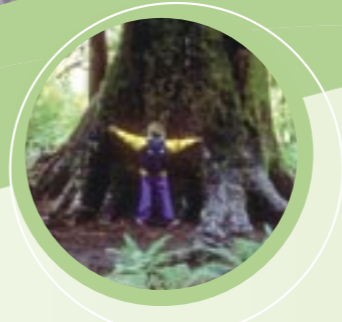


1979–2004  
Twenty-five Years of International Cooperation on the

# Convention on Long-range Transboundary Air Pollution



**Further information on the *Convention* may be obtained from the:**  
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United Nations Economic Commission for Europe

# Introduction

For 25 years, many countries have worked together to address the environmental and health effects of air pollution under the landmark **Convention on Long-range Transboundary Air Pollution** — the first international agreement to recognize that regional solutions are needed to address the flow of air pollution across geographical borders.

Adopted in 1979, the *Convention* established a broad framework for the United Nations Economic Commission for Europe (UNECE) region<sup>1</sup> to work cooperatively on the transport of pollutants through the atmosphere and over borders, oceans and continents.

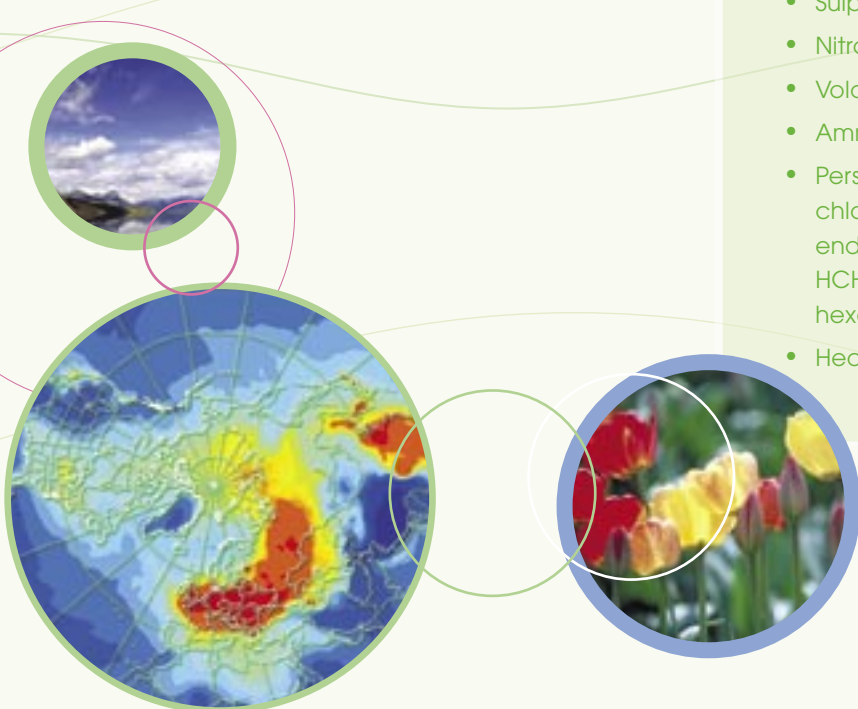
The *Convention* includes a process for negotiating concrete measures to control pollutants through specific agreements called protocols. It also coordinates efforts on research, monitoring and the development of emission reduction strategies on regional air pollution.

This brochure, prepared by the Government of Canada in cooperation with other Parties to the *Convention*, highlights the achievements of the *Convention* and provides information on its current and future work.



## Pollutants Covered under the *Convention*

- Sulphur dioxide
- Nitrogen oxides (NO<sub>x</sub>)
- Volatile organic compounds (VOCs)
- Ammonia
- Persistent organic pollutants (POPs) (aldrin, chlordane, chlordecone, dieldrin, dioxins, endrin, hexabromobiphenyl, furans, mirex, PAH, HCH (or lindane), toxaphene, DDT, heptachlor, hexachlorobenzene, PCBs)
- Heavy metals (cadmium, lead and mercury)



<sup>1</sup> Europe, Central Asia and North America.

