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Study of International Regulatory Co-operation (IRC) arrangements for air quality: The cases of the Convention on Long-Range Transboundary Air Pollution, the Canada-United States Air Quality Agreement, and co-operation in North East Asia

Céline Kauffmann,

Camila Saffirio

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JEL Classification: F53, F55, K32, K33, Q53, Q58

* OECD, France

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Study of International Regulatory Co-operation (IRC) Arrangements for Air Quality: The cases of the Convention on Long-Range Transboundary Air Pollution, the Canada-United States Air Quality Agreement, and co-operation in North East Asia

Céline Kauffmann*, Camila Saffirio*

ABSTRACT

China, Japan and Korea have deployed a multiplicity of co-operation efforts at different levels of government to promote air quality and curb transboundary pollution. This paper identifies the existing arrangements for air quality co-operation in North East Asia and provides guidance to advance the co-operation required to face cross-border air pollution building on the experience of two long-standing co-operative agreements in this area: the Canada-United States Air Quality Agreement and UNECE's Convention on Long-Range Transboundary Air Pollution. This paper finds that the multilateral arrangements existent in North East Asia are yet to produce a comprehensive science-based regional approach to address transboundary air pollution. Key suggestions for countries to capitalise on the stronger momentum for co-operation in this area include: i) building on the existing frameworks for international regulatory co-operation for air quality; ii) advancing a common understanding of transboundary air pollution across scientific regional arrangements; and iii) strengthening the domestic policy frameworks for air quality in each country as a key prerequisite.

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Key words: Regulatory policy, international regulatory co-operation, air pollution

* OECD, France

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Table of contents

Tables

Figures

Boxes

Acronyms and abbreviations

ACAP	Asia Centre for Air Pollution Research
ADB	Asian Development Bank
APCAP	Asia Pacific Clean Air Partnership
AQC	Air Quality Committee
AQG	Air Quality Guidelines
BAT	Best available technologies
CAPMoN	Canadian Air and Precipitation Monitoring Network
CCAC	Climate and Clean Air Coalition
CCC	Chemical Coordinating Centre
CEC	Commission for Environmental Cooperation
CEIP	Centre on Emission Inventories and Projections
CIAM	Centre for Integrated Assessment Modelling
CLRTAP	Convention on Long-Range Transboundary Air Pollution
CRAES	Chinese Research Academy of Environmental Sciences
DSS	Dust and sand storms
EANET	Acid Deposition Monitoring Network in East Asia
ECA	Environmental Cooperation Agreement between the United States, Mexico and Canada
ECCC	Environment and Climate Change Canada
ECEH	European Centre for Environment and Health
EIA	Environmental impact assessment
ELV	Emission limit values
EMEP	Co-operative programme for monitoring and evaluation of the long-range transmissions of air pollutants in Europe
EPA	United States Environmental Protection Agency
GAINS	Greenhouse Gases Air Pollution Interactions and Synergies model
GEF	Global Environment Facility
GLWQA	Great Lakes Water Quality Agreement
IAM	Integrated assessment modelling
IIASA	International Institute for Applied Systems Analysis
IJC	International Joint Commission

IMO	International Maritime Organisation
JICA	Japan International Co-operation Agency
LTP	Joint Research Project on Long-range Transboundary Air Pollutants in North-east Asia
MET.NO	Norwegian Meteorological Institute
MoU	Memorandum of Understanding
MSC-E	Meteorological Synthesising Centre East
MSC-W	Meteorological Synthesising Centre West
NAFTA	North America Free Trade Agreement
NAPS	National Air Pollution Surveillance program
NEASPEC	North-East Asian Sub-regional Programme for Environmental Cooperation
NECs	National emission ceilings
NH_3	Ammonia
NIER	National Institute of Environmental Research of Korea
NIES	National Institute for Environmental Studies of Japan
NILU	Norwegian Institute for Air Research
NO_x	Nitrogen oxides
O_3	Ozone
OECD	Organisation for Economic Co-operation and Development
PEMA	Pollution Emission Management Area
PM	Particulate material
POPs	Persistent organic pollutants
RAINS	Regional Air Pollution Information and Simulation model
RRC.AP	United Nations Environmental Programme Regional Resource Centre for Asia and the Pacific
SDG	Sustainable Development Goals
SO_2	Sulphur dioxide
SOMA	Sulphur oxides management area
SO_x	Sulphur oxides
TEMM	Tripartite Environment Ministers Meeting
TFHTAP	Task Force on Hemispheric Transport of Air Pollution
TFIAM	Task Force on Integrated Assessment Modelling
UBA	Austrian Environment Agency
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USMCA	United States-Mexico-Canada Agreement
VOCs	Volatile organic compounds
WGE	Working Group on Effects
WGSR	Working Group on Strategies and Review

WHO	World Health Organization
WLTP	Worldwide Harmonised Light Vehicles Test Procedure
WMO	World Meteorological Organisation

Introduction

This working paper is part of a joint project of the OECD Environment Policy Committee and Regulatory Policy Committee (RPC) focused on regulatory frameworks, enforcement and co-operation to address air pollution in North East Asia, supported by the Ministry of Environment of Korea. The joint project comprises two pillars:

1. Country studies of policies, regulatory framework and enforcement for air quality management, covering China, Japan and Korea; and
2. Studies of international regulatory co-operation (IRC) initiatives to address air pollution, focusing on existing arrangements in North East Asia, the Canada-United States Air Quality Agreement (Air Quality Agreement) and the Convention on Long-range Transboundary Air Pollution (CLRTAP).

