

LONG RANGE TRANSBOUNDARY AIR POLLUTION

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Summary

The 1979 Convention on Long Range Transboundary Air Pollution was the first multilateral treaty for dealing with air pollutants. Aimed initially at reducing the effects of acid rain through control of the emissions of sulfur, its scope was later widened to include nitrogen pollutants, volatile organic compounds and photochemical oxidants. Still later, heavy metals and persistent organic pollutants were also added.

The most recent agreement – the 1999 Protocol to Abate Acidification, Eutrophication, and Ground-level Ozone – is innovative in several respects. Based on environmental quality targets to combat four different kinds of environmental effect, it sets requirements for reducing emissions of four air pollutants. The negotiations were supported by nearly five years of data gathering, analyses, and meeting of experts. The cost-effectiveness analysis were aimed at ensuring that the environmental aims would be attained at the lowest possible cost for Europe as a whole. Moreover, an analysis of the economic benefits showed that the overall gain would most likely exceed the outlay several times over.

The Convention is however much more than a collection of protocols. It is a living procedure, engaging hundreds or possibly thousands of scientists, government officials and others, and so generating and accumulating huge datasets of knowledge and

information – thus by its very existence keeping work for the environment moving. Since development has been steadily moving towards more complicated and more sophisticated protocols, a close cooperation between scientists and policy makers has become ever more necessary. Its protocols are important for defining the minimum efforts required of their signatory countries, and with the help of the media are themselves a means of increasing public awareness of the dangers of air pollution.

There is no doubt that the Convention has contributed to the progress made in reducing emissions of air pollutants in Europe. Between 1980 and 2004 emissions of sulfur dioxide have come down by more than 75%. Emissions of nitrogen oxides have declined by about 30%, and those of volatile organic compounds have dropped by approximately 40%. The Gothenburg Protocol of 1999 will help to ensure that emissions will continue to decline over the coming decade.

1. Introduction

When Sweden and Norway asserted, early in the 1970s, that the acidification of lakes and rivers could be blamed on the effects of air pollutants originating in countries far away, there were many that expressed doubts. But some years later, in the second half of that same decade, facts came to light that confirmed the theory. By then it was established that air pollutants, such as sulfur and nitrogen compounds, are being transported by winds over distances of thousands of kilometers before being deposited. Due to the serious acidification problems in their countries and the large shares of imported pollution, Sweden and Norway pressed for international agreements on reducing the emissions of sulfur dioxide. After a few years of negotiating, in 1979 some thirty nations signed the Convention on Long Range Transboundary Air Pollution. This is a convention that was worked out within UN ECE, the United Nations Economic Commission for Europe, where the United States and Canada are members as well as all the countries of Europe.

The alarming increase in forest damage throughout Europe in the early 1980s, contributed to widening the scope of the international activities to cover not only sulfur emissions, but also those of oxides of nitrogen, ammonia, and volatile organic compounds. In the course of the 1980s, phenomena such as ‘global warming’ and the depletion of the ozone layer demonstrated that damage caused by air pollutants is not locally and regionally restricted, but also has a global dimension. Over the years, scientific knowledge about the damage caused by sulfur and nitrogen compounds and ground-level ozone has increased. The scientific work resulted in the early 1990s that the Convention started to develop and negotiate new protocols using the so-called critical loads approach. The first such agreement was the revised sulfur protocol, signed in Oslo in 1994. This was followed in 1999 by the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone, also called the ‘multi-effects and multi-pollutants’ protocol.

2. The Convention

In 1967, the Swedish scientist Svante Odén presented a theory, in which he claimed that the dying of fish in lakes and rivers in South Scandinavia was caused by emissions of

sulfur dioxide from Great Britain and continental Europe. He moreover claimed that the deposition of acidifying pollutants also impoverished the forest soils by the leaching of mineral nutrients, such as calcium, sodium, and potassium. At the first global environmental conference, organized by the United Nations in Stockholm in 1972, Sweden introduced a case study on acidification. The conclusions of this study was, however, met with skepticism by most countries. At that time few believed in long-range transport of air pollutants. This is obvious from the fact that all countries signed the conference declaration, which says that states have an obligation to make sure that activities carried out in one country do not give rise to environmental damage in others (Principle No. 21).