# Twenty-five Years of Achievement: A History of Success

The Convention on Long-range Transboundary Air Pollution is a unique example of a cooperative venture that brings together countries, regions and continents to implement effective action for cleaner air.

The link between sulphur emissions in continental Europe and the acidification of lakes in Scandinavia was first suspected by scientists during the 1960s. The link became more established in the 1970s, as evidence increasingly showed that pollutants could travel hundreds of kilometres from their point of emission to affect air quality and ecosystems far away.

In 1972, the United Nations Conference on the Human Environment in Stockholm took up the issue of international cooperation to combat acidification. This effort was strengthened by the results of several studies between 1972 and 1977 that confirmed the long-range transport of pollutants and pointed to the damage they do to health and the environment.

In November 1979, Ministers within the framework of the United Nations Economic Commission for Europe met in Geneva and adopted the *Convention on Long-range Transboundary Air Pollution*.

The *Convention* entered into force in 1983 and now has 49 Parties, including the European Community. It has been extended by eight specific protocols, of which seven are in force.

## Parties and Signatories to the *Convention*

Armenia	Latvia	San Marino (Signatory only)
Austria	Liechtenstein	Serbia and Montenegro
Azerbaijan	Lithuania	Slovakia
Belarus	Luxembourg	Slovenia
Belgium	Malta	Spain
Bosnia and Herzegovina	Monaco	Sweden
Bulgaria	Netherlands	Switzerland
Canada	Norway	The former Yugoslav Republic of Macedonia
Croatia	Poland	Turkey
Cyprus	Portugal	Ukraine
Czech Republic	Republic of Moldova	United Kingdom
Denmark	Romania	United States of America
Estonia	Russian Federation	European Community
Finland		
France		
Georgia		
Germany		
Greece		
Holy See (Signatory only)		
Hungary		
Iceland		
Ireland		
Italy		
Kazakhstan		
Kyrgyzstan		



# The Protocols



While the *Convention on Long-range Transboundary Air Pollution* sets a broad framework for action to stop air pollution, meeting its goals and objectives has been through setting concrete measures under a series of protocols that identify the need for Parties to carry out research and development, to exchange scientific and technical information, and to take part in monitoring programmes.

To promote such activities, the *Convention* has established scientific and technical programmes to improve understanding of the transport and effects of pollutants, and to provide the scientific foundation for decision making.

Each protocol addresses a specific pollutant, groups of pollutants or areas of concern, and together they cover nearly all of the major air pollutants. The protocols provide for reduction of emissions of sulphur dioxide, nitrogen oxides (NO<sub>x</sub>), volatile organic compounds (VOCs), heavy metals, persistent organic pollutants (POPs) and ammonia.

Since 1998, the compliance of individual Parties with their obligations un-

## **The Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone:**

Adopted in 1999, the Gothenburg Protocol sets emission ceilings to be achieved by 2010 for four pollutants: sulphur (as sulphur dioxide), NO<sub>x</sub>, VOCs and ammonia. The Protocol sets limits on specific emission sources, such as combustion plants, electricity production, dry cleaning, cars, paints or aerosols, and some specific ammonia sources. This protocol is expected to be in force by early 2005.

## **The Aarhus Protocol on Persistent Organic Pollutants (POPs):**

Adopted in 1998, the Protocol on Persistent Organic Pollutants (POPs) entered into force in October 2003. It bans the production and use of some substances outright, while scheduling others for elimination or severe restriction at a later stage.

## **The Aarhus Protocol on Heavy Metals:**

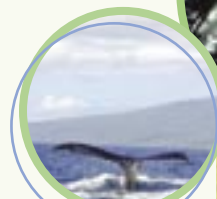
Adopted in 1998, the Protocol on Heavy Metals entered into force in December 2003. It focuses on cadmium, lead and mercury — heavy metals particularly harmful to human health and the environment.