This document brings together the three IRC studies, with a view to identify the existing arrangements for air quality co-operation in North East Asia, and draw lessons from long standing cooperative agreements in this area as provided by the Air Quality Agreement and the CLRTAP. The three studies build on and feed into the OECD body of work on IRC developed since 2012. The CLRTAP case study continues the work developed in the context of the Partnership of international organisations for effective international rule-making,[2] in particular a 2016 case study on UNECE (OECD/UNECE, 2016[1]). These case studies will ultimately contribute to the development of an IRC Toolkit.

This document complements the country studies of policies, regulatory framework and enforcement for air quality management in China (Botta, 2020[2]), Japan (Botta, 2020[3]) and Korea (Trnka, 2020[4]). Overall, this joint project aims to support the broader ambition of countries in the region to improve their air quality policies by highlighting the challenges and possible solutions related to the design and enforcement of effective regulatory frameworks for air quality and the co-operation needs that transboundary air pollution generates.

[2] See https://www.oecd.org/gov/regulatory-policy/international-organisations-and-role-in-irc.htm.

Key diagnostic elements and recommendations

Key diagnostic elements

- ***China, Japan and Korea have deployed a multiplicity of co-operation efforts to address air quality and transboundary pollution at different levels of government.*** At the multilateral level, approaches include a number of environmental co-operation programmes and networks with overlaps in features including membership, participants, purpose, nature, and instruments of co-operation. While some of these programmes address air quality as part of a broader focus on environmental challenges, others are specifically targeted to transboundary air pollution. In addition to multilateral efforts, some national and local governments have also used bilateral mechanisms such as memorandum of understanding (MoU) to promote co-operation for air quality management between cities. Finally, countries have unilaterally incorporated elements of international standards in their domestic legislation in sensible areas of air quality, notably air standards and emission standards for motor vehicles.
- ***Multilateral co-operation efforts for air quality in the region remain limited in their scope and focus mainly on data collection and exchange of information.*** Certain efforts focusing on joint scientific and research projects have been instrumental in building links between national experts working in the field of air quality; notably the Joint Research Project on Long-range Transboundary Air Pollutants in North-east Asia (LTP), the Acid Deposition Monitoring Network in East Asia (EANET) and the expert dialogues under the Tripartite Environment Ministers Meeting (TEMM). These arrangements are yet to deliver a consensus on key scientific areas regarding air pollution in the region, including monitoring, measurement and modelling methodologies that are critical to advance research outcomes into policy measures such as mitigation goals.
- ***Overall, multilateral arrangements are yet to produce a coherent regional approach to address transboundary air pollution.*** There are working examples of regional agreements addressing cross-border air pollution, notably UNECE's Convention on Long-Range Transboundary Air Pollution (CLRTAP) and the Canada-US Air Quality Agreement. However, the existing IRC arrangements for air quality in North East Asia remain fragmented and are yet to deliver a coherent framework and holistic strategy for transboundary air pollution in the region. This multiplicity of arrangements responds to a mix of factors, including the varying degree to which countries in the region are sources or receptors of transboundary air pollution and their competing interest in leading some arrangements. For example, Japan has historically supported co-operation under EANET, an arrangement with broad Asian geographic coverage. On the other hand, Korea favours a more targeted approach of collaboration within the sub-region. The existing co-operation arrangements in the region together with other successful international experiences provide a critical basis upon which a more systematic regional IRC strategy could build to address transboundary air pollution.

- ***A host of actors are involved in efforts to improve air quality in North East Asia and the broader region.*** At domestic level, these actors include Ministries of Environment and Ministries of Foreign Affairs, national research centres, national co-operation agencies, local governments and universities. At international level, a number of international organisations, including UN-bodies such as the United Nations Environment Programme (UNEP) and the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP), play a key role, including by serving as permanent secretariat for some regional programmes. From a technical assistance perspective, the Asian Development Bank (ADB) and the Global Environment Facility (GEF) provide financial and technical support to relevant regional bilateral and multilateral projects dealing with air quality with a strong focus on capacity building and technological transfer. Such diversity of actors is necessary to properly address the multi-level challenge of air quality. Yet, in the absence of a coherent regional strategy for transboundary air pollution, this fragmentation can create overlaps in functions and difficulties in co-ordination efforts both at domestic and regional levels.
- ***There is nevertheless some momentum for regional co-operation on air quality including through stronger agreements.*** In recent years, countries in the region have made air pollution a top political priority with a special focus on particulate material (PM). China — the regions' largest source of air pollution given its size — has steadily strengthened its air pollution framework and shown increased willingness to engage in IRC efforts for air quality. In addition, Korea's 2017 Comprehensive Plan on Fine Dust Management includes international co-operation efforts as one of four key pillars of action. As a consequence, there has been increased interest in advancing towards a stronger agreement on regional transboundary air pollution, as illustrated by the launch of the North-East Asia Clean Air Partnership (NEACAP) under the North-East Asian Sub-regional Programme for Environmental Cooperation (NEASPEC). Recent initiatives such as the Asia Pacific Clean Air Partnership (APCAP) Joint Forums held in 2015 and 2018 aim to strengthen co-ordination and co-operation between national officials and experts from 26 countries, international organisations and initiatives, academics and other stakeholders involved in efforts to manage air pollution. The Paris Agreement on climate change and the 2030 Agenda for Sustainable Development create additional momentum to develop a holistic IRC approach to address transboundary air pollution.

