and importers. The tax rate is set at the approximate difference between the carbon dioxide emissions imbedded in natural gas and the fuel used (World Bank 2014, 81). In July 2016, that tax rate was a maximum of Mex\$18.77 (between US\$0.31 and US\$2.50).

The tax has been adopted in the context of wider fiscal and energy sector reforms. The government intends for the energy sector reforms to make the sector more responsive to price signals, making the tax more effective (Ludovino Lopes Advogados et al. 2014, 68). In addition, the tax was adopted shortly after the passage of the General Law on Climate Change (LGCC, as per the Spanish acronym), which establishes the use of economic instruments like taxes as a principle of national policy on climate change mitigation, adaptation, and vulnerability reduction (Ley General de Cambio Climático, Article 91).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**125,385,833 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$8,521.90 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**2.2% (2014)**

(World Bank, 2015b)

##### MAJOR SOURCES OF GHGs (2006) With changes for Land Use, Land-Use Change and Forestry (LULUCF)

**Energy (50.7%); Waste (14.1%); LULUCF (9.9%); Industrial processes (9%); Agriculture (6.4%)**

(Comisión Intersecretarial de Cambio Climático 2009, 26)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 425,268,649 (1990); 665,304,920 (2013)**

**With LULUCF: 425,268,649 (1990); 492,307,310 (2013)**

**Change: +56.4% from 1990 levels (without LULUCF); +15.8% from 1990 levels (with LULUCF)**

(UNFCCC, 2016; Secretaría de Medio Ambiente y Recursos Naturales 2015, 68)

**TOTAL GHG EMISSIONS** (metric tons of CO<sub>2</sub>e per capita)**Without LULUCF: 5.0 (1990); 7.8 (2013)****With LULUCF: 7.8 (1990); 4.0 (2013)***(World Bank, 2015c; UNFCCC, 2016; Secretaría de Medio Ambiente y Recursos Naturales 2015, 68)***ENERGY CONSUMPTION BY SOURCE (2014)****Oil (52%); Gas (40%); Coal (4%)***(The Shift Project Data Portal 2016)***TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy production: 9.758 Quadrillion BTUs****Primary energy consumption: 17.165 Quadrillion BTUs****Surplus: 2.593 Quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.756/1.00****Rank: 74/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 35/100****Rank: 95/167***(Transparency International, 2015)***GOVERNMENT CAPACITY***(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 47.8****Political Stability and Absence of Violence/Terrorism: 20.9****Government Effectiveness: 61.1****Regulatory Quality: 66.8****Rule of Law: 38.0****Control of Corruption: 26.4***(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

Since the carbon tax was included in a 2014 tax package (Ley del impuesto especial sobre producción y servicios) that did not include stated goals and objectives, it is useful to reference the stated objectives of the related reform movement and the General Law on Climate Change for evidence of the carbon tax's policy goals.

The carbon tax was introduced as part of broader reforms, known as “Pacto por Mexico,” aimed at overhauling the educational system, reducing the Mexican government's dependence on tax revenues from Petróleos Mexicanos (PEMEX), encouraging transparency, funding universal social security, stimulating economic growth, reforming and simplifying the income tax system, encouraging private investment in the energy sector, reforming the political system, and improving the health and well-being of citizens (Sada 2013a; Sada 2013b; OECD 2015, 4).

The LGCC, enacted in 2012, included a voluntary commitment to reduce GHG emissions by 30% below 2000 levels by 2020, and by 50% below 2000 levels by 2050 (Ludovino Lopes Advogados et al. 2014, 68). It also encouraged the use of economic instruments in pursuit of climate change mitigation and adaptation efforts (Ley General de Cambio Climático, Article 91).

Furthermore, since the carbon tax does not tax natural gas and the tax rate is based on the difference between carbon dioxide emissions imbedded in natural gas and the fuel used, it is reasonable to assume fuel switching was another primary goal of the legislation.

## DESIGN

### COVERED SOURCES AND SECTORS

The tax is levied on sales and imports of the following fuels based on their carbon content: propane, butane, gasoline, kerosene and other jet fuels, fuel oil, petroleum coke, carbon coke, and coal (Ludovino Lopes Advogados et al. 2014, 68). This covers roughly 40% of Mexico's total GHG emissions (IETA 2014, 77).

The energy sector is the primary focus of the tax since the tax is applied upstream, to producers and importers (Climate Focus 2013, 68). Since natural gas is not taxed, natural gas producers and importers are not subject to the tax.

### POINT OF REGULATION

**Upstream.** The tax applies to producers and importers, but not to resellers (Ludovino Lopes Advogados et al. 2014, 68).

### TAX RATE (in MXN and USD per tCO<sub>2</sub>e)

The initial proposal was to set the tax rate at US\$5.00/tCO<sub>2</sub>e (Ludovino Lopes Advogados et al. 2014, 68). The tax rate in the final legislation was modified to approximately Mex\$39.80/tCO<sub>2</sub>e (US\$3.50/tCO<sub>2</sub>) and the rate was capped at 3% of the sales price of the fuel (World Bank 2014, 81). The observed tax rate varies by fuel since the tax rate is based on the difference between the emissions that would have occurred if natural gas had been used and the emissions associated with the fuel that was actually used (Waty 2015, 3). In July 2016, that tax rate was set at a maximum of Mex\$18.77 (US\$2.50).

The Ministry of Finance is tasked with updating the tax rate annually (Ley del impuesto especial sobre producción y servicios, Article 2).

### METHODOLOGY USED TO ESTABLISH TAX RATE

The federal government announced a proposal for the implementation of a new tax on the sale and importation of fossil fuels. To inform the carbon price, an index was created by weighting the price of several international emissions trading markets, such as those of Europe, New Zealand, and California between October 2012 and June of 2013, to establish an average price of US\$5.70/ton of carbon (CESPEDES 2013, 1). Nevertheless, the final tax rate of approximately US\$3.50/tCO<sub>2</sub>e was established through political negotiations.

### MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

The tax applies to imports only (Climate Focus 2013), not to exports (CESPEDES 2013, 5).

Covered entities will be allowed to substitute payment of the tax with the surrender of an equivalent number of offsets from Mexican CDM projects (Munozcano 2014). The value of offsets for purposes of substituting for carbon tax obligations will be determined according to the monetary value of the Certified Emission Reductions (CERs) purchased, not the carbon value, to avoid the scenario of market collapse/oversupply potentially undermining the emission reduction goals of the tax. It is not clear yet how this will work in practice, though one option under consideration is taking the international market price on the day of surrender as the value of the credit (Muñoz 2016). This system will be launched in 2017.

### IMPLEMENTING AGENCIES AND APPROACHES

The Tax Administration Service (SAT, as per the Spanish acronym), the agency of the Ministry of Finance charged with tax collection, is responsible for the day-to-day administration of the carbon tax. The tax may be paid in cash or through the surrender of carbon credits for CDM projects in Mexico (Servicio de Administración Tributaria 2014).



Under Mexico's LGCC, the Secretariat of Environment and Natural Resources (Semarnat) is responsible for managing the reporting of emissions and emissions reductions (Ley General de Cambio Climático, Articles 87–90).

Currently, both ministries are working on the coordination processes in order to identify pertinent alternatives to achieve the national goals, considering economic and market instruments (Muñoz 2016).

## MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

SAT is the entity in charge of the carbon tax accounting.

The customs authorities have been provided with additional technical support to enable them to distinguish between different fuels, in particular between biofuels and liquid petroleum (Muñoz 2016).

Semarnat has given significant inspection authority to its Federal Attorney General's Office for the Protection of the Environment (Profepa, as per the Spanish acronym). Profepa can impose a fine of 3,000 days of minimum wage for a violation. If the federal prosecutor finds evidence of falsified data or noncompliance with reporting requirements, he can impose a fine of up to 10,000 days of the minimum wage. For a second violation, the fine can be up to three times the original amount. Violators can also be charged with additional civil and criminal liabilities (Ley General de Cambio Climático, Articles 111–116).