## **The Oslo Protocol on Further Reduction of Sulphur Emissions:**

Adopted in 1994 and entering into force four years later, the Oslo Protocol aims at gradually attaining critical loads for acidification and setting long-term targets for reductions in sulphur emissions. It also emphasizes energy savings.

der the protocols has been subject to regular review by an Implementation Committee established by the *Convention's* Executive Body. This

work has further strengthened the *Convention's* work, by encouraging Parties to meet their commitments in a timely and effective way.





**The Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes:** In order to address a group of major air pollutants responsible for the formation of ground-level ozone, the Protocol entered into force in 1997.

**The Sofia Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes:** Entering into force in 1991, the Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes was adopted in Sofia in 1988. It requires Parties to ensure emissions of nitrogen oxides or their transboundary fluxes at the end of 1994 are not higher than those in 1987, and it requires establishment of critical loads and related emission reduction objectives with a timetable for action.

**The Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent:** Adopted in 1985, the Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes, by at least 30 per cent, entered into force in 1987. As a result of this Protocol, substantial cuts in sulphur emissions have been recorded in Europe.

**The Geneva Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP):** The Protocol on Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) was adopted in 1984 and entered into force in 1988. It provides for international cost-sharing of the EMEP centres.



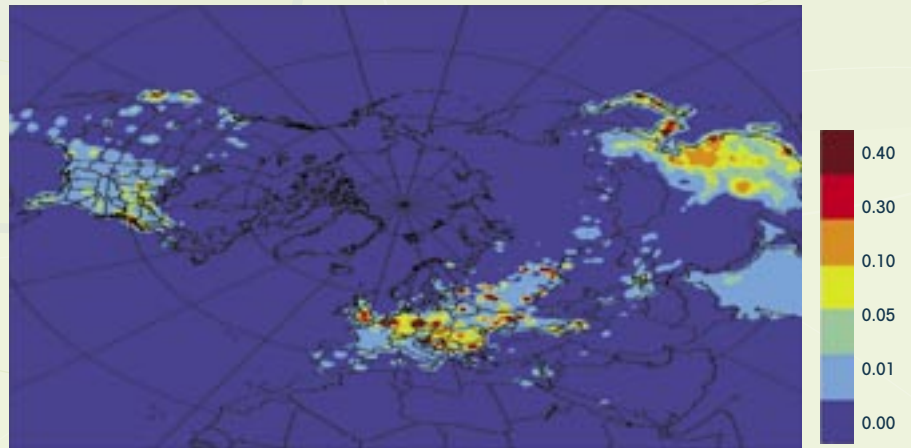
# Science and Monitoring

Strong science is a major reason for the success of the *Convention*. Experts from Europe and North America work together in a wide variety of ways, and results of their research and monitoring not only help design actions under the *Convention*, but often lead the way to domestic and sub-regional initiatives.

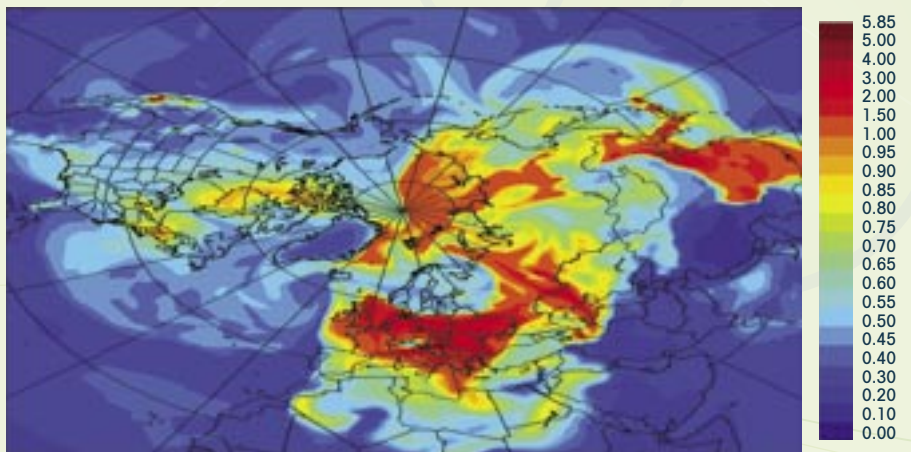
For its foundation science, the *Convention* relies on its Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP), and its Working Group on Effects. Each of these bodies has task forces and programme centres that provide information and results on particular topics.