Recommendations

- ***Capitalise on the existing institutional frameworks for international regulatory co-operation for air quality and bridge their fragmentation.*** China, Japan and Korea have deployed a multiplicity of co-operation efforts to address air quality and transboundary pollution. Countries should use the full potential of these existing agreements, strengthen the links between them and build on their work to create a framework that gradually advances into specific measures to reduce air pollution. The CLRTAP and the Air Quality Agreements show how countries can take advantage of existing co-operation institutions (UNECE and the IJC, respectively) to advance in additional areas of collaboration. A promising regional milestone towards this goal is the approval in 2018 of the North East Asia Clean Air Partnership, a voluntary framework promoted by UN ESCAP to address transboundary air pollution in the region covering multiple pollutants.
- ***Build on the existing scientific regional arrangements to develop a common understanding of regional transboundary air pollution, including reliable data and reporting methodologies.*** Evidence-based environmental policy to address transboundary air pollution requires a broad scientific agreement on key issues including the effects of air pollution, monitoring and modelling methodologies, development of emission inventories and source-receptor relationship between countries. Existing programmes such as EANET, LTP, NEASPEC and the expert dialogues under TEMM as well as the bilateral co-operation efforts between national

research centres have produced links between experts working in the field of air quality. These arrangements are a starting point to develop a common view on these issues to deliver reliable emission data and reporting methodologies. The mechanisms developed under the CLRTAP and the Air Quality Agreement provide a useful example of how a joint science-based approach can contribute to the success of the arrangements. Both instruments made scientific agreement an early priority by including science-oriented annexes and bodies focused on aligning air pollution monitoring, measurement, and modelling. Notably, the air pollution scientific mechanisms developed under the Convention have been instrumental in the development of air pollution policies under other arrangements including the EU. Countries should leverage on these scientific mechanisms to develop a common understanding of regional transboundary air pollution.

- ***Recognise the diverging drivers and incentives across countries to co-operate to address air pollution.*** The region's air pollution challenge is increasingly complex and the transboundary dimension implies that action to curb it cuts across several policy areas and spread across national boundaries. A range of factors may impact the success of IRC efforts to address air pollution. While the geographical proximity and mutual economic interdependence between countries in the region may serve to promote IRC, the varying degree to which countries are sources or receptors of transboundary air pollution creates an uneven interest in co-operating in this area. Countries should consider these factor when shaping up their IRC arrangements in this field. The experience from the CLRTAP and Air Quality Agreement show that countries can effectively agree on this complex issue and achieve results.
- ***Understand and deploy the full range of international regulatory co-operation mechanisms available to advance towards a comprehensive framework to address transboundary air pollution.*** IRC can take different forms that are not mutually exclusive and can operate simultaneously. This host of approaches include legally binding arrangements that create obligations among parties and softer forms of co-operation with weaker legal or co-ordination strength such as exchange of information that are also effective to promote collaboration among parties and can support or anticipate on more binding processes. For now, co-operation in the region has focused on softer mechanisms such as monitoring, data collection and exchange of information. These areas are critical building blocks of stronger co-operation approaches, such as jointly defined targets or reduction instruments.
- ***Build on the momentum to advance towards stronger forms of IRC on air quality.*** Recent developments for regional co-operation – such as the agreement of NEACAP – point to opportunities to develop a more robust IRC framework. The CLRTAP and Air Quality Agreement are good examples of how binding and non-binding regulatory approaches can work together to deliver environmental results. Both instruments mix binding emissions limits with soft measures such as guidelines to promote abatement technologies to control emissions in specific sectors including energy, traffic, agriculture and industry. The precise IRC framework could build on the extensive existing experience of regulatory co-operation in a variety of sectors worldwide as documented by the OECD and be the subject of further OECD work.
- Ensure links between climate change and air quality policies. Integrating measures on air pollution and climate change is as a cost-effective way to mitigate transboundary air pollution, which allow to simultaneously reduce risks to human health and improve the environment. The climate policies pushed by the Paris Agreement create a good momentum for co-ordinated action on climate change and air management.
- Develop a regional approach to address transboundary air pollution that is flexible enough to meet the needs of countries that deal with air pollution under widely different circumstances. China, Japan and Korea should recognise their respective specific needs and approaches to facilitate implementation of commitments to enhance air quality. The CLRTAP and the Air Quality Agreement offer examples of various mechanisms that can help deliver a flexible and proportional

agreement to curb transboundary air pollution. For instance, the country-specific emission limits agreed in recent CLRTAP Protocols show the viability of adopting differentiated targets that allow for politically and environmentally balanced commitments.