The transboundary properties of sulfur pollution was scientifically established through a four-year western European research project, the results of which were published in 1977. Parallel to that project, scientists in Sweden and Norway worked intensively to gather more information on the causes and effects of acidification. New evidence was put together for the purpose of being able to present a convincing case for the neighboring countries in Europe.

Following the Conference on Security and Cooperation in Europe, held in Helsinki in August 1975, the Soviet Union had proposed the arranging of high-level East-West meetings to discuss among others the environment. This initiative was seen as a way to continue the process of détente, and the task to follow up on the proposal was given to the United Nations Economic Commission for Europe (ECE). Being one of five regional economic commissions of the United Nations, the ECE brings together all the European countries, as well as the United States and Canada.

Referring to the declaration of the 1972 UN Conference on the Human Environment, the Scandinavian countries presented in early 1977 a joint draft for an international convention on transboundary air pollution. After some hard negotiating, the Convention on Long Range Transboundary Air Pollution (abbreviated CLRTAP, and in the following called the Convention) was signed at Geneva in November 1979 by thirty-three members of the ECE (see Table 1). After ratification by twenty-four of the signatories, it came into force in March 1983. Several more countries have since adhered, bringing the total number of parties to the Convention to fifty.

The Convention does not in itself call for any binding commitments to undertake concrete measures for the reduction of specific pollutants. The text only says that countries 'shall endeavor to limit and, as far as possible, gradually reduce and prevent air pollution', and that, in order to achieve this, they shall use 'the best available technology which is economically feasible'. Moreover, the text provided for exchange of information, consultation, research, and monitoring. Although the Convention in itself is a weak document, it established the framework for the development of a series of more specific and substantial agreements (so-called protocols).

	Conv (a)	EMEP (b)	1st S (c)	NOx (d)	VOC (e)	2nd S (f)	HM (g)	POP (h)	GBG (i)
Albania	R	—	—	—	—	—	—	—	—
Armenia	R	—	—	—	—	—	S	S	S
Austria	S+R	R	S+R	S+R	S+R	S+R	S+R	S+R	S
Azerbaijan	R	—	—	—	—	—	—	—	—
Belarus	S+R	S+R	S+R	S+R	—	—	—	—	—
Belgium	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S
Bosnia & Herz.	R	R	—	—	—	—	—	—	—
Bulgaria	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R
Canada	S+R	S+R	S+R	S+R	S	S+R	S+R	S+R	S
Croatia	R	R	—	—	—	S+R	S	S	S
Cyprus	R	R	—	R	—	R	S+R	S+R	—
Czech Rep.	R	R	R	R	R	S+R	S+R	S+R	S+R
Denmark	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R
Estonia	R	R	R	R	R	—	R	R	—
Finland	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R
France	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S
Georgia	R	—	—	—	—	—	—	—	—
Germany	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R
Greece	S+R	R	—	S+R	S	S+R	S	S	S
Holy See	S	—	—	—	—	—	—	—	—

Hungary	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S
Iceland	S+R	—	—	—	—	—	S	S+R	—
Ireland	S+R	S+R	—	S+R	—	S+R	S	S	S
Italy	S+R	S+R	S+R	S+R	S+R	S+R	S	S+R	S
Kazakhstan	R	—	—	—	—	—	—	—	—
Kyrgyzstan	R	—	—	—	—	—	—	—	—
Latvia	R	R	—	—	—	—	S+R	S+R	S+R
Liechtenstein	S+R	R	S+R	S+R	S+R	S+R	S+R	S+R	S
Lithuania	R	R	—	R	—	—	S+R	S+R	R
Luxembourg	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R
Macedonia	R	—	—	—	—	—	—	—	—
Malta	R	R	—	—	—	—	—	—	—
Monaco	R	R	—	—	R	R	R	—	—
Netherlands	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R
Norway	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R
Poland	S+R	R	—	S	—	S	S	S	S
Portugal	S+R	R	—	—	S	—	S	S	S+R
Rep. Moldova	R	—	—	—	—	—	S+R	S+R	S
Romania	S+R	R	—	—	—	—	S+R	S+R	S+R
Russian Fed.	S+R	S+R	S+R	S+R	—	S	—	—	—
San Marino	S	—	—	—	—	—	—	—	—
Serbia & Monten.	R	R	—	—	—	—	—	—	—