EMEP provides sound scientific support in the areas of emission inventories and projections, atmospheric monitoring and modelling, and integrated assessment modelling. Results from the monitoring network, together with emission data and atmospheric transport modelling, have shown how air pollution moves through the atmosphere, and have made it possible to quantify the source-receptor relationships

## Distribution of Total Gaseous Mercury (TGM) in Different Seasons



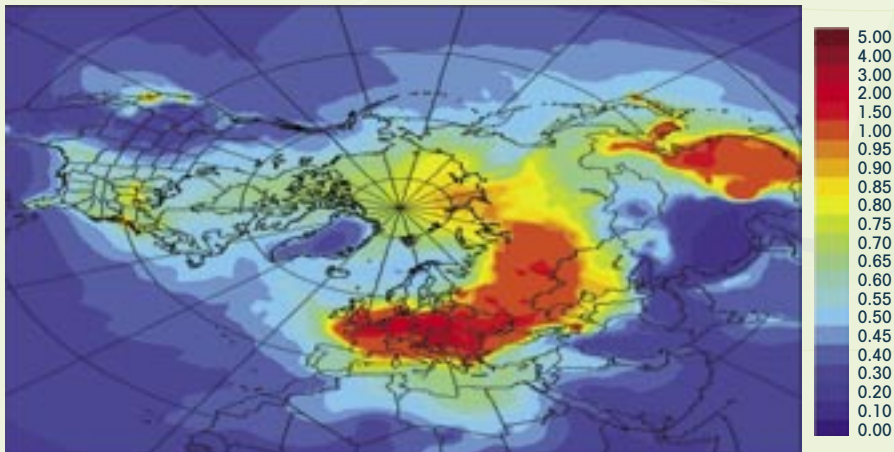
(a) Anthropogenic emissions 1990 (mg Hg/m<sup>2</sup>/yr)



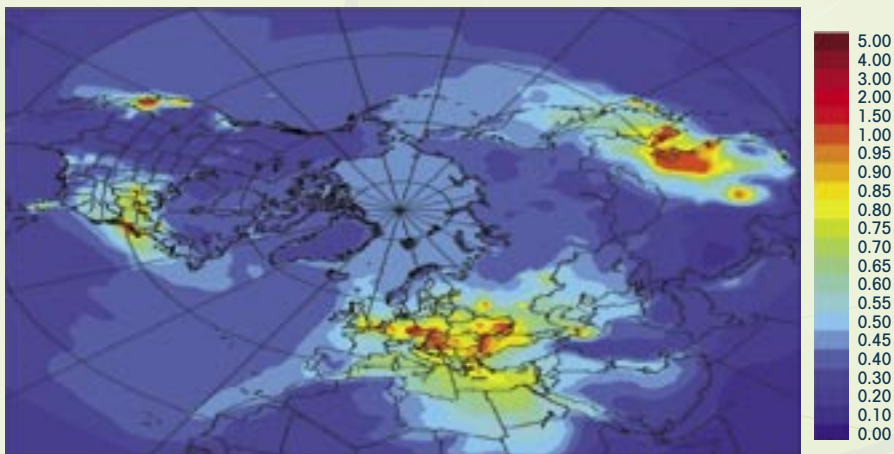
(b) Mercury episode January 16, 1997 (ng/m<sup>3</sup>)

between countries and regions. This science is used by policy-makers to design actions across regions such as Europe and North America, as well as to address emissions in their own areas.

The **Working Group on Effects** has under it six International Cooperative Programmes (ICPs), and a Joint World Health Organization (WHO) – Executive Body Task Force



(c) Surface air TGM January 1997 (ng/m<sup>3</sup>)



(d) Surface air TGM July 1997 (ng/m<sup>3</sup>)

Courtesy Environment Canada Meteorological Service

Science and monitoring help increase our understanding of the way pollutants move around the planet. Starting with the man-made emissions of mercury (a heavy metal) in 1990, these maps show the average concentrations of airborne mercury in the northern hemisphere for typical winter and summer months. The “mercury episode” was a day with particularly high levels of mercury in the air.