- A regional strategy to address transboundary air pollution can progress gradually building on an adaptable framework that allows to progressively advance into new areas. Adaptability is a key feature to ensure that instruments are fit to face emerging or evolving challenges on transboundary air pollution, including addressing multiple pollutants and multiple effects. The CLRTAP offers an example of instruments adopted to formalise co-operation on air pollution that began with a first stage focused on trust-building among Parties and advanced into more ambitious and complex measures through protocols and amendments agreed over time. Similarly, the Air Quality Agreement builds on the long-standing tradition of environmental co-operation between Canada and the United States and has been amended once to accommodate new pollutants.
- Strengthen stakeholder engagement and transparency. Engaging with those concerned and affected by policy measures is increasingly seen as fundamental to improve the design of regulations, enhance compliance and increase public trust in government. Addressing transboundary air pollution depends on expertise from both government and non-government actors at multiple levels. Countries should promote initiatives to secure the participation of interested parties in regional transboundary air pollution issues, for instance through platforms such as the APCAP Joint Forum. Increasing public consultation on these issues allows stakeholders to exert pressure on parties to deliver on their air management goals. The Air Quality Agreement offers a successful example of an international arrangements for air quality that embeds mechanisms to secure public participation, including in the instrument's review and assessment program.
- Consider developing air quality commitments that establish specific goals for defined geographical areas. Joint regulatory commitments to promote air quality could be scaled to target specifically affected geographical areas. For example, certain commitments under the Air Quality Agreement only apply to a designated border region particularly affected by transboundary ozone named Pollution Emission Management Area (PEMA). Similarly, the CLRTAP contemplates a Sulphur Oxides Management Area (SOMA) where special measures under the 1994 Sulphur Protocol apply.
- Improve the domestic policy framework for air quality management as a key prerequisite for IRC. Regional co-operation needs to complement and not replace strong domestic policies aimed at addressing local sources of air emissions. International regulatory co-operation efforts require strong and effective domestic regulatory frameworks. Notwithstanding the transboundary angle, air pollution takes its sources in national emissions. Countries should continue to strengthen their policies, regulatory and enforcement frameworks for air quality management. Further, there are strong disparities in air quality capacities among countries in the region. This creates an opportunity for assistance including through capacity building and technological transfer. Countries should strengthen their co-operation efforts to this effect across levels of government, including through enhanced inter-city co-operation. The Seoul-Beijing MoU shows how cities can collaborate to exchange experiences and build local capacities for addressing air pollution.

Chapter 1. Study of existing arrangements for IRC on air quality in North East Asia

This chapter examines the arrangements for regulatory co-operation to address transboundary pollution in North East Asia, with a focus on multilateral mechanisms that include China, Japan and Korea, countries particularly affected by air pollution. Since the 1990s, these three countries have deployed an array of co-operation efforts to address air quality and transboundary pollution at different levels of government and involving diverse actors. To date, these mechanisms include a host of environmental co-operation programmes and networks with certain overlaps in features including membership, participants, purpose, nature, and favoured forms of international regulatory co-operation (IRC).

Overall, these mechanisms remain limited in scope focusing mainly on monitoring, data collection and exchange of information. Furthermore, these arrangements have not produced a coherent regional approach to address transboundary air pollution, unlike other regions where legally binding instruments have been developed for these purposes. The increasing awareness over the harms of air pollution together with the surge of national air quality policies create a strong momentum for regional co-operation on the subject including through more formal agreements. Considering the significant challenge that air pollution represents for North East Asia, this study aims to identify room for improvement in the existing regional frameworks for transboundary air pollution.

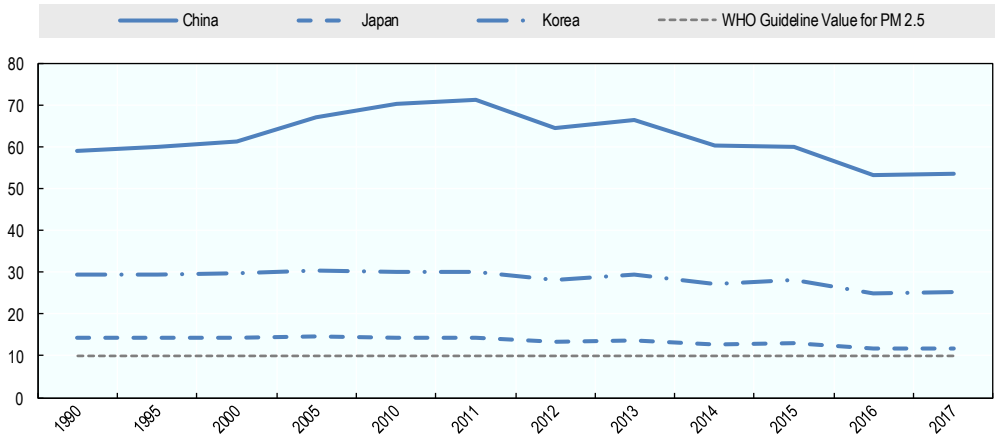
1.1. The context of IRC on air quality in North East Asia

1.1.1. Critical characteristics of transboundary air pollution that make regulatory co-operation important North East Asia

Air pollution is a serious environmental risk affecting almost all countries and the focus of growing concern in recent years. The negative consequences from indoor and outdoor air pollution have a significant impact on human health, the environment and economic growth and justify policy action. Air pollution is a particularly pressing issue in certain areas of the globe; the region comprising China, Japan and Korea is particularly impacted due to the rapid industrialisation, population growth and ageing, and weather conditions. Indeed, residents in these three countries are exposed to annual concentration levels of fine particulate material (PM)[3] above the safest level identified by the WHO (10µg/m3) (Figure 1.1).

[3] Particulate matter (PM) has significant adverse effects on health. PM smaller than 10 micrometres in diameter (PM10) can be inhaled and cause damage into the lungs while particulates smaller than 2.5 micrometres (PM2.5) can cause serious health problems including both respiratory and cardiovascular disease, having its most severe effects on children and elderly people and considerably increasing the risk of heart disease.

