UNITED NATIONS ECONOMIC COMMMISSION FOR EUROPE

Protecting the Air We Breathe

40 years of cooperation under the Convention on Long-range Transboundary Air Pollution

UNECE

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Acknowledgements
Photos: iStock, Valentin Sokolowsky, UNECE

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1 Introduction

When scientists in the 1960s investigated the causes of the acid rain that was destroying forests, causing fish loss in lakes and putting entire ecosystems at risks in the Northern Hemisphere, they discovered that air pollutants, a significant part of which were emitted thousands of kilometers away, were the culprit.

Environmental issues took center stage for the first time in 1972 at the international level at the United Nations Conference on the Human Environment in Stockholm. Air pollution was also recognized as an issue of concern that required international cooperation in the Final Act of the Helsinki Conference on Security and Cooperation in Europe in 1975. These two landmark conferences (and many more formal and informal talks between several countries on both sides of the Iron Curtain) paved the way for intergovernmental negotiations culminating in the signing of the UNECE Convention on Long-range Transboundary Air Pollution (Air Convention).

In 1979, 32 countries in the pan-European region decided to cooperate to reduce air pollution. In signing the UNECE Convention on Long-range Transboundary Air Pollution, they created the first international treaty to deal with air pollution on a broad regional basis. After entering into force in 1983, the Convention laid down the general principles of international cooperation for air pollution abatement and set up an institutional framework which has since brought together science and policy.

Over the last 40 years since its inception, the Convention has substantially contributed to the development of international environmental law and has created the essential framework for controlling and reducing the damage to human health and the environment caused by transboundary air pollution. It is a successful example of what can be achieved through intergovernmental cooperation.

2 Achievements

Emission reductions and effects

The result of the collective effort over the last 40 years has been remarkable: emissions of a series of harmful substances have been reduced by 40 to 80 per cent since 1990 in the region. In particular, the decrease in sulphur emissions has led to healthier forest soils.

Particulate matter concentrations at European measurement sites declined by around a third between 2000 and 2012. National average annual concentrations of fine particulate matter ($PM_{2.5}$) fell by 33 per cent between 2000 and 2012 in the United States of America, and by 4 per cent in Canada. The number of days exceeding the World Health Organization's guideline level for ozone concentrations is now about 20 per cent lower than in 1990.

The decoupling of economic growth and air pollution trends has prevented 600,000 premature deaths annually in Europe and North America. The average life expectancy has increased by 12 months, thanks to emission reductions.

A common scientific understanding

The solid scientific underpinning of the Convention has been important for its success. The scientific network under the Convention has successfully developed a common knowledge providing for joint monitoring, modelling and effects-based programmes. The Convention has also served as a platform for scientists and policymakers to exchange information, leading to innovative approaches and mutual trust and learning.

Long before negotiations on the Convention started in the late seventies, countries in Europe established scientific cooperation across borders to tackle the problem of air pollution, acid rain, and die-back of forests. In particular, it was the need to compare data and share experiences that led to the development of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) under the auspices of UNECE in 1977.

Early on in the discussions on the Convention, it became clear that a good understanding of the harmful effects of air pollution was a prerequisite for reaching agreement on effective pollution control. The Working Group on Effects (WGE) was established under the Convention in 1980 in order to develop the necessary international cooperation in the research on and the monitoring of pollutant effects.

Despite Cold War political tensions in the 1980s, the two scientific bodies have since developed into the backbone of the science-policy interface for the Convention. The consistent exchange of experience and know-how through the network of scientists over the years has enabled continued progress towards ever more refined, accurate and comparable data. One of the most important achievements of the groups has been bringing together scientists and policymakers in the UNECE region for common and productive dialogue to support progress in improving air quality. It is essential to maintain and strengthen the close two-way linkages between science and policy.

Meeting of the delegations of Norway and the USSR and exchange of views on the preparation of a future Convention on Transboundary Air Pollution (Moscow, 1979); Gro Harlem Brundtland, Minister of the Environment of Norway (left) and Leonid Nikolaevich Efremov, First Deputy Chairman of the State Committee on Science and Technology, USSR (right). Photo courtesy of Valentin Sokolowsky.