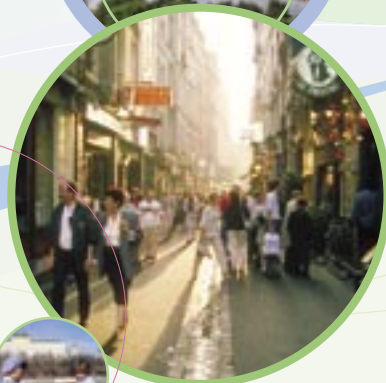
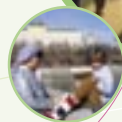
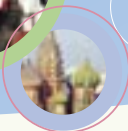
on the Health Aspects of Long-range Transboundary Air Pollution. Work has concentrated on the most endangered areas, and has focused on key pollutants: oxides of sulphur

and nitrogen, reduced nitrogen, ozone, heavy metals, fine particles, and POPs. For Each ICP, a task force coordinates planning, and a programme centre collates data and information, and reports on results.

A key advancement under the *Convention* has been the use of control technologies (“end-of-pipe solutions”). Without the development of control technologies that could be implemented without excessive costs, it would not have been possible to achieve significant reductions. Control technologies have been supplemented with “best available techniques.”

# Europe

## Works Together on Air Pollution



The implementation of policies and approaches, based on scientific advancements, is perhaps the greatest achievement in Europe in the 25 years the *Convention* has been in existence.

An instrumental factor in the development of the *Convention* has been the “effects-based” or “critical loads” approach, and the use of integrated assessment models as a basis for policy development. It has allowed for the developing scenarios to achieve specified environmental goals in a cost-efficient way for Europe.

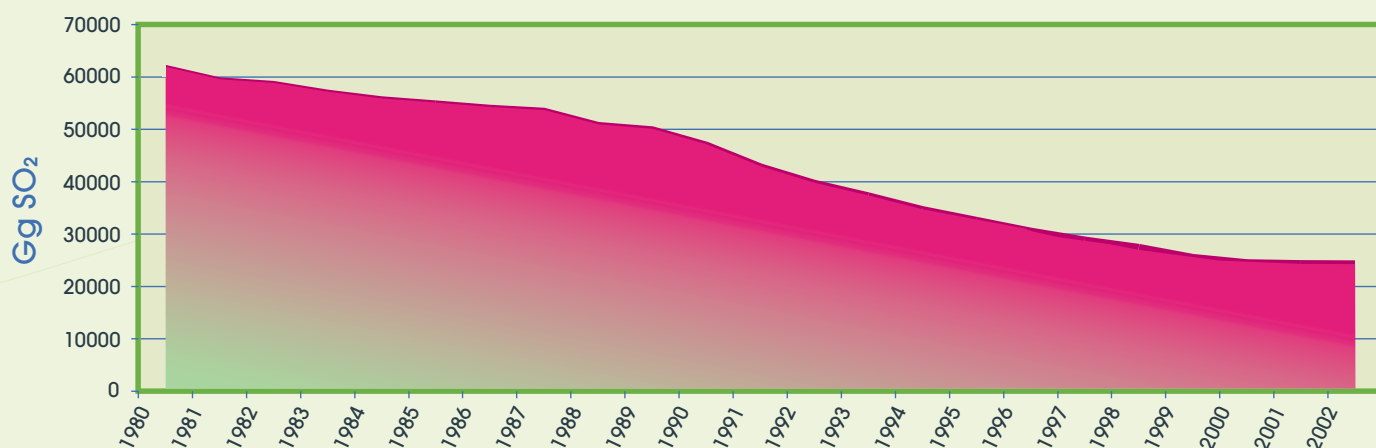
With such well-defined and scientifically-sound objectives, many

European countries have been keen to implement the *Convention's* protocols, being aware of the calculated benefits both to themselves and their neighbours. With few exceptions, countries are on track to cut their emissions.

