

ECON 260

Air Pollution-Control Policy

Learning Objectives

- LO1 Provide a brief overview of Canada's air pollution control policies.
- LO2 Explain the policy issues that arise from Canada's regulation of air contaminants.
- LO3 Describe measures that could be taken to reduce emissions from motor vehicles.
- LO4 Describe the basic components of the Canada-United States policies to reduce acid rain.

Air Pollution Control Policies in Canada

- National targets have been set for the criteria air contaminants
 - These guidelines are objectives, not binding standards
 - Provinces set their own targets and policies for intra-provincial emissions based on scientific information and other criteria
 - There are no federal standards for criteria pollutants, but provinces have followed the guidelines in setting standards
- The core legislation is the 1971 *Clean Air Act (CAA)*, which became the Canadian Environment Protection Act (CEPA)

Clean Air Act (CAA)

- The CAA gave the federal government authority to:
 - Conduct a national program of air-pollution surveillance;
 - Establish air-quality objectives;
 - Establish regulations including standards at the source; and
 - Establish guidelines, which were recommended limits on pollutants.
- Under the CAA, the federal government adopted National Ambient Air Quality Objectives (NAAQOs) for the “Big Five” criteria air contaminants
 - The objectives Canada adopted are similar to those in the USA and other countries around the world

The “Big Five” Criteria Air Contaminants

- Nitrogen oxides (NO_x)
- Sulphur oxides (SO_x)
- Particulate matter (PM)
- Carbon monoxide (CO)
- Volatile organic compounds (VOCs)

Three Levels of NAAQOs

- There are three levels of NAAQOs:
 - **Maximum desirable level is the long-term goal for air quality to protect the population and ecosystems.** It provides a basis for preventing degradation of air quality in relatively unpolluted parts of the country.
 - **Maximum acceptable level is the next lower level of air quality. It is seen as the level of air quality** needed to provide adequate protection against adverse effects of air pollutants on human health and comfort, soil, water, vegetation, animals, materials, and visibility.
 - **Maximum tolerable level represents the lowest boundary before immediate action is required to protect** the health of the general population.

Canada's NAAQOs

- Table 17-2 Canada's National Ambient Air Quality Objectives (NAAQOs)

Pollutant	Averaging Time	Maximum desirable concentration	Maximum acceptable concentration	Maximum tolerable concentration
Sulphur dioxide	Annual	11 ppb	23 ppb	---
	24-hour	57 ppb	115 ppb	306 ppb
	1-hour	172 ppb	344 ppb	--
Carbon monoxide	8-hour	5 ppm	13 ppm	17 ppm
	1-hour	13 ppb	31 ppb	--
Nitrogen dioxide	Annual	32 ppb	52 ppb	--
	24-hour	--	106 ppb	160 ppb
	1-hour	--	213 ppb	532 ppb

Source: "Canada's National Ambient Air Quality Objectives (NAAQOs)," www.hc-sc.gc.ca/ewh-semt/air/out-ext/reg-eng.php#4, Health Canada. Reproduced with the permission of the Minister of Public Works and Government Services, 2010.

CCME

- The Canadian Council of the Ministers of the Environment (CCME) includes all provincial environment ministers who work to implement coordinated policies
- 2012: CCME agreed to implement a broad policy for managing air quality in Canada under what is called the Air Quality Management System (AQMS)
 - Objective to protect human health and the environment with continuous improvement in air quality
 - Covers industrial and transportation sources of air contaminants
- Role of CCME is to design the system
 - Monitoring, enforcement, and reporting the responsibility of provinces and territories

Challenging Policy Issues

Policy issue #1: How do we protect areas that have higher air quality than maximum acceptable level (the non-degradation dilemma)?