Slovakia	R	R	R	R	R	S+R	S+R	S+R	S+R
Slovenia	R	R	—	R	—	S+R	S+R	S+R	S+R
Spain	S+R	R	—	S+R	S+R	S+R	S	S	S+R
Sweden	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R
Switzerland	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R	S+R
Turkey	S+R	S+R	—	—	—	—	—	—	—
Ukraine	S+R	S+R	S+R	S+R	S	S	S	S	—
United Kingdom	S+R	S+R	—	S+R	S+R	S+R	S+R	S+R	S+R
United States	S+R	S+R	—	S+R	S	—	S+R	S	S+R
Eur. Community	S+R	S+R	—	R	S	S+R	S+R	S+R	R
Total	32/50	22/41	19/22	25/31	23/21	28/27	36/28	36/28	31/20

- (a) Convention on Long Range Transboundary Air Pollution. Adopted 1979, entry into force 1983.
- (b) Protocol to the 1979 LRTAP Convention on Long-term Financing of the Co-operative Programme for Monitoring and Evaluation of the Long-range Transmissions of Air Pollutants in Europe (EMEP). Adopted 1984, entry into force 1988.
- (c) Protocol to the 1979 LRTAP Convention on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent. Adopted 1985, entry into force 1987.
- (d) Protocol to the 1979 LRTAP Convention Concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes. Adopted 1988, entry into force 1991.
- (e) Protocol to the 1979 LRTAP Convention Concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes. Adopted 1991, entry into force 1997.
- (f) Protocol to the 1979 LRTAP Convention on Further Reduction of Sulphur Emissions. Adopted 1994, entry into force 1998.
- (g) Protocol to the 1979 LRTAP Convention on Heavy Metals. Adopted 1998, entry into force 2003.
- (h) Protocol to the 1979 LRTAP Convention on Persistent Organic Pollutants. Adopted 1998, entry into force 2003.
- (i) Protocol to the 1979 LRTAP Convention to Abate Acidification, Eutrophication and Ground-level Ozone. Adopted 1999, entry into force 2005.

Table 1. Status of the Convention on Long Range Transboundary Air Pollution (Summer 2006)

3. Exports and Imports

Since 1977 the monitoring of transboundary air pollution has been done through a European-wide program known as EMEP (The Cooperative Programme for Monitoring and Evaluation of the Long Range Transmission of Air Pollutants in Europe). One of the first significant decisions made by the parties to the Convention, after its coming into force was to take over the financial responsibility for this program. To this end, a protocol for long-term financing of EMEP was adopted in September 1984. (This protocol entered into force in 1988).

The EMEP program has three main tasks:

- collection of emission data;
- measurements of air and precipitation quality; and,
- modeling of atmospheric transport, concentration, and deposition of air pollutants.

The collection, scrutiny and reporting of emission inventories for all pollutants covered by the various protocols is important both scientifically and politically. High-quality emission data is crucial for modeling purposes, as well as for assessment of countries' compliance with their obligations in the protocols.

Measurements are carried out by a network of about 100 monitoring stations spread through twenty-five or so countries. Modeling provides data on transformation and transport in the atmosphere, and the concentrations, and subsequent deposition of the different pollutants. EMEP issues annual reports containing updated emission data and showing the transboundary fluxes of the various pollutants, thus providing information as to who does what to whom (so-called blame matrices).

4. The First Sulfur Protocol

In June 1982, Sweden hosted the Stockholm Conference on the Acidification of the Environment. The aims of the meeting were to speed up the ratification of the Convention; to review and update scientific evidence on the causes and effects of acid deposition, and, to review the state-of-the-art of emission abatement measures. At the scientific session of the conference, experts agreed for the first time that it was possible to set limits for the burden of acidifying deposition that could be tolerated by various ecosystems – a concept that was some years later to be developed into the critical loads approach. At the same conference, German scientists presented evidence that acidifying pollution affected terrestrial as well as aquatic ecosystems. The alarming increase of damage to forests in West Germany led to a major turnabout in the country's attitude towards international action to reduce emissions of air pollutants – from having been one of the laggards, to become a leading proponent of international agreements. At the ministerial session of the Stockholm conference, the West German Minister Baum pledged his government's support of a 50% reduction in emissions of both sulfur and nitrogen oxides over the next ten years.