Another indication of the success of the *Convention* is that most European governments have already taken actions or made plans to meet future commitments, even though the more recent protocols have either only recently entered into force, or are

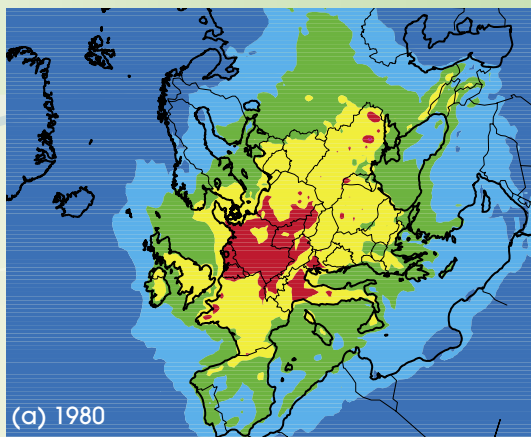
Recognizing that air pollution crosses boundaries, oceans and continents, the *Convention* involves countries from Europe, Central Asia and North America. They work together under the *Convention*, but also cooperate sub-regionally to address their own concerns.

Annual emissions of SO<sub>2</sub> in Europe 1980 to 2000 (in kilotons)



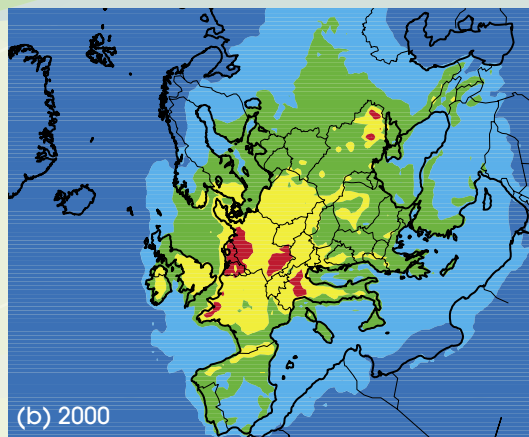
(Source: EMEP)

## Total nitrogen depositions in Europe in 1980



(a) 1980

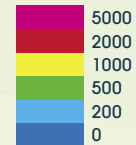
From the EMEP/EEA Joint Review Report



(b) 2000

The decrease in nitrogen deposition in Europe can be seen in these two maps: the one on the left shows deposition levels in 1980, while the one on the right shows the same area in 2000.

Units: mg N/m<sup>2</sup>/yr



just about to do so. Many European countries already recognize that future goals should place much more emphasis on the control of emissions of particulate matter, and integrated assessment modelling is to take account of this.

In Europe, the *Convention's* work has been running in parallel with similar

activities of the European Commission, where abatement policies are being developed for the European Community through the Clean Air for Europe (CAFE) programme.

The successes of the *Convention's* work can already be seen. The *Convention's* monitoring programmes already show indications of im-

proved air quality, while some have also found signs of environmental recovery following the emission cuts that have taken place over the last 15 years. These results are particularly marked in the freshwater monitoring programme that covers many countries in Europe and parts of North America.

# Central Asia: A New Region for the *Convention*

The five countries of Central Asia lie at the far east of the UNECE region, and until recently, they had not been involved with the work of the *Convention*. In recent years, however, both Kazakhstan and Kyrgyzstan have become Parties to the *Convention* and have indicated an intention to become more involved with its work and protocols. Tajikistan, Turkmenistan

and Uzbekistan are also showing an interest in becoming Parties to the *Convention* and some of its protocols. UNECE itself has a particular interest in assisting Central Asian countries in their future development, and a United Nations-funded project will be helping to develop emissions reporting, pollution monitoring and clean-coal combustion technology in the Central Asian region.