Figure 1.1. Exposure to PM2.5 in China, Japan and Korea, 1990-2017



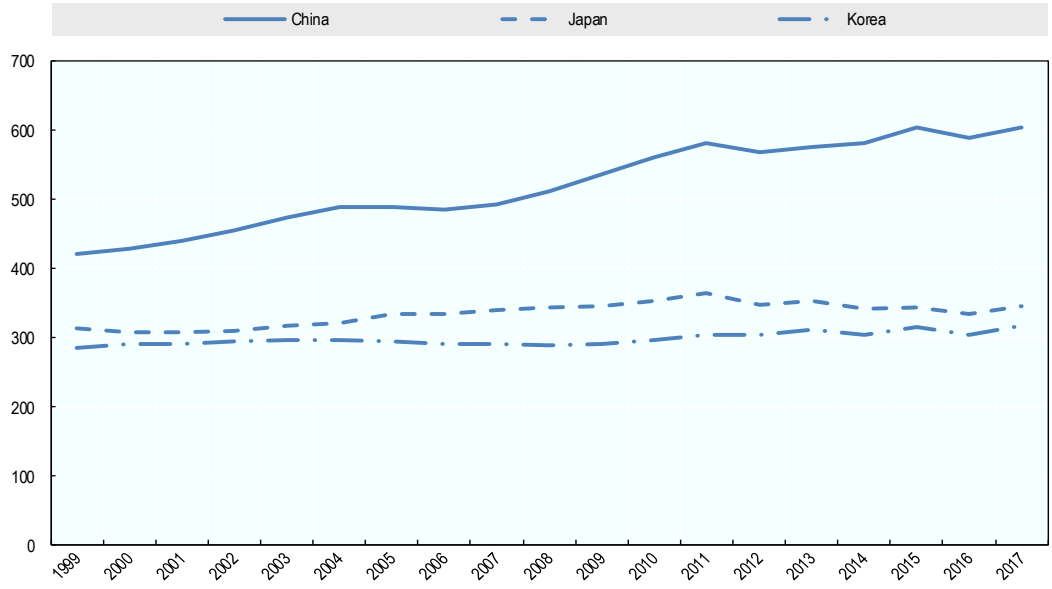
Notes: 2005 WHO Guideline values for PM2.5 are 10 µg/m3 annual mean. The underlying PM2.5 concentration estimates are taken from the Global Burden of Disease (GBD) 2017 project. They are derived by integrating satellite observations, chemical transport models and measurements from ground monitoring station networks. The concentration estimates are population-weighted using gridded population datasets from the Joint Research Centre Global Human Settlement project.
Source: OECD Stats.

The impacts of air pollution on human health are diverse and alarming. Adverse effects include excess mortality (number of premature deaths) and morbidity (frequency of illness normally related to cardiovascular or respiratory problems). Air pollution takes a heavier toll on certain vulnerable population subgroups, including children, the elderly, ill individuals, and poor people (WHO, 2006[5]). According to the World Health Organisation (WHO) air pollution is currently the biggest environmental risk to human health and the cause of over 3 million deaths per year (WHO, 2016[6]). Further, WHO data shows that in 2012 the Western Pacific region carried the largest burden of disease from outdoor air pollution, with 1.1 million deaths.[4] According to OECD data, deaths from exposure to outdoor pollutants in China, Japan and Korea account for around 300 000 deaths per year consistently since 1990 (Figure 1.2)

[4] WHO Western Pacific region includes the following 37 countries: American Samoa (USA), Australia, Brunei Darussalam, Cambodia, China, Cook Islands, Fiji, French Polynesia (France), Guam (USA), Hong Kong SAR (China), Japan, Kiribati, Lao People's Democratic Republic, Macao SAR (China), Malaysia, Marshall Islands, Micronesia, Federated States of, Mongolia, Nauru, New Caledonia (France), New Zealand, Niue, Northern Mariana Islands, Commonwealth of the (USA), Palau, Papua New Guinea, Philippines, Pitcairn Islands (UK), Republic of Korea, Samoa, Singapore, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Viet Nam, Wallis and Futuna (France).

Figure 1.2. Premature deaths from exposure to ambient particulate matter in China, Japan and Korea, 1990-2016

Number of deaths caused by ambient particulate matter per year per million people

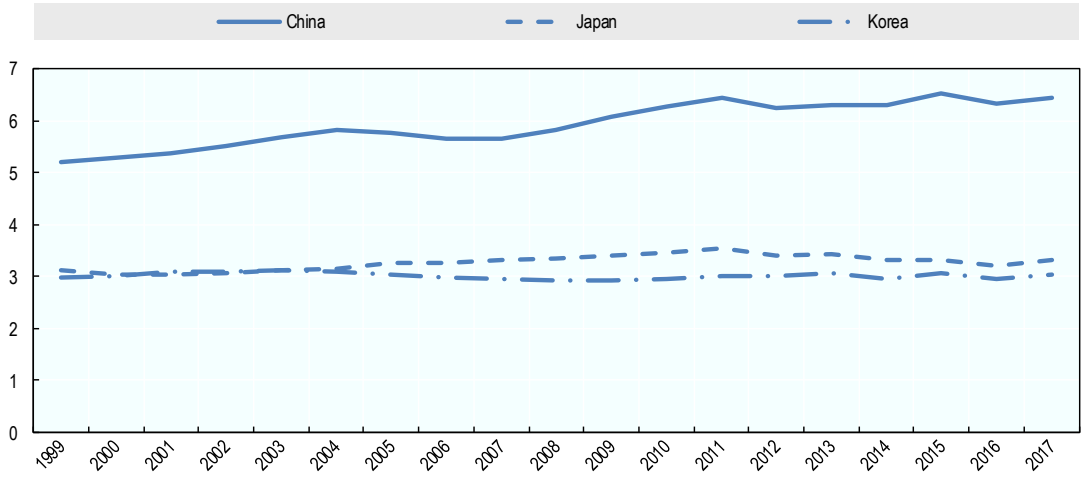


Source: OECD Stats.