The first meeting of the Convention's Executive Body was held in June 1983. Here the Scandinavian countries (Finland, Norway and Sweden) put forward a proposal for

limiting sulfur emissions. It called upon the members of the Convention to reduce their emissions of sulfur by at least 30% by 1993, using 1983 as a base year. The 30% reduction was to be regarded as the first step in a long-term project for reducing emissions. The appeal from the Scandinavian countries was supported by five other countries: Austria, Canada, Denmark, Switzerland, and West Germany. At the same meeting, Austria, Switzerland, and West Germany jointly proposed that action should be taken to reduce the emissions also of nitrogen oxides.

In 1984 first Canada and then West Germany arranged high-level conferences – the first was held in Ottawa in March, and the second in Munich in June – aimed at pressuring laggard countries into joining the so-called ‘30 percent club’. In Ottawa, ten countries – the eight above mentioned, plus France and the Netherlands – committed themselves to reduce national emissions of sulfur by at least 30%. At the Munich meeting the ‘30 percent club’ grew to eighteen countries when it was joined by Belgium, Liechtenstein, and Luxembourg from Western Europe, and Belarus, Bulgaria, East Germany, Soviet Union, and Ukraine from Eastern Europe.

A protocol was signed in Helsinki, Finland, in July 1985. Supported by more than twenty parties to the Convention, it came into force in September 1987. It required the signatories to reduce their national yearly emissions of sulfur, or its transboundary fluxes, by at least 30% by 1993 at the latest, from 1980 levels. Some of the greatest polluters, such as the United States, Poland, Britain, and Spain, still have not signed the Helsinki Protocol – despite the fact that adherence has, in the public view, become something of a test of environmental commitment on the part of the governments.

Already at the time of the signing of the Helsinki Protocol, it was generally accepted that a 30% reduction would be far from sufficient to stop the ongoing acidification. This had been made clear among others at the scientific conference held in Stockholm in 1982. Here it was established that, in order to stop acidification in many sensitive areas, the deposition of sulfur must not exceed 3–5 kg per hectare and year. In order to attain that target, emissions would have to be reduced by at least 80–90% over large regions of Europe. This was why many countries, and especially so the Scandinavian, regarded the Helsinki Protocol only as a first step. In fact, by 1985 several states had already individually adopted more far-reaching national emission reduction targets.

According to the official emission statistics, all countries that signed the Helsinki Protocol achieved the target of at least a 30% reduction in their emissions of sulfur. It may however be of interest to note that of the twenty-one original signatories, ten had actually already reached that target in 1985, the year of the signing of the protocol. In effect, most European countries – including those who did not explicitly support the Helsinki Protocol – had by 1993 achieved emission reductions well beyond the 30% target. Some countries, such as Austria, Finland, the former West Germany, Norway, Sweden, and Switzerland reduced their emissions by 70–85%, while a few countries (Greece, Portugal, and Turkey) actually increased their emissions. The overall result was that between 1980 and 1993, total European emissions of sulfur fell by more than 45%. By comparison, the twenty European countries that had ratified the protocol had reduced their annual emissions on average by 55%.

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Websites for further information

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<http://www.unece.org/env.lrtap>

The European Monitoring and Evaluation Programme (EMEP):

<http://www.emep.int>

The Environment Directorate of the Commission of the European Communities:
http://ec.europa.eu/environment/air/air_en.htm

The European Environment Agency:
<http://eea.eu.int>

The International Institute for Applied Systems Analysis (IIASA):
<http://www.iiasa.ac.at/~rains>

The Swedish NGO Secretariat on Acid Rain:
<http://www.acidrain.org>

Biographical Sketch

Christer Ågren is director of the Swedish NGO Secretariat on Acid Rain, an organization that specializes in the dissemination of information on acid rain and plays an important role in the advisory process on international policy-making in this area.