Source-Receptor Matrices

Although there was enough scientific evidence for the transboundary transport of air pollution from the beginning, it was at first not so easy to separate local (national) deposition and imported deposition on a bigger geographic scale. Calculations that were undertaken within the EMEP structure to distinguish between 'foreign' and 'home-made' pollution were presented in the form of source-receptor matrices. With these source-receptor matrices, it is possible to show how much of a country's own emissions fall within its territory. One can also demonstrate the transboundary fluxes from a selected country to other regions.

Integrated Assessment Modelling

Integrated Assessment Modelling has played a vital role in policy negotiations under the Convention. The goal is to facilitate the design of an international cost-effective and effect-based policy, taking into account equity criteria as well as the relevant differences in environmental sensitivities. Over time, integrated assessment models of air pollution have become increasingly complex, considering different pollutants, their interactions and the effects of air pollution on different receptors.

Work on the models, particularly the Regional Acidification Information and Simulation (RAINS) model – led by the International Institute for Applied Systems Analysis –, increasingly fostered collaboration between scientists in the East and the West. The RAINS model was used as a basis for protocol negotiations under the Convention and has been, over the years, further developed to address emission control strategies that simultaneously address air pollutants and greenhouse gases in order to maximize benefits at all scales – what has come to be known as the Greenhouse Gas – Air Pollution Interactions and Synergies (GAINS) model.

From Environmental Concerns to Health Concerns

At the time of the establishment of the Convention, the main driving force was the problem of acidified freshwaters in Scandinavia and Canada, and the initial aim was to reduce emissions and transboundary flows of sulphur pollution. Subsequently, harmful effects on other ecosystems, such as forests, also came into focus.

While the damage to ecosystems continued to be the main concern throughout the 1980s, the damaging impacts of air pollutants to human health became an issue of growing concern in the 1990s. Interactions between air pollution and climate change have also become a field of study for the Convention.

CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

UNITED NATIONS

1979

The beginning: concerns in Scandinavia

Scientists investigate the link between sulphur emissions and acidification of lakes in Scandinavia.

United Nations Conference on the Human Environment

The first major UN conference on international environmental issues (Stockholm Conference) marks a turning point in the development of international environmental policy.

First efforts to tackle air pollution under UNECE

Working Party on Air Pollution Problems under UNECE is convened for the first time.

Scientific cooperation on air pollution under EMEP begins

Countries in Europe establish scientific cooperation across borders to tackle the problem of air pollution, acid rain, and die-back of forests. The Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) holds its first Steering Body session.

1977

1975

1978

Conference on Security and Co-operation in Europe in Helsinki

Part 5 of the Final Act of the Helsinki Conference on Security and Cooperation in Europe, which is devoted to cooperation on environmental protection, paves the way to negotiations leading to the Air Convention.

Start of negotiations on the Convention on Long-range Transboundary Air Pollution

Intense negotiations at the end of 1978 and the beginning of 1979 result in the compromise to conclude a framework convention with clear statements of its final goal, urgent tasks, principles and fields of cooperation, mechanisms for the implementation of decisions and settlement of disputes etc. The particular measures aimed at reducing transboundary air pollution are supposed to be determined later, after special scientific studies and economic assessments.

Signing of the Convention

At a high-level meeting within the framework of the UNECE on the Protection of the Environment, 32 countries sign the Convention on Long-range Trans-boundary Air Pollution. The Convention has helped to reduce emissions of a series of harmful substances in the region by 40 to 70 per cent since 1990.

1979

13 November

Convention enters into force

With 25 ratifications deposited, the Convention enters into force. The first session of the Executive Body for the Convention is held in June 1983.

1983

1980

Establishment of the Working Group on Effects

The Working Group on Effects (WGE) is established to collect and assess available information on dose-effect relationships, the extent of estimated damage caused by sulphur compounds and estimated benefits of emission reductions.

First substantial protocol on reduction of sulphur emissions adopted

The Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent is adopted as the first substantial protocol, requiring Parties to develop national programmes to reduce sulphur emissions. As a result of this Protocol, substantial cuts in sulphur emissions have been recorded in Europe.

1985

1984

1988

First protocol under the Convention adopted, securing the financing of EMEP

The Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) is adopted. It provides for international cost-sharing of a monitoring programme which forms the backbone for review and assessment of relevant air pollution under the Convention.

Protocol concerning the Control of Nitrogen Oxides and their Transboundary Fluxes adopted

The Protocol concerning the Control of Nitrogen Oxides and their Transboundary Fluxes is adopted. Entering into force in 1991, the Protocol requires Parties to ensure emissions of nitrogen oxides (NO_x) 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.

Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes adopted

The Protocol concerning the Control of Emissions of Volatile Organic Compounds (VOCs) or their Transboundary Fluxes is adopted, helping to address a group of major air pollutants responsible for the formation of ground-level ozone.

The multi-pollutant, multi-effect strategy paves the way for an integrated approach to tackle key air pollutants

The reviews of the NO_x Protocol, the 1994 Sulphur Protocol and the Protocol on VOCs are integrated into one multi-pollutant multi-effect strategy, which would culminate in the adoption of the Gothenburg Protocol.

1991

1990s
Mid

1994

Protocol on Further Reduction of Sulphur Emissions adopted

The Protocol on Further Reduction of Sulphur Emissions is adopted. For the first time, reduction obligations are derived from the cost-effectiveness and effect-based principles developed under the Convention.

Protocols on Heavy Metals and Persistent Organic Pollutants adopted

The Protocols on Heavy Metals and on Persistent Organic Pollutants (POPs) are adopted, requiring Parties to apply best available techniques and emission limit values to cadmium, lead and mercury and certain POPs and product control and management measures for some other POPs.

The protocols enter into force in 2003.

1998

1997

Implementation Committee established to review compliance

The Implementation Committee is established to review compliance of Parties with their reporting and emission reduction obligations. This work has further strengthened the Convention's work, by encouraging Parties to meet their commitments in a timely and effective way.

1999

Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol) adopted

The Gothenburg Protocol is adopted, requiring Parties to control nitrogen oxides, sulphur oxides, volatile organic compounds and ammonia following the so-called multi-pollutant, multi-effect strategy. 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.

Amendments to the POPs Protocol adopted

Amendments to the POPs Protocol are adopted to include obligations for additional substances.

Amendments to the Gothenburg Protocol and the Protocol on Heavy Metals adopted

Amendments to the Gothenburg Protocol make it the first legally binding agreement to include emission reduction commitments for fine particulate matter, including black carbon (or soot). Amendments to the Protocol on Heavy Metals are adopted, to include more stringent controls for heavy metals emissions.

2009

2012

2010

Long-term strategy for the Convention (2010-2020) adopted

The long-term strategy for the Convention is adopted (2010-2020), highlighting implementation of the protocols, capacity-building, and cooperation with other organizations.

Batumi Action for Cleaner Air endorsed at the Eighth Environment for Europe Ministerial Conference

Environment Ministers endorse the Batumi Action for Cleaner Air initiative, a voluntary initiative to support countries in improving air quality, inspiring national actions and promoting cooperation within and beyond the UNECE region.

Convention Assessment Report launched

The Scientific Assessment Report «Towards Cleaner Air» is launched, highlighting achievements and remaining issues for the Convention to tackle.

2016

2014

Comprehensive capacity-building programme established

The capacity-building programme under the Convention aims to encourage ratification and implementation of the Convention and its protocols in countries in Eastern Europe, the Caucasus and Central Asia.

2018

Updated long-term strategy for the Convention adopted

The updated long-term strategy for the Convention highlights priorities for the years 2020-2030, including remaining work on reducing ozone precursors, particulate matter; the implementaion of the protocols, specifically in Eastern Europe, the Caucasus and Central Asia; work on the interlinkages between air pollution, biodiversity and climate change and cooperation beyond the UNECE region.

3 Development of the Convention

Over the past four decades, the Convention has gone through a number of phases. In the beginning, the focus was on building a sound scientific base. Subsequently, an emphasis was put on development and negotiation of gradually more advanced protocols, while at the same time ensuring that the scientific knowledge was kept up to date. Examination and review of protocols, implementation and compliance, and positioning of the Convention in the global context are marking the current phase.

The first protocol that was signed under the Convention – the 1984 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) – did not set any emission reduction targets, but provided a financing scheme to fund the activities under EMEP. As the scientific backbone of the Convention, EMEP has provided information to Governments on the emission, transport and deposition of air pollution since 1977.

As acid rain and acidification of rivers and lakes were the starting point for the negotiations of the Convention, sulphur dioxide (SO_2) was already mentioned in the Convention text. This led to the negotiations of the first substantive protocol on air pollution abatement under the Convention, the 1985 Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent.