## USE OF TAX REVENUES

The tax was expected to raise roughly one billion dollars annually (Environmental Defense Fund, CDC Climat Research, Caisse Dépôts Group, and IETA 2015, 3). However, public records indicate revenues have been significantly less than expected: Mex\$9,670,350,000 (US\$492,975,296) in 2014; Mex\$7,648,509,994 (US\$389,905,895) in 2015; and an estimated Mex\$6,968,640,000 (US\$355,247,469) in 2016 (Servicio de Administración Tributaria 2016). At present, all revenue is directed toward the national budget. Though it is in principle possible for Congress to provide for all or part of the revenue to be directed toward a specific cause, earmarking is generally not favored in Mexico because of legal aspects of the national tax structure (Muñoz 2016).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The adoption of the carbon tax is part of wider fiscal and energy sector reforms (Ludovino Lopes Advogados et al. 2014, 69). In December 2013, the Mexican Congress approved constitutional amendments that ended the state monopolies of electricity and petroleum to encourage private investment (Oxford Business Group 2015). A series of related laws were passed in August 2014, and investments in the energy sector rose to US\$2.4 billion in 2014 (Norton Rose Fulbright, 2015; Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 3). This was key to the decision to introduce a carbon tax, since in a monopolistic market the price signal would have had little effect and a command-and-control type of regulation would have made more sense. As part of these reforms Mexico also introduced a range of policies and measures designed to foster the gas industry and promote enhanced exploitation of natural gas, a factor which is likely to have influenced the decision to exempt natural gas from the carbon tax (Muñoz 2016).

Mexico's LGCC is linked to the carbon tax in several ways. As noted above, it establishes the nation's emissions reporting requirements (Ley General de Cambio Climático, Articles 111–116). In addition, it empowers the government to adopt a broad range of fiscal or economic instruments to address climate change and establishes a Climate Change Fund in which money raised through the use of such economic instruments can be deposited (Ludovino Lopes Advogados et al. 2014, 69; Ley General de Cambio Climático, Article 91).

Mexico is planning on launching its carbon offset market in 2017 and may link this scheme to international programs, for example those of California, Quebec, and Ontario (Szabo 2015).

## EVALUATION

### OUTCOMES

The Mexican government claims that the carbon tax has already led to GHG emission reductions of 1.5 million tCO<sub>2</sub>e (Muñoz 2016).

## CHALLENGES

The carbon tax has been heavily criticized in the media and is opposed by a large number of energy sector companies, as well as the principal Mexican business association. Various sector representatives held meetings with senators and deputies seeking to convince them to reject the tax. Interest groups representing heavy industry have claimed that there is minimal opportunity to reduce emissions for many users because of the absence of viable lower-carbon alternatives for energy users. They therefore argued that, until broader reforms that make alternatives more viable have been introduced in the energy sector, the tax is primarily a revenue-collection measure and will not lead to major emission reductions. This pressure ultimately led the government to agree to allow CERs to be surrendered in lieu of a tax payment. The government has also introduced wider fiscal and energy sector reforms that seek to make the sector more responsive to price signals, thereby rendering the tax more effective (Ludovino Lopes Advogados et al. 2014, 69).

Mexico has expressed a commitment in its Intended Nationally Determined Contributions (INDCs) to reaching its maximum level of GHG emissions close to 2026 and reducing GHG emissions by 50% relative to 2000 levels by 2050 (Government of Mexico 2015, 2). However, Mexico's economy is expected to grow substantially through 2050, and the massive infrastructural requirements will have significant implications for GHG emissions, which will likely determine whether Mexico will reach its goals by 2050 (Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 8).

Additional challenges relate to the substantial amount of fuel that is stolen (before any payment of tax) and sold on the black market by organized crime gangs (Muñoz 2016).

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# NORWAY

## CARBON TAX – ACT CONCERNING SALES TAX AND ACT RELATING TO TAX ON DISCHARGE OF CO<sub>2</sub> TAX IN THE PETROLEUM ACTIVITY ON THE CONTINENTAL SHELF (1990)

### OVERVIEW

LEVEL OF TAX: National | YEAR OF ADOPTION: 1991

#### BRIEF DESCRIPTION OF TAX:

Norway introduced a carbon tax in 1991. The tax covers CO<sub>2</sub> emissions from heating oil, diesel, natural gas, gasoline, and LPG. The rate per CO<sub>2</sub>e varies by sector, fuel type, and use, with the highest rates applying to offshore petroleum. Except for offshore petroleum and aviation, emissions covered by the EU ETS are exempted from the carbon tax. There is also a GHG tax on HFC and PFC. About 80% of Norway's GHG emissions (excluding changes for Land Use, Land-Use Change and Forestry, LULUCF) are subject to the carbon tax and/or the EU ETS (Norwegian Ministry of Climate and Environment 2014, 8).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**5,136,475 (2014)**  
(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$67,228.40 (2014)**  
(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**2.2% (2014)**  
(World Bank, 2015b)

##### MAJOR SOURCES OF GHGs (2014) With changes for Land Use, Land-Use Change and Forestry (LULUCF)

**Energy (73%); Industrial Processes and Product Use (16%); Agriculture (8%); Waste (3%); LULUCF (-47%)**  
(Norwegian Environment Agency, Statistics Norway, and Norwegian Institute of Bioeconomy Research 2016, 35)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 51,900,000 (1990); 53,200,000 (2014)**

**With LULUCF: 41,400,000 (1990); 27,700,000 (2014)**

**Change: +2.5% (without LULUCF); -33.1% (with LULUCF)**

(Norwegian Environment Agency, Statistics Norway, and Norwegian Institute of Bioeconomy Research 2016, 35)

##### TOTAL GHG EMISSIONS (metric tons of CO<sub>2</sub>e per capita)

**Without LULUCF: 12.5 (1990); 10.1 (2014)**

**With LULUCF: 8.1 (1990); 6.5 (2014)**

(World Bank, 2015c; Norwegian Environment Agency, Statistics Norway, and Norwegian Institute of Bioeconomy Research 2016, 35)

### ENERGY CONSUMPTION BY SOURCE (2014)

**Oil (39%); Hydroelectricity (37%); Gas (19%)**

*(The Shift Project Data Portal 2016)*

### TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)

**Primary energy production: 9.919 Quadrillion BTUs**

**Primary energy consumption: 1.938 Quadrillion BTUs**

**Surplus: 7.981 Quadrillion BTUs**

*(U.S. EIA 2016a; U.S. EIA 2016b)*

### HUMAN DEVELOPMENT INDEX

*(United Nations Development Program 2014 – Score/1.00, Rank/188)*

**Score: 0.944/1.00**

**Rank: 1/188**

*(UNDP 2015)*

### LEVEL OF PERCEIVED CORRUPTION

*(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)*

**Score: 87/100**

**Rank: 5/167**

*(Transparency International, 2015)*

### GOVERNMENT CAPACITY

*(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)*

**Voice & Accountability: 100**

**Political Stability and Absence of Violence/Terrorism: 90.3**

**Government Effectiveness: 96.6**

**Regulatory Quality: 92.3**

**Rule of Law: 99**

**Control of Corruption: 99**

*(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The purpose of the CO<sub>2</sub> tax was to internalize the external costs of emissions and thereby reduce emissions and encourage investments in low-carbon technology (IEEP 2013, 79).

## DESIGN

### COVERED SOURCES AND SECTORS

The carbon tax applies to heating oil, diesel, gasoline, LPG, and natural gas (approximately 60% of total GHG emissions) (Norwegian Ministry of Climate and Environment 2014, 9). A GHG tax is also levied on HFCs and PFC. The use of coal and coke, which is marginal, was covered by the carbon tax from 1992 to 2003, but is no longer subject to it (IEEP 2013, 80).

The tax covers many economic sectors. Full exemptions are made for international air and maritime transport and fishing in distant waters. A reduced rate applies to fishing in inshore waters as well as to the herring meal and fishmeal industries. Some sectors are exempt from a CO<sub>2</sub> tax on gas, including commercial greenhouses and freight and passenger transport within the domestic shipping sector.

Partly to avoid double regulation, sectors covered by the EU ETS are exempted from the carbon tax, with the exception of offshore petroleum and domestic aviation. The carbon tax and the EU ETS both put a price on GHG emissions. If the ETS cap is predefined and economically binding, a carbon tax on emissions covered by ETS will not reduce total emissions, but only reduce the price on allowances. In addition to petroleum production and aviation within the European Economic Area (EEA), most of the Norwegian manufacturing industry is subject to the EU ETS. Currently about 80% of Norway's GHG emissions are covered either by the carbon tax or the EU ETS or both. The main sectors not subject to direct pricing of GHG emissions are agriculture and waste.

## POINT OF REGULATION

**Upstream and midstream.** The carbon tax applies upstream to oil and gas companies operating on the continental shelf. The carbon tax applies midstream to fuels, as sales taxes have to be paid to the Norwegian Tax Administration by midstream suppliers after collection from downstream users.

TAX RATE  
(in NOK and USD per tCO<sub>2</sub>e)

The 2016 tax rates ranged from NOK 29–445 /tCO<sub>2</sub>e (US\$4–54 /tCO<sub>2</sub>e), depending on sector, fuel type, and use (World Bank 2014, 81; Bruvoll and Dalen 2009, 4). The rates for offshore petroleum are the highest (World Bank 2014, 81). The tax rates are reviewed and adjusted annually (IEEP 2013, 79). In December 2015, a government-sponsored green tax commission proposed a general carbon tax rate of NOK 420/tCO<sub>2</sub>e (US\$0.52/tCO<sub>2</sub>e) for all non-ETS sectors (NOU 2015), but the proposal met with significant opposition.