Some effects of air pollution on the environment include crop yields losses and forest damage from ozone, pollution water and land, biodiversity damage, diminished visibility due to “smog”. The consequences of air pollution over human health and the environment entail significant economic costs mainly from health expenditures, labour productivity losses, reduction in agricultural and commercial forest yields, and reduced tourism flows to heavily polluted areas. The cost of the health impact of outdoor air pollution in OECD countries, both deaths and illness, was estimated at about USD 1.7 trillion in 2010 and at about USD 1.4 trillion in China (OECD, 2014[7]). OECD (2016) finds that unless more stringent policies are adopted, the market costs of outdoor air pollution, flowing from reduced labour productivity, additional health expenditures and crop yield losses, are projected to lead to global annual economic costs of 1% of GDP by 2060) (OECD, 2016[8]). These GDP losses are especially large in China where they could reach –2.6% of GDP (Figure 1.3).

Figure 1.3. Welfare cost of premature deaths from exposure to outdoor PM2.5 in China, Japan and Korea, 1999-2017

% GDP equivalent



Source: OECD Stats.

Certain air pollutants have a lifetime of weeks or even years, which allows them to be transported on a regional, hemispheric and global scale (WHO, 2006[5]). Evidence shows how air pollutants move across borders and regions, including Europe (OECD, 1979[9]) and North America (Commission for Environmental Cooperation, 1997[10]). Similarly, available evidence suggests that Korea and Japan's downwind locations increases their susceptibility to foreign emissions of PM and dust and sand storms (DSS) mainly originating in China (Jung, 2016[11]) Overall, however the understanding of the mechanisms of long-range transportation of pollutants in North East Asia remains limited and could be extended (OECD, 2002[12]). (see the case studies of Japan (Botta, 2020[3]) and Korea (Trnka, 2020[4]).

1.1.2. Addressing transboundary air pollution through IRC

Air pollution is a classic example of a policy problem of transnational nature that offers opportunities for IRC.[5] (OECD, 1994[13]) suggests that IRC is a necessary feature of successful policies in areas that share certain features:

1. Areas that are strongly science driven and that benefit from shared methodologies;
2. Areas involving global "goods" or "bads" where problems have an intrinsic cross-border nature; and
3. Areas for which there is a strong incentive to co-operate or where countries can benefit from sharing information.

Transboundary air pollution meets each one of these features:

- Successful air pollution management policies rely on shared scientific views of key features and the development of common methodologies for modelling, monitoring and other assessment tools. For these purposes, instruments such as the CLRTAP and the Air Quality Agreement encourage countries to collect and exchange information and engage in joint research on issues that include, inter alia, the impacts on air pollution on human health and the environment and developing

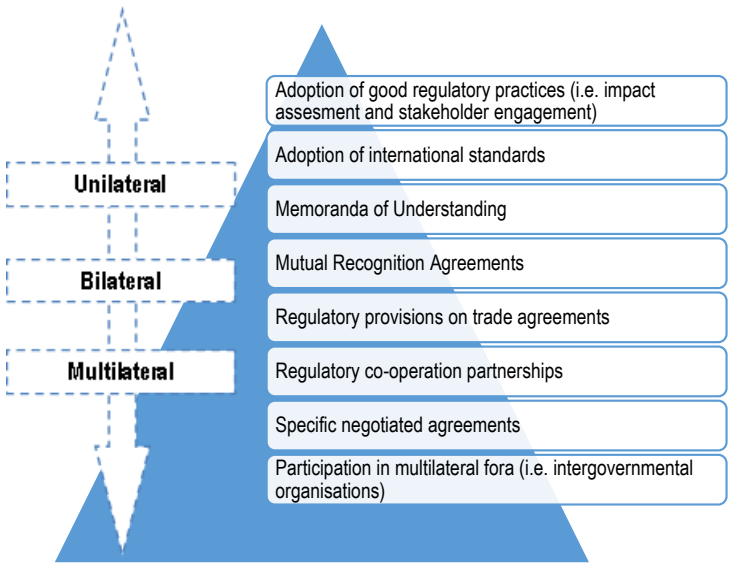
[5] (OECD, 2013[17]) defines IRC as any agreement or institutional arrangement, formal or informal, between countries to promote some form of coherence in the design, monitoring, enforcement or *ex post* evaluation of regulation.

emission inventories. The concept of critical loads and integrated assessment modelling delivered by the European Monitoring and Evaluation Programme (EMEP) under the CLRTAP are successful examples of key scientific tools designed under a multilateral agreement adopted to curb air pollution (Sundqvist, 2011[14]).

- Transportation of air pollutants across different countries turns fighting air pollution into a multi-level challenge where domestic intervention need to be supported by IRC mechanisms that complement local action and resources.
- The shared nature of the challenge of curbing air pollution creates additional incentives for countries to co-operate to strengthen their domestic competences for air quality management. By co-ordinating action in this area, countries create a level playing field that avoids regulatory arbitrage while simultaneously expanding the market for clean technologies (UNECE, 2016[15]). These benefits are particularly relevant when dealing with countries with different economic and technical capacities.

However, the existence of a strong rationale for co-operation to address a policy challenge does not always result in IRC taking place. Additional political economy considerations may shape IRC efforts, these include geographical proximity between countries, their economic and trade relationships, the nature of the regulatory challenge and the aptitude of the domestic regulatory setting to promote IRC (Kauffmann and Basedow, 2016[16]). In the case of co-operation to curb transboundary air pollution in North East Asia, while geographical proximity is at the base of the problem and increases the need for international co-operation, the political sensitivity of air pollution together with the varying degree to which countries in the region are sources or receptors of transboundary air pollution, make IRC more difficult.

Figure 1.4. The variety of IRC approaches



Source: Based on OECD (2013), International Regulatory Co-operation: Addressing Global Challenges, Paris.