# The North American Story

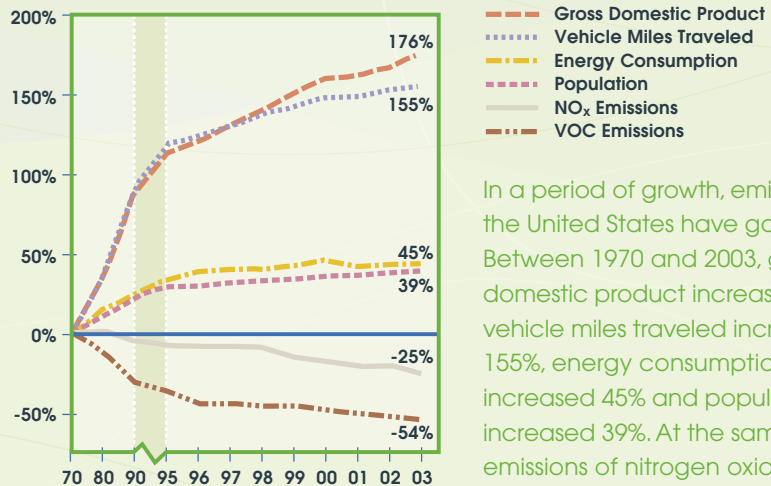


Canada and the United States recognized over a generation ago that solving long-range transport of air pollution could be more effectively achieved through international cooperation with a strong focus on regional solutions. Building on that recognition and action, both countries signed the *Convention* in 1979.

North America has benefited greatly from the U.S. and Canadian participation in the *Convention*. The strong science and modelling have shown how other countries impact North America's environment, particularly in the vulnerable northern areas.

Canada and the United States implement the provisions of the *Convention* through bilateral agreements: cooperating on long-range transport of air pollutants under the 1991 Canada-U.S. Air Quality Agreement, the Great Lakes Binational Toxics Strategy, and (with Mexico) under the Commission for Environmental Cooperation and the Border Air Quality Strategy, launched in January 2003. Among the achievements this cooperation has produced are the Acid Rain Annex to the Canada-U.S. Air Quality Agreement,

## Comparison of Growth Areas and Emissions in the U.S.



U.S. Environmental Protection Agency

In a period of growth, emissions in the United States have gone down. Between 1970 and 2003, gross domestic product increased 176%, vehicle miles traveled increased 155%, energy consumption increased 45% and population increased 39%. At the same time, emissions of nitrogen oxides decreased 25% and Volatile Organic Compounds decreased 54%. Both are components of smog.

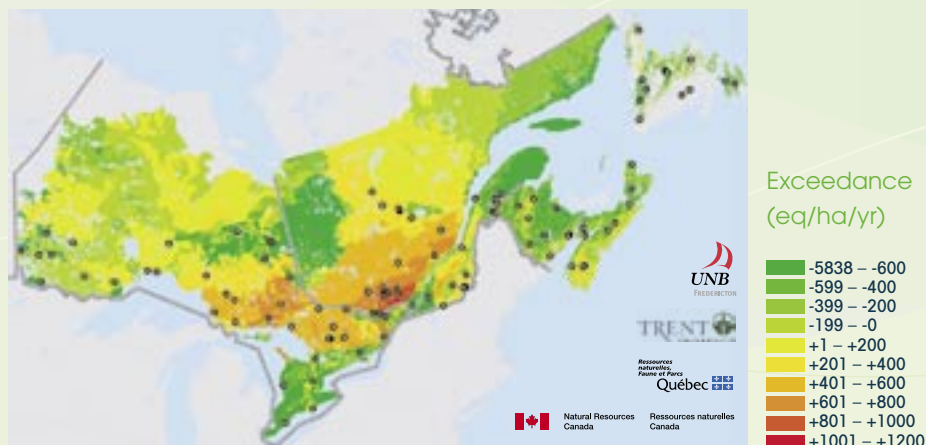
where commitments were made to reduce sulphur dioxide emissions; and the Ozone Annex to the same agreement, expected to bring significant reductions of emissions of NO<sub>x</sub> and VOCs. For heavy metals, there are wide-ranging domestic programmes in both countries that have established emission standards for sources that emit mercury, cadmium and lead compounds.