## METHODOLOGY USED TO ESTABLISH TAX RATE

Tax rates are generally set in the yearly budget as a result of political negotiation (IEEP 2013, 81).

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

Industrial processes are exempt from the carbon tax but since 2005 have been partly covered by the Norwegian ETS, which has been linked to the EU ETS since 2008. Since 2013, industrial processes have been fully covered by the EU ETS.

Fishing in distant waters, international aviation, and international shipping are exempted from CO<sub>2</sub> taxes. Fishing and shipping in inshore waters and greenhouses enjoy exemptions from the CO<sub>2</sub> tax on natural gas.

## IMPLEMENTING AGENCIES AND APPROACHES

The CO<sub>2</sub> tax on petroleum activities is administrated by the Norwegian Petroleum Directorate. The ordinary CO<sub>2</sub> tax collected through the sales tax is administrated by the Norwegian Tax Administration.

## MONITORING AND ENFORCEMENT &amp; EFFORTS TO PREVENT FRAUD AND CORRUPTION

Each petroleum installation on the continental shelf must have a license to operate. The petroleum companies are required to measure, report, and pay their carbon tax semiannually to the Norwegian Petroleum Directorate. Petroleum companies are charged interest for late payments, with appropriate rates being determined by the King. Failure to comply with the law is subject to fines and up to three months imprisonment (Act Relating to Tax on Discharge of CO<sub>2</sub> in the Petroleum Activities on the Continental Shelf 1990).

The Act concerning Sales Tax imposes fines on individuals/businesses for failing to pay excise taxes and allows the Norwegian Tax Administration to impose administrative fines for nonpayment.

## USE OF TAX REVENUES

CO<sub>2</sub> tax revenues from the petroleum industry go to the Global Government Pension Fund to contribute to the government savings needed for the financing of the rising public pension expenditures and to support long-term priorities for the spending of government petroleum revenues. Other revenues from the carbon tax have generally gone to the national budget.

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

In addition to the carbon tax and tax on the GHGs HFCs and PFCs, Norway has a broad range of environmental taxes, including a road usage tax on engine fuels, a tax on lubrication oil, a sulphur tax, a tax on NO<sub>x</sub> emissions, a tax on chemicals harmful to health and the environment, and a tax on beverage packaging. Norway also uses emissions trading schemes (EU ETS), different types of direct regulations, and direct subsidies to encourage R&D and innovation. In addition, flaring has been banned from the Norwegian continental shelf gas and oil production sites since 1971. Tax reliefs to promote the purchase of environmentally friendly cars are also applied in Norway.



## EVALUATION

### OUTCOMES

Calculating the effect of policy measures ex post involves considerable methodological difficulties. A rough estimate of the mitigation effects of the carbon taxes suggests that emissions would have been more than 6 to 7 million tons of CO<sub>2</sub>e higher in 2010 than without the tax (Norwegian Ministry of Climate and Environment 2014, 65). Under the Kyoto Protocol's first commitment period (2008–12), Norway was committed to limit GHG emissions to on average 1% above 1990 levels and has overachieved its Kyoto commitment for the period 2008–12 through domestic measures and the use of Kyoto flexibility mechanisms (Norwegian Ministry of Climate and Environment 2014, 120).

Domestic GHG emissions (without LULUCF) increased by 2.5% between 1990 and 2014 (Norwegian Environment Agency, Statistics Norway, and Norwegian Institute of Bioeconomy Research 2016, 35). Norway has had a strong GDP and population growth rate, while its energy intensity has decreased even as total emissions have increased. The energy intensity (measured as mainland energy consumption / mainland GDP) in 2014 had decreased by more than 40% with respect to 1990 (Norwegian Ministry of Climate and Environment 2014, 113).

The carbon tax has also encouraged technological innovation. As a result of the carbon tax, StatoilHydro developed a carbon sequestration project that involved injecting carbon dioxide from natural gas into the sea floor to substantially reduce its carbon dioxide emissions and associated carbon taxes (Abboud 2008).

### CHALLENGES

When the carbon tax was first proposed in 1990, industry opposed the tax by arguing that the policy would have a negative impact on jobs and international competitiveness (Abboud 2008). This led to the introduction of numerous carbon tax exemptions, which may have undermined its effectiveness.

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# PORTUGAL

## CARBON TAX AND GREEN TAXATION REFORM – LAW NO. 82-D (2014)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 2014

#### BRIEF DESCRIPTION OF TAX:

Portugal adopted its Green Taxation Reform in 2014 to avoid increases in other taxes to address budget constraints. At the same time, it set a national target to reduce GHG emissions by 40% compared to 1990 levels and increase the share of renewable energy to 40% by 2030 (Government of Portugal, Ministry of Environment Spatial Planning and Energy 2014). To meet its goal, the Portuguese government introduced a carbon tax of €5/tCO<sub>2</sub>e (US\$5/tCO<sub>2</sub>e) on non-EU ETS sectors. Revenues from the carbon tax were intended to be redistributed to low-income individuals (Kossoy et al. 2015, 46).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**10,401,062 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$18,384.90 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**0.9% (2014)**

(World Bank, 2015b)

**MAJOR SOURCES OF GHGs (2014)** Without changes for Land Use, Land-Use Change and Forestry (LULUCF) Energy industries (23%); Manufacturing Industry and Construction (12%); Transport (24%); Other energy sectors (7%); Fugitive emissions (2%); Agriculture (11%); Waste (11%); Industrial Processes and Product Use (10%)

(Pereira et al. 2016, 2–7)

**TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS** (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 60,656,000 (1990); 64,620,000 (2014)**

**With LULUCF: 62,404,000 (1990); 54,588,000 (2014)**

**Change: +6.5% from 1990 levels (without LULUCF); -12.5% from 1990 levels (with LULUCF)**

(Pereira et al. 2016, 2–6)

##### TOTAL GHG EMISSIONS (metric tons of CO<sub>2</sub>e per capita)

**Without LULUCF: 6.0 (1990), 6.2 (2014)**

**With LULUCF: 6.3 (1990); 5.2 (2014)**

(World Bank 2015c; Pereira et al. 2016, 2–6)

##### ENERGY CONSUMPTION BY SOURCE (2014)

**Oil (57%); Gas (18%); Coal (9%); Wind (8%)**

(The Shift Project Data Portal 2016)

**TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy production: 0.162 Quadrillion BTUs****Primary energy consumption: 1.11 Quadrillion BTUs****Deficit: -0.948 Quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.83/1.00****Rank: 43/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 63/100****Rank: 28/167***(Transparency International, 2015)***GOVERNMENT CAPACITY***(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 83.3****Political Stability and Absence of Violence/Terrorism: 73.3****Government Effectiveness: 79.8****Regulatory Quality: 75.0****Rule of Law: 84.1****Control of Corruption: 79.3***(World Bank, 2015e)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

Since Portugal passed the carbon tax as part of a broader green taxation reform, one can look to the broader goals of the Green Taxation Reform for evidence of the carbon tax's goals. The stated goals of the Green Taxation Reform were:

- To promote energy independence
- To encourage more sustainable production and consumption
- To promote environmentally-friendly innovations
- To encourage more efficient use of resources
- To advance economic development
- To create new sources of government revenue
- To pursue international commitments

The Green Taxation Reform hopes to achieve a “triple dividend” of environmental protection and energy independence, economic growth and job creation, and enhanced government fiscal responsibility (Government of Portugal, Ministry of Environment Spatial Planning and Energy 2014, 32).

## DESIGN

### COVERED SOURCES AND SECTORS

The carbon tax applies to oil, gas, and coal (approximately 26% of the country's total GHG emissions) (Kossoy et al. 2015, 46; World Bank 2015d, 3).

The tax is levied on all energy use by sectors not covered by the EU ETS (Kossoy et al. 2015, 46).

The sectors exempt from the EU ETS carbon tax are the following: power stations and other combustion installations, oil refineries, coke ovens, metal ore roasting and sintering installations, iron and steel production, cement clinker production, glass manufacturing, ceramic manufacturing, bricks, lime, and pulp and paper production (European Commission 2008).

## POINT OF REGULATION

**Midstream.** The tax is levied on primary energy purchased by firms, which is consistent with Portugal's existing energy policy (Pereira and Pereira 2015).