When countries co-operate to address air pollution they can deploy several of the IRC mechanisms described in (OECD, 2013[17]). Most notably the unilateral approaches to embed international considerations in domestic rule-making, the importance of bilateral and international platforms for information collection and sharing of expertise, and the different approaches to the development of

international regulatory instruments and standards (Figure 1.4). Likewise, (OECD, 2012[18]) offers insight on a range of possible policy approaches to address air pollution (Table 1.1). These include actions that countries can take at the unilateral level (i.e. establishing taxes on emissions) or through collaborative approaches with other countries (i.e. adopting international instruments such as the CLRTAP or the Air Quality Agreement).

Table 1.1. Selected policy approaches for air pollution management

Regulatory (command and control) approaches	Economic instruments	Others
Ambient air quality standards	Tradable permits schemes for air emissions from stationary sources (e.g. SO_2 allowance trading system under the US Clean Air Act)	Information collection: - through emission and air quality monitoring; - for cost-benefit analyses to support policy evaluation (with valuation of health impacts); - for public education (e.g. Canada's Air Quality Health Index)
Automobile emission standards	Fuel taxes	Voluntary schemes (e.g. car scrapping schemes)
Industrial emission standards, technology standards	Congestion charges	International regulatory instruments (e.g. the C L TAP)
Reporting requirements for stationary sources (e.g. pollutant release and transfer registers)	Taxes on emissions	Flexible work initiatives (e.g. the US Telework Enhancement Act of 2010)
Fuel quality standards	Financial incentives for the development of alternative and renewable fuels and advanced transport technologies (e.g. California's DRIVE programme)	
Vehicle inspection and maintenance programmes		

Source: OECD (2012), OECD Environmental Outlook to 2050, Paris.

The domestic and international importance of air pollution has been recognised in the Sustainable Development Goals (SDGs), which acknowledge it as an interconnected challenge with regional and sub-regional dimensions (United Nations General Assembly, 2015[19]). They identify air pollution as a global health priority by including it in SDG 3 on good health and wellbeing, where countries commit to "substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination". Additionally, annual PM levels in cities are included in SDG 11 as an indicator of urban sustainable development and SDG 7 considers access to clean energy in as an indicator for sustainable energy.

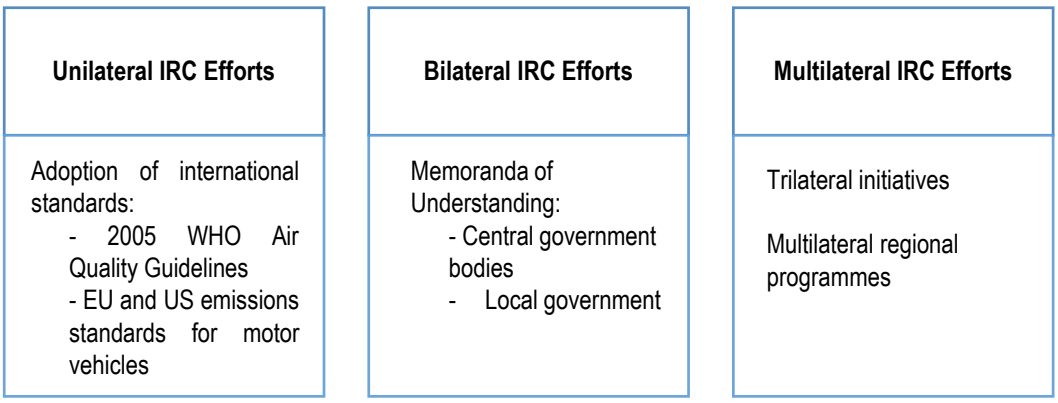
1.1.3. Landscape of co-operation arrangements for air quality co-operation in North East Asia

Co-operation for air quality in North East Asia takes place through a number of mechanisms and actors dealing broadly with environmental issues or specifically aimed at curbing air pollution. Such diversity is necessary to properly address the multi-level challenge of air quality and also observed in other regions dealing with this issue. Indeed, arrangements such as the CLRTAP and the Air Quality Agreement operate in crowded regulatory spaces that involve domestic regulations and agencies as well as regional and global arrangements and actors. Nevertheless, this fragmentation can sometimes create duplications and overlaps in functions between arrangements and difficulties in co-ordination efforts both a domestic and regional level.

The forms of co-operation for air quality in North East Asia

To curb air pollution, China, Japan and Korea have drawn from the wide range of IRC approaches as described by (OECD, 2013[17]) (Figure 1.5). From a unilateral perspective, countries have embedded international considerations into their domestic air quality policies mainly by using international standards. This is the case for national air quality standards (AQSs) which are typically set using the 2005 WHO Air Quality Guidelines as reference point for air quality (Box 1.1) (See also the case studies for China (COM/ENV/EPOC/GOV/RPC(2018)3), Japan (COM/ENV/EPOC/GOV/RPC(2018)2) and Korea (COM/ENV/EPOC/GOV/RPC(2018)4). Countries have also advanced towards much stricter emission standards from motor vehicles, for instance by using the Worldwide Harmonised Light Vehicles Test Procedure (WLTP) approved by UNECE in 2014 as reference points.

Figure 1.5. Overview of IRC efforts on air quality in China, Japan and Korea



Box 1.1. The WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide

The WHO air quality guidelines (WHO AQGs) offer direction to reduce the impact of air pollution over human health. The guidelines were developed in 1987 and updated in 1997 and 2005 to reflect new scientific evidence on the health effects of air pollution. The 2005 WHO AQGs currently provide values and interim targets for four air pollutants: particulate matter (PM), ozone (O_3), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2).