- The three levels of NAAQOs take into account existing level of pollution in an area
- Non-degradation dilemma: areas with air quality already better than a national ambient standard could compete unfairly for new industrial development

Policy Issue 2

- Policy issue #2: Should old plants be treated differently than new plants (grandfathering)?
 - U.S. standards often less stringent for older plants than for new plants in any location
 - New source bias: new sources or existing sources that are modified in some major way, usually held to stricter standards than existing, established sources
 - More expensive to retrofit existing plants with pollution-control equipment than to incorporate the equipment into new plants when they are being built

Policy Issue 3

- Policy issue #3: Uniformity of standards
 - NAAQOs an example of a uniform target
 - Creates a policy problem: unless MAC happen to be the same in all regions, uniform national standards will not be efficient
 - Standards that take into account MACs and MDs across regions may be cost-efficient
 - Complex to define and administer

Policy Issue 4

- Policy issue #4: Inefficiency of command-and-control (CAC) policies
 - Environmental economists have estimated the excess costs of the CAC approach to air pollution control inherent in technology-based standards
 - Studies in U.S. find that CAC programs cost more than market-based approaches to achieve a specific level of improvement in air quality
 - Actual control programs are much more costly than they need to be
 - MAC higher, society probably settling for smaller improvements in ambient quality than might be achieved if control programs were fully cost-effective

Motor Vehicle Emissions

- The federal government regulates emissions from new motor vehicles under the *Motor Vehicle Safety Act*, administered by Environment Canada under CEPA
- Problems with all regulations currently in place:
 - Based on emissions per kilometer travelled, no control for *total* number of kilometers driven
 - Emissions per car may fall, but if amount of cars/kilometers increase, emissions may start rising again

- Recall:

Total quantity of emissions = Number of vehicles X Average km travelled X Emissions per km

Motor Vehicle Emissions

Total quantity of emissions = Number of vehicles X Average km travelled X Emissions per km

- The goal is to reduce total emissions cost-effectively by balancing the three factors on the right of the equation according to the equimarginal principle
- Federal motor vehicle emissions standards focus only on the last of these three factors (emissions per km) while not regulating total km or number of vehicles
- Direct incentive-based policy approaches are available:
 - Levy a significantly higher tax on motor-vehicle fuels, e.g., carbon tax
 - Incentive to think more about their driving habits, organize their driving more coherently, reduce total km travelled, shift to more fuel efficient vehicles, use mass transit more
 - Tax vehicle emissions directly (Estimated emissions for a specific car model x the km driven by that car)

Acid Rain

- Sulphur dioxide (SO_2) is responsible for the acidic precipitation that lowers the pH of susceptible lakes, damages forests and buildings, and may contribute to health problems of susceptible individuals
- Flow of SO_2 across the Canada-U.S. border a source of political struggle between the two countries
- Major sources in Canada:
 - Metal smelting companies in Sudbury
 - Coal-fired electric power plants operated by Ontario Hydro

Acid Rain Exports

- U.S. “exports” of SO₂ across the border exceeded Canada’s exports to the US
 - Canada’s position: ambient air quality standards in U.S. weren’t strong enough
 - US has tightened standards and reduced its emissions that affect Canada
- 2000: Canada signed the Ozone Annex
 - Agreement with U.S. to reduce transboundary smog
 - Overall goal: reduce NO_x by 44% in transboundary region by 2010
 - Agreement has been successful

Acid Rain

- The Ozone Annex commits Canada to:
 - Reduce emissions of NO_x in Ontario and Quebec.
 - Annual cap of 39 kilotonnes of NO_x (as NO₂) is to be reached by 2007 for central and southern Ontario
 - Cap of 5 kilotonnes is set for Quebec
 - The federal government has allocated funds to help the fossil-fuel electricity generators meet these targets.
 - Improve air pollution monitoring.
 - Ensure that Canadian fuels and vehicle emissions are in line with U.S. standards.
 - Canadian vehicle emission guidelines now align with those in the U.S.

Chapter Overview

- Air pollution control in Canada has largely been a provincial responsibility.
 - Due to transboundary nature of many air pollutants, the federal government has played a larger role in recent years
- The federal government provided a strong advisory role with the creation of the NAAQOs
- There are many policy problems associated with non-degradation and differential standards vs. uniform standards
 - Not fully cost-effective due to differences in MAC and MD across firms and regions
- Little attention has been given to reducing total vehicle kilometers driven or numbers of vehicles in urban areas with degraded air quality
- Bilateral problem of acid rain led to a unilateral CAC actions in Canada
 - US agreed in 1990 to significant reductions in emissions of SO₂

Chapter 18 will review policies on toxic and hazardous substances.