TAX RATE  
(in EUR and USD per tCO<sub>2</sub>e)

A carbon tax of €5/tCO<sub>2</sub>e (US\$5/tCO<sub>2</sub>e) was imposed on January 1, 2015. This rate is adjusted annually, based on the average EU allowance auction clearing price of preceding years (Kossoy et al. 2015, 46; Law No. 82-D, Section VI).

## METHODOLOGY USED TO ESTABLISH TAX RATE

The Commission for Environmental Tax Reform (Comissão para a Reforma da Fiscalidade Verde, CRFV) indexed the price of carbon to the current and expected values of the EU ETS. The carbon tax had been expected to start at €6/tCO<sub>2</sub>e, rise to €10/tCO<sub>2</sub>e by 2020, and reach €35/tCO<sub>2</sub>e by 2030 (Pereira et. al, 2016, 114). However, Parliament set the initial rate at €5/tCO<sub>2</sub>e, suggesting the final rate was established through some degree of political compromise.

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

Efforts to contain implementation costs include:

- Recycling of revenue to lower income taxes
- Exempting companies covered by the EU ETS

## IMPLEMENTING AGENCIES AND APPROACHES

The Department of Environment, Spatial Planning, and Energy is involved in the implementation.

## MONITORING AND ENFORCEMENT &amp; EFFORTS TO PREVENT FRAUD AND CORRUPTION

Information not available.

## USE OF TAX REVENUES

The full green tax reform package aims to be revenue-neutral, and the revenues will at least initially be used to offset income taxes to lower-income families (Kossoy et al. 2015, 46). After 2015, there is no obligation to use the revenues from the tax to offset personal income taxes and revenues can be directed to the general fund (Pereira et al. 2016, 114).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The Portuguese CO<sub>2</sub> tax was part of a broader Green Taxation Reform introduced in Portugal in 2014 that sought to advance energy independence, promote economic growth and job creation, and increase government revenues. The Green Taxation Reform included the following:

- A CO<sub>2</sub> tax
- An increase in the motor vehicle tax, based on CO<sub>2</sub> emissions
- A tax on plastic bags
- Revisions to the Hydric Resources Tax and Waste Management Tax
- Incentives for the purchase of lower-emissions vehicles
- Incentives for the retirement of end-of-life vehicles
- Property taxes incorporating the value of ecosystems
- Corporate taxes recognizing local impacts
- The establishment of the Nature Conservation Fund
- Encouragement of the corporate programs for bike- and car-sharing (Government of Portugal, Ministry of Environment Spatial Planning and Energy 2014, 33)

## EVALUATION

### OUTCOMES

An early evaluation of the Portugal carbon tax by the European Commission estimated that the Green Taxation Reform could reduce CO<sub>2</sub> emissions by 92 million tons of CO<sub>2</sub> (2% of total emissions) by 2020. In addition, it estimated that employment in Portugal could increase by 29% by 2020 and by 39% by 2030 as a result of the Green Tax Reforms (Diemer 2013, 18–19). However, the report did not isolate the impacts of the carbon tax from the Green Tax Reform package as a whole.

### CHALLENGES

Several studies have concluded that Portugal's Green Taxation Reform will not be sufficient to reach the country's stated emission reduction goal of 40% below 1990 levels by 2030. One study by Pereira and Pereira (2015) states that a steady energy efficiency gain of 2 to 2.5 percent and a carbon tax of at least €35/tCO<sub>2</sub>e would be required to meet its goals (Pereira and Pereira 2015).

Pereira et al. (2016) criticized the Portuguese government for not enacting the carbon tax as originally proposed by the Commission for Environmental Tax Reform. Under the original CRFV proposal, 50% of carbon tax revenues were to be used for investment tax credits; 25% was to be used to reduce employer Social Security payments; and 25% was to be used to lower personal income taxes. The researchers state that because the government sidestepped several characteristics of the proposed tax, the triple dividend will not be achieved and the new carbon tax will likely have detrimental effects on the economic and fiscal performance of Portugal (Pereira et al. 2016, 115–116).

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# SOUTH AFRICA

## CARBON TAX (PROPOSED)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 2017

#### BRIEF DESCRIPTION OF TAX:

The South African carbon tax bill was published for public comment in November 2015, with its implementation being expected in the second half of 2017. Its goal is to reduce GHG emissions by 34% below business as usual (BAU) by 2020 and by 42% below BAU by 2025. The tax rate will begin at R 120/tCO<sub>2</sub>e (US\$8.50/tCO<sub>2</sub>e) and will increase by CPI + 2% each year through 2019 (R 145.20 ~ US\$9.50). The tax covers all direct GHG emissions from fossil fuel combustion, industrial processes, product use, and fugitive emissions. The tax is based on fuel inputs for stationary sources and incorporated into the current fuel tax regime for nonstationary sources.

All South African businesses subject to the tax will be given a tax exemption on the first 60% of their GHG emissions. Certain industries will receive additional thresholds, capped at a total threshold of 95% of emissions. These thresholds and allowances may be reduced after the first phase of the carbon tax ends in 2020. Given the substantial number of allowances associated with the tax regime, it has been estimated that the effective carbon tax rate will lie between R 6 and R 48 per tCO<sub>2</sub>e.

The revenue from the tax is expected to be used for an energy efficiency savings tax incentive, a decrease in the electricity levy; a tax credit for renewable energy purchases; free basic energy services for low-income individuals; support for public transport; and support for rail transport for freight (National Treasury 2015; National Treasury 2016).

The South African government is considering the migration to an emissions trading scheme for some sectors, with a combination of some grandfathering of allowances based on benchmarking and some auctioning of allowances (National Treasury 2016, 37).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**54,001,953 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$6,086.40 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**1.5% (2014)**

(World Bank, 2015b)

##### MAJOR SOURCES OF GHGs (1994)

**Without LULUCF: Energy (78.3%); Industrial Processes (8.0%); Agriculture (9.3%); Waste (4.3%)**

**With LULUCF: Energy (82.4%); Industrial Processes (8.4%); Agriculture (9.8%); Waste (4.5%); LULUCF (-5.2%)**  
(UNFCCC 2016)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without Changes for LULUCF: 347,349,360 (1990); 544,314,000 (2010)**

**With LULUCF: 330,366,990 (1990); 518,239,000 (2010)**

**Change: +56.7% from 1990 levels (without LULUCF); +56.8% from 1990 levels (with LULUCF)**

(UNFCCC 2016; Department of Environmental Affairs, Republic of South Africa 2014, 37)



**TOTAL GHG EMISSIONS** (metric tons of CO<sub>2</sub>e per capita)**Without LULUCF: 9.9 (1990); 9.9 (1994)****With LULUCF: 9.4 (1990); 9.4 (1994)***(World Bank 2015c; UNFCCC 2016)***ENERGY CONSUMPTION BY SOURCE (2014)****Coal (71%); Oil (23%)***(The Shift Project Data Portal 2016)***TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy production: 6.052 quadrillion BTUs****Primary energy consumption: 5.439 quadrillion BTUs****Surplus: 0.613 quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.666/1.00****Rank: 116/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 44/100****Rank: 61/167***(Transparency International, 2015)***GOVERNMENT CAPACITY***(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 68.5****Political Stability and Absence of Violence/Terrorism: 43.2****Government Effectiveness: 65.4****Regulatory Quality: 63.9****Rule of Law: 63.9****Control of Corruption: 54.3***(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The goal of the carbon tax is to reduce GHG emissions by 34% below BAU by 2020 and by 42% below BAU by 2025 (National Treasury 2015).

## DESIGN

### COVERED SOURCES AND SECTORS

The tax covers most GHG emissions from fossil fuel combustion, industrial processes, and fugitive emissions. Due to the challenges with emissions measurement in the waste and land-use sectors, these sectors will be exempt from the tax through Phase 1. Fuels used for international flights and ships will initially also be excluded from the tax. Emissions from gasoline and diesel will be covered under the existing fuel tax regime (National Treasury 2015).

### POINT OF REGULATION

**Midstream.** The tax is applied to emission generators (Ernst and Young 2015).

### TAX RATE (in ZAR and USD per tCO<sub>2</sub>e)

The headline tax rate will begin at R 120/tCO<sub>2</sub>e (US\$8.50/tCO<sub>2</sub>e) and the effective tax rate will lie in the R 6–48 /tCO<sub>2</sub>e range. The tax rate will increase by CPI + 2% each year through 2019 (R 145.20 ~ US\$9.50) (Energy Research Centre 2015, 2).

### METHODOLOGY USED TO ESTABLISH TAX RATE

The National Treasury's Carbon Tax Policy Paper (2013) noted the tax should be modest to contain compliance costs and ease the country's transition to a low-carbon economy (National Treasury 2013, 58).

### MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

All South African businesses subject to the tax will be given a tax-free exemption on the first 60% of their GHG emissions. Certain industries will receive additional thresholds, capped at a total threshold of 95% of emissions:

- 10% bonus for industrial process emissions
- Up to 10% bonus for trade-exposed industries
- Up to 5% bonus based on company performance against emissions intensity benchmarks to recognize early actions
- Between 5 and 10 percent allowance for carbon offsets generated in South Africa, depending on the sector
- A 5% bonus for companies that participate in Phase 1 of the carbon budgeting system (through 2020)

These thresholds and allowances may be reduced after the first phase of the carbon tax ends in 2020 (National Treasury 2015; National Treasury 2016).

### IMPLEMENTING AGENCIES AND APPROACHES

The South African Revenue Service (SARS) will administer the carbon tax. The Department Environmental Affairs will oversee the monitoring and verification system and maintain emissions data in the National Atmospheric Emissions Information System (NAEIS). The Department of Energy will collate energy use data as well as supply them to the NAEIS and administer the carbon offset system (National Treasury 2015; Republic of South Africa 2015, 6).

### EFFORTS TO PREVENT FRAUD AND CORRUPTION

Information not available.

### USE OF TAX REVENUES

The revenue from the carbon tax will go to the National Revenue Fund, because of national provisions against earmarking, but is expected to be used for the following purposes: an energy efficiency tax incentive; a decrease in the electricity levy; a tax credit for renewable energy purchase; free basic energy services for low-income individuals; support for public transport; and support for rail transport of freight (Energy Research Centre 2015, 4). The overall impact of the carbon tax is expected to be revenue-neutral (National Treasury 2016, 45).

### LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The carbon tax will be tied to the carbon offsets program administered by the Department of Energy, for which draft regulations were issued in June 2016. Under the proposed regulations, projects eligible for carbon credits must relate to nontaxable activities; be based in South Africa; not appear on the negative list; begin after January 1, 2017; and be approved by the Clean Development Mechanism, Verified Carbon Standard, Gold Standard, or South African Department of Energy (Ernst and Young 2016).

## MONITORING AND ENFORCEMENT PROVISIONS

Energy use will be reported into the Central Energy Database and supplied to the NAEIS to support monitoring and verification efforts (National Treasury 2015).

## EVALUATION

### OUTCOMES

While additional modeling is still in process, an early study by the National Treasury suggested a broad-based carbon tax that is implemented gradually and recycles tax revenues will decrease GHG emissions with minor short-term negative impacts on the economy. In the medium to long term, such a policy would help South Africa transition to a low-carbon economy and create green jobs (National Treasury 2015).

### CHALLENGES

A report by the Energy Research Centre expressed concerns over the nation's administrative capacity of monitoring, reporting, and verification (MRV). This same report also expressed concerns that the bill in its current form did not explicitly allow for regular reviews of the legislation, which could prove to be challenging if South Africa fails to achieve its stated environmental objectives (Energy Research Centre 2015, 5–6).

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# SWEDEN

## CO<sub>2</sub> TAX (KOLDIOXIDSKATT) (1991)

### OVERVIEW

LEVEL OF TAX: National | YEAR OF ADOPTION: 1991

#### BRIEF DESCRIPTION OF TAX:

Sweden introduced a CO<sub>2</sub> tax in 1991 in an effort to reduce fossil fuel consumption, decrease CO<sub>2</sub> emissions, and encourage technological innovation. While originally part of a major tax reform, the CO<sub>2</sub> tax has evolved substantially over time to reflect economic developments, expand its coverage and, more recently, to align it with the EU ETS. The full tax rate in 2016 corresponded to SKr 1,120/tCO<sub>2</sub>e (US\$132/tCO<sub>2</sub>e), making it the highest existing carbon pricing mechanism in the world. Energy-intensive industries are typically covered by the EU ETS and do not face the CO<sub>2</sub> tax. Industries not covered by the EU ETS have enjoyed a reduced CO<sub>2</sub> tax rate. However, the reduced rate is gradually being phased out between 2010 (21% of the general tax rate paid) and 2018 (100% of the general tax rate paid) so there will eventually no longer be a reduced tax rate. The tax covers fossil fuels used for heating purposes and motor fuel consumption (approximately responsible for 42% of total GHG emissions). The tax has been widely considered an effective tool to significantly reduce Sweden's CO<sub>2</sub> emissions, which have fallen on average 0.5% annually since 1990 (Ludovino Lopes Advogados et al. 2014, 74; World Bank 2014a, 82).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**9,696,110 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$46,066.70 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**2.3% (2014)**

(World Bank, 2015b)

##### MAJOR SOURCES OF GHGS (2014) Without changes for Land Use, Land-Use Change and Forestry (LULUCF)

**Energy (72.2%); Industrial processes and product use (11.8%); Agriculture (13.1%); and Waste (2.8%)**

(Adriansson et al. 2016, 27)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without Changes for LULUCF: 71,917,000 (1990); 54,383,000 (2014)**

**With LULUCF: 34,945,000 (1990); 9,316,000 (2014)**

**Change: -24.3% from 1990 levels (without LULUCF); -73.3% from 1990 levels (with LULUCF)**

(Adriansson et al. 2016, 27)

##### TOTAL GHG EMISSIONS (metric tons of CO<sub>2</sub>e per capita)

**Without LULUCF: 8.4 (1990); 5.6 (2014)**

**With LULUCF: 4.0 (1990); 0.99 (2014)**

(World Bank 2015c; Adriansson et al. 2016, 27)

**ENERGY CONSUMPTION BY SOURCE (2014)****Nuclear (40%); Oil (37%); Hydroelectricity (13%)***(The Shift Project Data Portal 2016)***TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy production: 1.416 quadrillion BTUs****Primary energy consumption: 2.256 quadrillion BTUs****Deficit: -0.84 Quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.907/1.00****Rank: 14/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 89/100****Rank: 3/167***(Transparency International, 2015)***GOVERNMENT CAPACITY***(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 99.5****Political Stability and Absence of Violence/Terrorism: 86.9****Government Effectiveness: 95.7****Regulatory Quality: 96.2****Rule of Law: 97.6****Control of Corruption: 97.6***(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

Sweden first introduced a CO<sub>2</sub> tax in 1991 in an effort to reduce fossil fuel consumption, decrease CO<sub>2</sub> emissions, and encourage technological innovation (Ludovino Lopes Advogados et al. 2014, 72).

## DESIGN

### COVERED SOURCES AND SECTORS

The CO<sub>2</sub> tax applies to fossil fuels used for heating purposes outside the EU ETS and transportation (approximately 42% of the country's total GHG emissions).

The tax covers households as well as the service sectors, industries outside the EU ETS, agriculture, and the transport sector. A partial tax exemption is granted to heating fuels in industries not covered by the EU ETS and to agriculture until the end of 2017. A partial tax exemption also applies to diesel for agricultural vehicles as well as for certain vehicles used in mining.

Fossil fuels used in most EU ETS installations are given full exemption from the CO<sub>2</sub> tax in order to ensure a cost-effective policy design. These installations covered by the EU ETS include: large combustion installations in industry and in combined heat and power (CHP) production, oil refineries, coke ovens, metal ore roasting and sintering installations, iron and steel production, cement clinker production, glass manufacturing, ceramic manufacturing, bricks, lime, and pulp and paper production. District heating plants have a partial CO<sub>2</sub> tax exemption. Fossil fuels used in power stations face a full CO<sub>2</sub> tax exemption, following mandatory EU law provisions, because of the fact that the generated electricity is taxed by an excise duty.

## POINT OF REGULATION

**Upstream.** Close to 500 enterprises are liable to paying the CO<sub>2</sub> tax. Some are large industrial consumers but typically these enterprises are fuel distributors, which pass this cost on to downstream users of fossil fuels.

TAX RATE  
(in SEK and USD per tCO<sub>2</sub>e)

The current full tax rate is SKr 1,120/tCO<sub>2</sub>e (US\$132/tCO<sub>2</sub>e), with reduced rates for certain users listed above. The rate has increased fairly constantly since 1991, when it stood at about SKr 250/tCO<sub>2</sub>e (US\$44/tCO<sub>2</sub>e) (Sumner, Bird, and Smith 2009, 11; World Bank 2014a, 82).

## METHODOLOGY USED TO ESTABLISH TAX RATE

The tax rates are expressed in commonly used trade units, such as per 1,000 kg for coal and per cubic meters (1,000 liters) m<sup>3</sup> for oil products. The methodology to establish these tax rates is to reference information on the content of fossil carbon in the different fuel types, such as gasoline, diesel, coal, and natural gas.