It soon became clear that in order to reduce acidification, other pollutants also had to be tackled. It was understood that nitrogen compounds contributed to acidification. In addition to this, nitrogen deposition and its eutrophying effects, which had caused ecosystem changes, prompted Parties to the Convention to negotiate the 1988 Sofia Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes.

In subsequent years, Parties to the Convention recognized that volatile organic compounds (VOCs), in addition to nitrogen oxides, which were already regulated under the 1988 Protocol on Nitrogen Oxides, were contributing to the formation of ground-level ozone and other photochemical oxidant products, causing damage to vegetation and crops. In order to reduce VOCs, Parties adopted the 1991 Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes.

First session of the Executive Body for the Convention (June 1983); UNECE Executive Secretary Klaus Sahlgren (left) and Chair of the Executive Body, Valentin Sokolowsky (right). Photo courtesy of Valentin Sokolowsky.

While the first three substantive protocols to the Convention (1985 Sulphur Protocol, 1988 Protocol on Nitrogen Oxides and the 1991 Protocol on VOCs) addressed one substance at a time and prescribed the same flat-rate emission reductions for all Parties, the 1994 Oslo Protocol on Further Reduction of Sulphur Emissions took a new approach. It was the first protocol to derive its quantitative reduction obligations from the cost-effectiveness and effect-based principles that had been developed under the Convention (see box). Its reduction obligations were based on the results of modelled linkages between the SO_2 emissions of each country and the exposure of different ecosystems, taking into account the sensitivity of such ecosystems to acidification. For the first time, Parties thus negotiated based on the critical loads approach (see box), which made it possible to achieve agreed benefits at minimal overall cost by setting country-specific ceilings for sulphur emissions. This thus led to a differentiation of emission reduction obligations of Parties to the Protocol, opening the door to true polluter pays burden sharing, which can be seen as a milestone in the region.

With the increase in the numbers of the protocols, overseeing Parties' compliance with their protocol obligations became increasingly complex. To remedy this situation, an Implementation Committee was established in 1997. The Committee has since regularly reviewed compliance of Parties with their reporting and emission reduction obligations. These efforts have further strengthened the Convention's work, by encouraging Parties to meet their commitments in a timely and effective way.

Critical Loads and Levels

The idea of setting quantitative values on what could be seen as an acceptable level of pollution loads to ecosystems was first discussed in the Working Group on Effects under the Convention in the early eighties and then slowly matured over the following years. The critical load is now defined as the highest annual deposition level at which adverse effects on natural ecosystems are unlikely to result in the long term. Critical loads vary greatly with soil type and other local characteristics. Critical loads maps, showing modelled deposition value ranges that would protect ecosystems, were then developed in the early nineties for the first time. These would assume an important role in supporting the negotiations of the 1994 Sulphur Protocol and the Gothenburg Protocol.

Subsequent negotiations under the Convention then focused on two other sets of pollutants: heavy metals and persistent organic pollutants (POPs). The two protocols that resulted from these negotiations, the 1998 Aarhus Protocol on Persistent Organic Pollutants (POPs) and the 1998 Aarhus Protocol on Heavy Metals addressed, for the first time, a group of pollutants, which would further pave the way for a more complex approach to designing protocols. Further revisions to these protocols were adopted in 2009 and 2012, respectively. The two protocols also inspired a global approach to control POPs and mercury, respectively, and served as stepping stones on the way to the Stockholm Convention on Persistent Organic Pollutants and the Minamata Convention on Mercury.

In many ways, the 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol) can be considered a turning point in the history of the Convention. When the decision to review the 1988 Protocol on Nitrogen Oxides was taken, it was increasingly recognized that various air pollutants interact in the atmosphere, that they lead to combined impacts and that they are often caused by the same sources. This made a substance-by-substance approach less efficient but led to the development of the so-called multi-pollutant-multi-effect approach. Consequently, the review of the 1988 Protocol on Nitrogen Oxides gradually grew into a combined review of the 1991 Protocol on VOCs and the 1994 Sulphur Protocol, culminating in the negotiations of the first multi-pollutant and multi-effect protocol. Building on the cost-effectiveness and effect-based principles, the Gothenburg Protocol comprises specific national emission ceilings for sulphur dioxide, nitrogen oxides, ammonia and volatile organic compounds.