With scientific evidence pointing to serious health and environmental concerns in the north, participation in the *Convention* has helped Canada press for reductions in Persistent Organic Pollutants from far away sources, and future advancements will benefit the health of northern residents and the environment on which they depend.

The United States is emphasizing a multi-pollutant approach in many jurisdictions to address more than one pollutant at a time. The United States has proposed an Interstate Air Quality Rule designed to reduce power plant emissions of sulphur dioxide, nitrogen oxides and mercury by establishing enforceable emission caps. This proposed rule focuses on states whose power plant emissions are significantly contributing to particulate matter and ozone pollution in downwind states in the eastern U.S.

Both countries are committed to working together on understanding more about the relationship between air pollution and health, working with the U.S. Health Effects Institute and the European Union.

## Critical Load Exceedance for Forest Soils in Eastern Canada



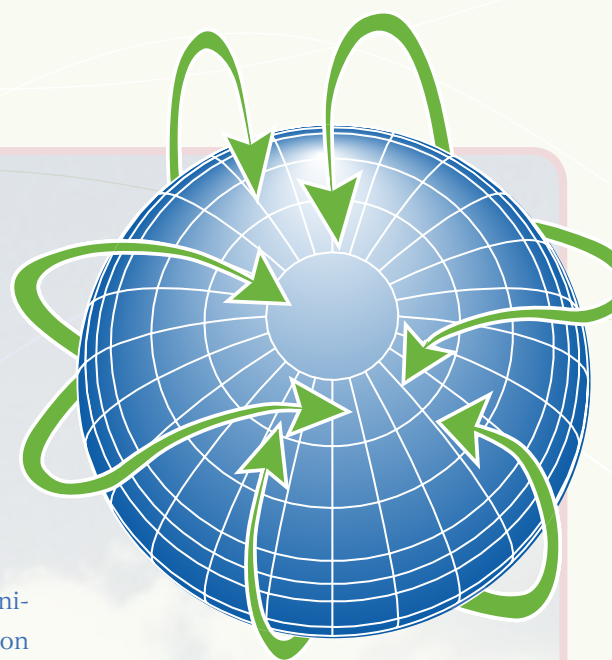
As part of a Canada -U.S. collaborative effort (Forest Mapping Project) under the auspices of the New England Governors and Eastern Canadian Premiers and associated activities, critical soil acidification loads for sulphur and nitrogen and related exceedances have been calculated and mapped for upland forests in Eastern Canada. This map shows exceedance of critical loads of acidity based on the 1994-1998 atmospheric deposition rates. Exceedance is high where atmospheric deposition rates are high, and where critical loads are calculated to be low. Highest exceedances are projected to occur on the Canadian Shield in Eastern Ontario and in Southern Quebec, and on south-western Nova Scotia. A finalized version and detailed explanation will be published in the 2004 Canadian Acid Deposition Science Assessment.

## Transboundary Air Pollution: The Future

The Parties to the *Convention* meet at least once a year to review progress in complying with emission reductions, to discuss further measures to reduce the effects of air pollution, to identify emerging issues and to discuss opportunities to work together and cooperate for the future. On entry into force, the protocols also undergo review to consider their effectiveness, and if further measures are needed. Technological development is also followed and used to update the *Convention's* guidance documents on best available techniques, and integrated as needed in setting emis-

sion limit values. Science and monitoring continue to be the foundation of the *Convention*. Not only does science point to the emerging issues and identify the threats to health and the environment, but it also provides the key to effective policy solutions in regions and individual countries.

Science also clearly shows the acidification problem is not yet resolved, with large excessive deposits of nitrogen compounds, as well as harmful concentrations of ozone and fine particles still observed in many countries. Further reductions of the polluting emissions are still required in the future, beyond 2010.



It is this scientific research effort that suggests that it may be important to consider some aspects of the long-range transport of air pollutants on a hemispheric or even global scale. As global emissions increase, transport between the continents is raising the "background" levels of the pollutants controlled by the protocols to the *Convention*. Hemispheric and global collaboration and action could be a major area of focus for *Convention* Parties in the future.