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

Efforts to address carbon leakage include:

- Gradual tax increases (IEEP 2013, 92)
- Lower tax rates for industry and agriculture (Andersson and Lövin 2015)
- Industries that are covered by the EU ETS receive full or partial exemptions from the CO<sub>2</sub> tax

## IMPLEMENTING AGENCIES AND APPROACHES

The Swedish Tax Agency is the central agency responsible for administering the CO<sub>2</sub> tax. The Swedish Environmental Protection Agency is responsible for monitoring and reporting GHG emissions (Nachmany et al. 2015, 4).

## MONITORING AND ENFORCEMENT &amp; EFFORTS TO PREVENT FRAUD AND CORRUPTION

Information not available.

## USE OF TAX REVENUES

Revenue from the Swedish CO<sub>2</sub> tax is generally deposited into the general government fund. Thus, no earmarking of the revenue exists (Sumner, Bird, and Smith 2009, 11).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

In 1991, the Sweden CO<sub>2</sub> tax was introduced to complement the existing energy tax, which during that year was being reduced significantly. During the collection process, the two taxes essentially function as one tax with two different elements (IEEP 2013, 88).

## EVALUATION

## OUTCOMES

The tax has been widely considered an effective tool to reduce Sweden's CO<sub>2</sub> emissions. Between 1990 and 2014, GHG equivalent emissions fell by 24%, while GDP increased by more than 60%. The use of heating fuel for households and services, to which the full tax rate has been applied ever since the tax was introduced, has decreased dramatically. At the same time, the production and use of biofuels, which are exempted from the tax, have increased significantly (Ludovino Lopes Advogados et al. 2014, 74).

## CHALLENGES

As with energy taxation in general, the Swedish tax on CO<sub>2</sub> has been criticized for its potential distributional effects, since low-income households spend a larger share of their income on energy-related goods (Ludovino Lopes Advogados et al. 2014, 74). Reports from the Swedish government suggest the social welfare system is addressing these distributional impacts.



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# SWITZERLAND

## CO<sub>2</sub> LEVY – FEDERAL ACT ON THE REDUCTION OF CO<sub>2</sub> EMISSIONS (2008)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 2008

#### BRIEF DESCRIPTION OF TAX:

In 2008, Switzerland introduced a CO<sub>2</sub> levy covering heating and process fuels (oil, natural gas, and coal) as part of a comprehensive climate policy package to decrease the use of fossil fuels. One-third of the revenue (max. Sw F 300 million) is earmarked for a buildings program subsidizing refurbishment and fuel switching to renewable energy sources. Two-thirds of the revenue is returned to the population on a per capita basis and to the business community based on wages paid to employees. Entities whose competitive position is at risk due to the CO<sub>2</sub> levy can seek exemption from the tax if they enter into a legally binding commitment to lower their CO<sub>2</sub> emissions. Large emitters are mandatorily covered by the country's Emissions Trading System (ETS), which Switzerland seeks to link to the EU ETS. The linkage between the levy and the possibility to be exempted provides an excellent example of the concept of "regulatory choice." At the same time, the existence of a levy establishes a maximum cost of compliance, or effective price ceiling.

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**8,190,229 (2014)**  
(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$59,294.80 (2014)**  
(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**1.9% (2014)**  
(World Bank, 2015b)

##### MAJOR SOURCES OF GHGs (2014) Without changes for Land Use, Land-Use Change and Forestry (LULUCF)

**Energy (77.1%); Industrial processes and product use (8.4%); Agriculture (12.7%); Waste (1.8%)**  
(Bretscher et al. 2016, 55)

##### TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

**Without LULUCF: 53,314,000 (1990); 48,605,000 (2014)**

**With LULUCF: 52,430,000 (1990); 47,656,000 (2014)**

**Change: -8.8% from 1990 levels (without LULUCF); -9.1 % from 1990 levels (with LULUCF)**

(Bretscher et al. 2016, 15)

##### TOTAL GHG EMISSIONS (metric tons of CO<sub>2</sub>e per capita)

**Without LULUCF: 7.9 (1990); 5.9 (2014)**

**With LULUCF: 7.8 (1990); 5.8 (2014)**

(World Bank 2015c; Bretscher et al. 2016, 15)

**ENERGY CONSUMPTION BY SOURCE (2014)****Oil (48%); Nuclear (26%); Hydroelectricity (13%); Gas (12%)***(The Shift Project Data Portal 2016)***TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)****Primary energy production: 0.64 Quadrillion BTUs****Primary energy consumption: 1.284 Quadrillion BTUs****Deficit: -0.644 Quadrillion BTUs***(U.S. EIA 2016a; U.S. EIA 2016b)***HUMAN DEVELOPMENT INDEX***(United Nations Development Program 2014 – Score/1.00, Rank/188)***Score: 0.93/1.00****Rank: 3/188***(UNDP 2015)***LEVEL OF PERCEIVED CORRUPTION***(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)***Score: 86/100****Rank: 7/167***(Transparency International, 2015)***GOVERNMENT CAPACITY***(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)***Voice & Accountability: 99****Political Stability and Absence of Violence/Terrorism: 93.7****Government Effectiveness: 99.5****Regulatory Quality: 96.6****Rule of Law: 98.1****Control of Corruption: 98.6***(World Bank, 2015d)*

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The stated goals of the Swiss government's early climate change efforts were:

- To support the CO<sub>2</sub> Act of 1999's stated objective of reducing energy-related carbon dioxide emissions by 2010 by 10% relative to 1990 levels
- To fulfill its Kyoto obligations to reduce emissions by 8% below 1990 levels by 2008–12 (Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 2)
- To give priority to voluntary action and—on a subsidiary basis, if targets cannot be met otherwise—introduce a carbon levy to set incentives to enhance energy efficiency and the use of renewables

## DESIGN

### COVERED SOURCES AND SECTORS

The carbon tax applies to oil, gas, and coal used for heating, lighting, operation of combined heat and power (CHP) plants, and electricity production (approximately 35% of the total GHG emissions).

The following businesses can be exempted from the carbon levy:

- Large, energy-intensive companies from industries exposed to international competition can apply for exemption from carbon levy and the national ETS if they agree to emission reduction targets
- Large, energy-intensive companies that are covered by the national ETS (usually companies with a total rate of thermal input of at least 20 MW)
- SMEs that voluntarily make emission reduction commitments (World Bank 2014, 56, 82; Federal Office of the Environment 2016a)

## POINT OF REGULATION

Upstream. The CO<sub>2</sub> levy is collected on top of the mineral oil tax from importers at border crossing or upon distribution from warehouse. The tax is paid by downstream users when they purchase fuels, with the amount of the levy printed on invoices (Federal Office for the Environment 2016b).

Companies exempted from the levy can claim a refund of the tax amount paid.

## TAX RATE (in CHF and USD per tCO<sub>2</sub>e)

In 2008, the carbon tax rate was Sw F 12/tCO<sub>2</sub>e (US\$10.68/tCO<sub>2</sub>e). The tax rate has increased gradually over time and reached Sw F 84/tCO<sub>2</sub>e (US\$87/tCO<sub>2</sub>e) in 2016. The tax rate is expected to increase again in 2018, if predefined intermediary targets for CO<sub>2</sub> emissions are not met, with a maximum tax rate of Sw F 120/tCO<sub>2</sub>e (US\$125/t CO<sub>2</sub>e) (Kossoy et al. 2015, 46).

## METHODOLOGY USED TO ESTABLISH TAX RATE

The tax rate is derived on the basis of emission reduction targets and price and cross-price elasticities.

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

The carbon levy effectively sets a price ceiling on compliance costs, while participation in the ETS provides flexibility. The price of carbon has been increased gradually over time.

## IMPLEMENTING AGENCIES AND APPROACHES

The Federal Customs Administration collects the CO<sub>2</sub> levy (Federal Office for the Environment, 2016b) and refunds taxes paid by exempted entities. The Federal Office for the Environment is responsible for granting and overseeing companies exempted by the tax and for distributing the tax revenues (Federal Customs Administration 2016).

## MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

The Federal Customs Administration is allowed to charge fines to individuals or businesses who fail to register to pay the levy, fail to keep accurate payment records, or make false statements regarding levy payments. The agency may also fine individuals or businesses who try to evade the levy a fine of up to three times the amount of the levy (CC641.71, Chapter 8).