The revision of the Gothenburg Protocol in 2012 marked another milestone in the development of the Convention as it resulted in the first binding agreement to include emission reduction commitments for fine particulate matter. The Parties also broke new ground for the first time in international air pollution policy by specifically including the short-lived climate pollutant black carbon (or soot) as a component of particular matter. Reducing particulate matter (including black carbon) through the implementation of the Gothenburg Protocol is thus a major step in reducing air pollution, while at the same time facilitating climate and health co-benefits.

The success of the protocols has not only lain in setting emissions reduction targets that clearly indicate the desired results, but also in specifying how those reductions should be achieved: by applying uniform minimum technical emission standards based on the best available techniques and energy-efficiency requirements. These technology-based requirements help to ensure a level playing field for all of the Parties.

4 Priorities and outlook into the future

After the revision of the protocols, work under the Convention is now focusing on ratification and implementation. Strategies to address the remaining air pollution issues, as outlined in its updated long-term strategy, are also a priority. This includes efforts to increase ratification and implementation of the Convention and its protocols, including through effective enforcement of compliance, and ensuring that protocols are kept under review.

At the subregional level, a few key achievements include the adoption of the European Union's new directive on National Emission Reduction Commitments, cooperation under the Canada-United States Air Quality Agreement and efforts to introduce best available techniques in Eastern Europe, the Caucasus and Central Asia.

Despite the progress made under the Convention, air pollution in the region continues to cause significant environmental and health problems and new challenges continue to emerge. Progress has also been uneven in the subregions, increasing the importance of capacity-building in order to: enhance skills; increase understanding of the provisions of the protocols; improve the use of existing capacity; share lessons learned; and transfer knowledge related to air quality monitoring, emission inventories and projections and abatement strategies. This work will remain a key focus so that countries, particularly in Eastern Europe, the Caucasus and Central Asia, can adopt the best available techniques and implement emission reduction commitments. The capacity-building programme managed by the secretariat and supported by several Parties has played an important role in this regard.

On the science side, science-based decision-making and effects-oriented approaches as a foundation for a sound policy will remain essential components of work under the Convention. This strength will be maintained and, where possible, improved, including with regard to cooperation between Convention bodies.

As global emissions increase, transport between the continents is raising the background levels of the pollutants controlled by the protocols to the Convention. This means that transboundary air pollution from outside the UNECE region has a growing impact on air quality within it. Ground-level ozone precursors, such as methane, are a major concern in this regard. Emissions from shipping is another one. At the same time, it is increasingly evident that local air pollution, including in cities, is heavily influenced by the long-range and transboundary transport of pollutants, and that cities are themselves large sources of air pollution. Particulate matter is a case in point. Work on the interplay between the measures taken on different levels of government is therefore important to identify appropriate multi-scale abatement strategies. In addition, air pollution is the central link in the interaction between ozone, nitrogen, climate change and ecosystems, which increasingly requires an integrated approach to environmental policymaking, also beyond the UNECE region. The health impacts of air pollution continue to be a major concern. Addressing these remaining pollution problems will require cooperation at both the scientific and the policy levels and will include other countries and regions. This also includes working with organizations and networks within the UN system and beyond to increase synergies and enhance outreach and information sharing.

It is important to continue to improve the communication of the Convention's work and successes in addressing transboundary air pollution (including at the political level) and to increase awareness of the importance of addressing air pollution for health and environmental reasons and the availability of cost-effective tools for doing so. Initiatives such as the Batumi Action for Cleaner Air initiative, which has helped raise awareness at the political level of the need to improve air quality, has inspired national actions and promoted additional collaboration within and beyond the UNECE region, play an important role in this regard. Linking the work under the Convention to the 2030 Agenda for Sustainable Development and the Sustainable Development Goals has also raised the Convention's visibility and will remain an important opportunity to do so in the future.

Ministers and children launching the Batumi Action for Cleaner Air initiative at the Eighth Environment for Europe Ministerial Conference (Batumi, Georgia, 8-10 June 2016). Photo courtesy of UNECE.

Today, as more and more countries around the globe face problems linked to severe air pollution, the topic is again high on the agenda of many different international forums. With its 40 years of experience, the Convention's contributions to these debates are now more relevant than ever. The Convention will further share its experience and scientific expertise and strive to play a key role in the development of further policy cooperation between regions in the future.

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Printed at United Nations, Geneva – 1914867 **(E)** – September 2019 – 500 – **ECE/EB.AIR/NONE/2019/3**