## USE OF TAX REVENUES

Roughly two-thirds of the revenue is redistributed to the public on a per capita basis through the health insurance system (only administrative channel), and reduced OASI social insurance contributions for businesses (Federal Office for the Environment, 2016c). Roughly one-third of the revenue, up to Sw F 300 million (US\$301 million), is used to finance carbon dioxide emission reductions from buildings. An additional Sw F 25 million (US\$ 27.5 million) can be directed into a technology fund, which offers loan guarantees for the development of technological innovations in renewable energy, energy efficiency, and improved use of natural resources (Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 6).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The CO<sub>2</sub> levy is part of the Swiss CO<sub>2</sub> Act. The 2011 revision to the CO<sub>2</sub> Act set a GHG reduction goal of 20% below 1990 levels by 2020 (Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 2). It includes provisions for energy efficiency improvements in buildings, emissions standards for passenger vehicles, the national ETS, standards for and the carbon levy on heating and process fuels, and an obligation for motor fuel importers and thermal power plants to offset CO<sub>2</sub> emissions (CC641.71).

The CO<sub>2</sub> levy is linked with the national ETS, which was implemented at the same time as the CO<sub>2</sub> levy. The Swiss ETS used to serve as a voluntary alternative mechanism to the carbon tax. Between 2008 and 2012, firms covered by the levy either paid the levy or participated in the ETS and set individual emission reduction targets. With the revision of the CO<sub>2</sub> Act, the ETS was transformed into a mandatory scheme for big emitters with an opt-in for medium- sized companies.

## EVALUATION

### OUTCOMES

The Federal Office of the Environment recently conducted two studies to estimate the impact of the carbon levy. Two separate models and business surveys were used in the estimation.

The results suggested that:

- The CO<sub>2</sub> levy was highly efficient in reducing emissions. Between 2008 and 2013, the total cumulative reduction effect was estimated to be between 2.5 and 5.4 million tCO<sub>2</sub>
- Approximately three-fourths of these reductions came from households, while only one-fourth of reductions came from industry
- Less CO<sub>2</sub>-intensive fuels (natural gas and renewables) acted as important substitutes for fossil fuels, especially in households
- Larger, energy-intensive firms were more likely to make an effort to reduce emissions (Ramer 2016)

### CHALLENGES

Switzerland is behind on meeting its GHG emissions targets for 2020 so the nation increased its carbon tax levy rates to Sw F 84/tCO<sub>2</sub>e (US\$ 87/tCO<sub>2</sub>e) in 2016 (Le News, 2015). Another increase is expected in 2018, if intermediary targets stipulated in the CO<sub>2</sub> ordinance are not met, up to Sw F 120/tCO<sub>2</sub>e (US\$125/tCO<sub>2</sub>e) (Kossoy et al. 2015, 46).

The direct redistribution of the levy revenues to the private sector, proportional to wages paid, and to the general public, on a per capita basis, limits the overall economic impact of the system (Ludovino Lopes Advogados et al. 2014, 78) and benefits individuals whose fossil fuel energy consumption is below average.

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# UNITED KINGDOM

## CARBON PRICE FLOOR/CARBON PRICE SUPPORT (2013)

### OVERVIEW

**LEVEL OF TAX:** National | **YEAR OF ADOPTION:** 2013

#### BRIEF DESCRIPTION OF TAX:

Since 2005, approximately 45% of GHG emissions in Europe have been covered by the European Union Emissions Trading System (EU ETS). Because of the influx of international credits and the 2008 international financial crisis, there has been widespread concern among government, industry, and civil society that the EU ETS price might not be sending a sufficient price signal to encourage investments in low-carbon technologies and promote the transition from fossil fuel use to lower-carbon energy sources. Though efforts to reform the system have been ongoing, progress has been slow (Sandbag 2012).

Within this context, the United Kingdom established the Carbon Price Floor (CPF)/Carbon Price Support (CPS) in 2013 as a means to “top up” the EU ETS price for covered facilities operating in the United Kingdom whenever the price of ETS allowances falls below the level established by the CPF. This is done by taxing fossil fuels used to generate electricity through its existing Climate Change Levy (CCL), which is used to tax natural gas, liquefied natural gas, and solid fossil fuels, and its Fuel Duty, which is used to tax fuel and gas oil (HM Revenue & Customs 2015d). While the main CCL tax rate is an energy tax applied downstream to business users, the CPS CCL tax rate is applied midstream to electricity generators and takes into account the carbon content of the fuel being used. While the fuel duty is applied when oils leave the refinery, the duties paid by electricity generators could be reclaimed under provisions of the Hydrocarbon Oil Duties (Reliefs for Electricity Generation). By reducing the amount of duty electricity generators could reclaim, the U.K. government effectively created “Oils Carbon Price Support Rates” (Ares 2014, 5).

The CPF and CPS are intended to maintain a clear price for carbon dioxide emissions, thereby encouraging investment in low-carbon technologies. The CPF sets a minimum price for carbon allowances for U.K. electricity generators (Ludovino Lopes Advogados et al. 2014; Sandbag 2012).

### CONTEXT

#### CONTEXT FOR POLICY DESIGN

##### POPULATION

**64,510,376 (2014)**

(World Bank, 2015c)

##### PER CAPITA GDP (based on constant 2005 U.S. dollars)

**\$41,489.60 (2014)**

(World Bank, 2015a)

##### GDP GROWTH RATE (annual %, based on constant 2005 U.S. dollars)

**2.9% (2014)**

(World Bank, 2015b)

**MAJOR SOURCES OF GHGs (2014)** Without Changes for Land Use, Land-Use Change and Forestry (LULUCF) **Energy (83%); Industrial Processes and Product Use (6.8%); Agriculture (8.7%); Waste (3.7%); LULUCF (-1.7%)**

(Brown et al. 2016, 105)



**TOTAL AGGREGATE ANTHROPOGENIC GREENHOUSE GAS (GHG) EMISSIONS** (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>) (metric tons of CO<sub>2</sub>e)

Without LULUCF: 799,840,000 (1990); 527,200,000 (2014)

With LULUCF: 800,090,000 (1990); 518,240,000 (2014)

Change: -34% from 1990 levels (without LULUCF); -35% from 1990 levels (with LULUCF)

(Brown et al. 2016, 36)

**TOTAL GHG EMISSIONS** (metric tons of CO<sub>2</sub>e per capita)

Without LULUCF: 14.0 (1990); 8.2 (2014)

With LULUCF: 14.0 (1990); 8.0 (2014)

(World Bank 2015c; Brown et al. 2016, 36)

**ENERGY CONSUMPTION BY SOURCE (2014)**

Oil (40%); Gas (35%); Coal (14%)

(The Shift Project Data Portal 2016)

**TOTAL PRIMARY ENERGY SURPLUS/DEFICIT (2007)**

Primary energy production: 7.286 Quadrillion BTUs

Primary energy consumption: 9.371 Quadrillion BTUs

Deficit: -2.085 Quadrillion BTUs

(U.S. EIA 2016a; U.S. EIA 2016b)

**HUMAN DEVELOPMENT INDEX**

(United Nations Development Program 2014 – Score/1.00, Rank/188)

Score: 0.907/1.00

Rank: 14/188

(UNDP 2015)

**LEVEL OF PERCEIVED CORRUPTION**

(Transparency International's Corruption Perceptions Index 2015 – Score/100, Rank/167)

Score: 81/100

Rank: 10/167

(Transparency International, 2015)

**GOVERNMENT CAPACITY**

(Worldwide Governance Indicators, World Bank Group 2014 – Percentile Rank out of 100)

Voice & Accountability: 92.1

Political Stability and Absence of Violence/Terrorism: 60.7

Government Effectiveness: 92.8

Regulatory Quality: 97.1

Rule of Law: 94.2

Control of Corruption: 92.8

(World Bank, 2015d)

## OBJECTIVES

### STATED POLICY GOALS/OBJECTIVES

The CPF is designed to encourage investments in low-carbon technologies and to help the United Kingdom achieve its commitment under its Climate Change Act to reduce GHG emissions by 80% by 2050 relative to 1990 levels (Sandbag 2012, 1).

## DESIGN

### COVERED SOURCES AND SECTORS

The CPF/CPS taxes fossil fuels used to generate electricity in Great Britain (England, Scotland, and Wales), covering approximately 25% of the United Kingdom's GHG emissions. Northern Ireland is exempt from the tax (World Bank 2014, 83).

The CPF/CPS applies to the electricity generators, combined heat and power (CHP) generators, and auto generators of electricity in Great Britain (World Bank 2014, 83).

**Exemptions are the following:**

- Use in small generating stations (capacity less than 2 MW)
- Use in small CHP stations (capacity less than 2 MW)
- Use in stand-by generators
- Electricity generated in Northern Ireland
- Use of coal slurry
- Generating stations fitted with Carbon Capture and Storage (CCS) (reduced rate)
- Electricity produced and used on-site at CHP stations that is considered of good quality, that is, meeting efficiency standards established under the CHP Quality Assurance Programme (begun in 2015) (HM Revenue & Customs 2015d, 6–10)

## POINT OF REGULATION

**Midstream.** The CPF/CSP applies to fossil fuels used to generate electricity. The tax applies to electricity companies, some CHP stations, and auto-generators (HM Revenue & Customs 2015d, 1–5).

## TAX RATE (in GBP and USD per tCO<sub>2</sub>e)

The CPS tax rate is calculated two years in advance by comparing the future traded price of carbon on EU ETS allowances with the target CPF. In 2013, the CPF was set at about £16/tCO<sub>2</sub>e (US\$25.87/tCO<sub>2</sub>e) and the corresponding CPS tax rate for 2013–14 was £4.94/tCO<sub>2</sub>e (US\$7.99/tCO<sub>2</sub>e) (Climate Focus 2013, 79).

The level of the CPF was expected to achieve a target price trajectory of £30/tCO<sub>2</sub>e (US\$43.16/tCO<sub>2</sub>e) in 2020 and £70/tCO<sub>2</sub>e (US\$100.70/tCO<sub>2</sub>e) by 2030 (Sandbag 2012, 2).

The CPS tax rate was set at £18.08/tCO<sub>2</sub>e (US\$29.93/tCO<sub>2</sub>e) for 2016–17 and will be capped at this rate through 2020 because of concerns about international competitiveness and carbon leakage (HM Revenue & Customs 2014; World Bank 2014, 83).

## METHODOLOGY USED TO ESTABLISH TAX RATE

Information not available.

## MEASURES USED TO ADDRESS CARBON LEAKAGE AND PROMOTE COST CONTAINMENT

Given persistently low prices in the EU ETS (in the range of the equivalent of US\$5.66 to US\$9.05 per metric ton of CO<sub>2</sub>e over the last couple of years) and the subsequent substantial gap with the CPF/CPS rate, concerns were raised regarding challenges related to international competitiveness and carbon leakage. In response, the CPS was frozen at £18.08/tCO<sub>2</sub>e (US\$29.93/tCO<sub>2</sub>e) in March 2014 until 2020 (Webster 2014; HM Revenue & Customs 2014).

## IMPLEMENTING AGENCIES AND APPROACHES

Electricity generators covered under CCL must register with HM Revenue & Customs using the CCL1 Climate Change Levy Application for Registration form and file taxes using form CCL 100. CHP stations are not required to register with HM Revenue & Customs but are regulated under the CHPQA Programme (HM Revenue & Customs 2015d, 5–6). Electricity generators that produce electricity from oils covered by the fuel duty are required to register with HM Revenue & Customs, pay the full fuel duty, and claim relief from duty on the amount of oil used to produce electricity (HM Revenue & Customs 2016).

The CHPQA Programme is administered by the Department of Energy and Climate Change. Participants are asked to report on a variety of measures, including equipment and facility performance (Department of Energy and Climate Change 2014).

## MONITORING AND ENFORCEMENT & EFFORTS TO PREVENT FRAUD AND CORRUPTION

Companies subject to CCL are required to maintain records on their tax payments, produce the records on request by HM Revenue & Customs, subject to penalties for failure to produce documents, and subject to further penalties for inaccuracies. If a company fails to register to pay its CPS tax under CCL, HM Revenue & Customs can compel the company to register (HM Revenue & Customs 2015d, 13). If a company fails to file or pay CCL in a timely manner, HM Revenue & Customs can charge penalties and interest and require the company to submit monthly returns in the future. HM Revenue & Customs can also take possession of goods if taxes remain unpaid. HM Revenue & Customs can also bring criminal charges, including tax evasion, intent to deceive, evasions/misstatements, and engaging in contracts with the intent to evade taxes (HM Revenue & Customs 2015c).

Participants in the voluntary CHPQA Programme are required to submit a variety of data regularly to the Department of Energy and Climate Change, including: details of the CHP location and responsible person (Form 1), equipment and metering (Form 2), and performance (Form 3 or 4). CHP stations that intend to obtain exemptions from the CPS rate of CCL for good-quality electricity require an exemption certificate from the Secretary of State (Department of Energy and Climate Change 2014).

## USE OF TAX REVENUES

Earmarking is not permitted in the United Kingdom, and so the revenue goes into the general government budget. Some commentators have suggested that the existence of a steady stream of revenue from the CPS is linked to the ability to provide support measures for renewable energy (Carbon Brief, 2013).

## LINK TO OTHER ENVIRONMENTAL REGULATORY INSTRUMENTS AND COMPLEMENTARY POLICIES

The CPF/CPS are linked to the EU ETS for all electricity generators in the United Kingdom. If the price of EU ETS allowances falls below the CPF, the electricity generator pays the corresponding CPS rate to the U.K. Treasury. The CPF/SPS are intended to complement the EU ETS price to encourage new and additional investment in low-carbon power generation.

The CPF/CPS are also linked to the CCL. The CCL, introduced in 2001, requires producers of electricity, natural gas, liquefied natural gas, and solid fossil fuels to charge business consumers the main tax rate of the CCL, which is based on the energy content of fuels. Exemptions to the main tax rate of the CCL included fuels used by electricity generators to produce electricity, electricity generated from renewable energy sources, and electricity produced from CHP stations. The exemption on fuels used by electricity generators for the production of electricity was replaced by the CPS rate of the CCL in 2013 (Deloitte 2011, 1–2).

The CPF/CPS are linked to the Hydrocarbon Oil Duties (Reliefs for Electricity Generation). These regulations, created in 2005, allowed for electricity generators that use oil for the generation of electricity to reclaim the fuel duties paid for electricity generation. The 2013 amendments to these regulations reduced the amount of fuel duties electricity generators could reclaim, thus effectively creating a Carbon Price Support tax rate for oils (HM Revenue & Customs 2012, 2).

The CHPQA Programme is a voluntary program for CHP stations. To receive exemptions from the CPS rate of CCL, CHP stations must obtain an exemption certificate from the Secretary of State confirming their energy efficiency (Department of Energy and Climate Change 2014).

The CPS rates are part of broader electricity sector reforms, aimed at upgrading the U.K. electricity sector. In 2013, the U.K. Parliament passed the Energy Act to establish Emissions Performance Standards for new fossil fuel electricity generators. Electricity generators that meet the performance standards for carbon dioxide emissions receive CCL exemptions (Environmental Defense Fund, CDC Climat Research, Caisse des Dépôts Group, and IETA 2015, 4). In 2014, the U.K. government introduced Contracts for Difference (CfDs), under which a “strike price” is established for various low-carbon technologies. The government pays the generator the difference between the “strike price” and the market price of electricity if market prices fall below the “strike price” and the generator refunds money to consumers if the market price goes above the “strike price” (Department of Energy and Climate Change 2013). In this same year, the United Kingdom also passed Capacity Market legislation that will require the U.K. government to estimate the country’s energy needs four years prior to the delivery year; conduct a “Dutch Auction” to ensure energy capacity is met at the lowest acceptable price to generators; make steady payments to energy providers; and assess penalties if providers fail to deliver on their energy capacity commitments (National Grid 2014).

## EVALUATION

### OUTCOMES

In the impact assessment of the government's proposal for the CPF, it was estimated that the monetized value of changes in GHG emissions would lie in the range of GBP 0.5–1.2 billion per year (Ludovino Lopes Advogados et al. 2014, 79).

In 2015, when the level of the CPF was increased to £18.08 per tCO<sub>2</sub>e, market analysts predicted that this price level could lead to up to 20 TerraWatt hours (TWh) of coal-based generation being replaced by gas-based generation (Guardian 2015).

### CHALLENGES

Some environmental and poverty campaign groups were initially opposed to the CPF/CPS because of fuel poverty considerations and questions over its effectiveness. Several of these groups, however, later supported continuing the policy (Carbon Brief 2014). Some businesses worry the CPF puts U.K. companies at a competitive disadvantage relative to their EU counterparts though others, in particular renewable and nuclear energy producers, advocate a higher price (Carbon Pulse 2016). The U.K. Parliament's Energy and Climate Change Committee and others have expressed the concern that the CPF/CPS may result in carbon leakage within the electricity sector, and thus fail to meet its intended environmental effects. The Energy and Climate Change Committee has also argued for the elimination of the CPF in favor of EU ETS reform, though this appears to ignore that the United Kingdom is actively pursuing EU ETS reform at the same time as it is operating the CPF/CPS (UK Parliament 2012).

The UK government, responding to concerns that the current rate of the CPF/CPS could result in challenges related to international competitiveness and carbon leakage, froze the CPS at £18.08/tCO<sub>2</sub>e (US\$29.93/tCO<sub>2</sub>e) in March 2014 (Webster 2014; HM Revenue & Customs, 2014).

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