Although countries set national air pollution standards according to different approaches considering health risks, and other economic, social and political factors, the WHO AQGs are the main reference point for policy-makers working on air quality management.

The WHO AQGs are currently under review and a new update is expected for 2020.

Source: OECD/WHO (2016), "International Regulatory Co-operation and International Organisations: The Case of the World Health Organisation (WHO)", WHO "Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide. Global update 2005".

Beyond these unilateral efforts, China, Japan and Korea have also taken action at the bilateral level to advance co-operation for air quality. These bilateral efforts are led by central and local governments and national research centres. They mainly focus on data exchange, technical assistance and capacity building.

Some of these bilateral efforts are framed in the broader context of environmental co-operation between countries. For instance, in 1993, Japan and Korea signed an Agreement on Cooperation in the field of Environmental Protection, which established a joint committee to strengthen co-operation on global and regional environmental issues. Similarly, building on the 1994 Japan-China Agreement on Environmental Protection, both countries have established a Joint Committee on Environmental Protection that has met annually since 2000 and promoted environmental co-operation and technology and experience exchanges including on air pollution (OECD, 2010[20]). Similarly, since 1996 the Sino-Japan Friendship Centre for Environmental Protection, an institution of the Japan International Co-operation Agency (JICA), has supported the Chinese environmental authorities (Box 1.2) (OECD, 2007[21]). This collaboration extends to air pollution and specifically research on fine particulate matter.

Box 1.2. The Sino-Japan Friendship Centre for Environmental Protection

The Sino-Japan Friendship Centre for Environmental Protection, established in 1996, benefits from official development assistance (ODA) aid from the Japan International Co-operation Agency (JICA) and funding from the Chinese government. The Centre is directly affiliated with the State Environmental Protection Administration. Its purview includes environmental scientific research, technology development, information exchange and personnel training. While continuously strengthening the co-operation between China and Japan, the Centre has also established relationships with other countries, regions and international organisations, and conducts exchange and co-operation on various other environmental issues.

The Centre is now in its fifth phase, which began in 2016. Activities includes a work stream on air pollution that supports research conducted by China's National Research Centre for Environmental Analysis and Tsinghua University.

Source: OECD (2007), OECD Environmental Performance Reviews: China 2007, OECD Environmental Performance Reviews, Paris, http://dx.doi.org/10.1787/9789264031166-en and author's development based on interviews.

Bilateral co-operation also occurs directly between research centres in each country. Some of these efforts have developed into Memorandum of Understanding (MoUs), voluntary agreements signed to formalise the basis for joint activity, including exchange of information and regular meetings. In 2015, Korea's National Institute of Environmental Research (NIER) and China's Chinese Research Academy of Environmental Sciences (CRAES) established an Air Quality Joint Research Team to develop joint research projects on air pollution. Likewise, in 2016, NIER and the National Institute for Environmental Studies of Japan (NIES) signed a MoU to strengthen co-operation on $PM_{2.5}$ monitoring and inventory modelling. Co-operation between research centres also extends to trilateral activities through the annual Tripartite Presidents Meeting among the directors of NIER, CRAES and NIES.

Local governments and cities in China, Japan and Korea engage in several bilateral co-operation efforts mainly focused on capacity building and technological transfer to build local capacities for addressing air pollution. The Ministries of Environment of Japan and China have set up an "Inter-City Cooperation" platform that brings together different cities and provinces in both countries dealing with air pollution issues. Seoul and Beijing signed a MoU for co-operation on air quality improvement including through capacity building and technological transfer (Box 1.3).

Box 1.3. The Seoul-Beijing MoU on air quality improvement

In March 2018 the mayors of Seoul and Beijing signed a MoU to strengthen environmental co-operation between capitals with a focus on air quality improvement and reducing PM pollution.

The MoU creates a fine dust hotline designating liaison officials in each city responsible for regularly exchanging information on air quality data. In addition, it establishes an "Air Quality Improvement Joint Research Group" tasked with conducting research on fine dust reduction and agrees to enhance co-operation through regular "Seoul-Beijing Air-quality Improvement Forums".

The MoU was adopted during the third meeting of the Seoul-Beijing Joint Committee, a permanent co-operation effort between both cities launched in 2013. The Joint Committee holds biannual meeting and focuses on advancing collaboration on economic, cultural, educational and environmental issues.

Source: Author's development based on interviews and publically available information http://english.seoul.go.kr/seoul-beijing-create-collaborative-fine-dust-hotline/.

Finally, China, Japan and Korea participate in a number of international and regional regulatory co-operation arrangements that deal with environmental issues including air quality and transboundary air pollution, such as the Minamata Convention on Mercury and the Stockholm Convention on Persistent Organic Pollutants. Section 1.2 of this case study discusses the main regional arrangements established for these purposes.

The actors of co-operation for air quality in North East Asia

The multiplicity of co-operation approaches on air quality between the three countries results in a number of actors being involved in regional air quality management in North East Asia, including domestic, regional and international bodies.

At domestic level, these actors include Ministries of Environment and Foreign Affairs, national research centres, and national co-operation agencies. In addition, some local governments are responsible for bilateral inter-city arrangements for air management collaboration. Experts and academics working in the field of air pollution are also central actors involved in science-oriented bilateral and multilateral co-operation efforts.

At the multilateral level, a number of international organisations, including UN-bodies play a key role promoting environmental co-operation. Namely, the United Nations Environment Programme (UNEP) and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) serve as permanent secretariat for some regional programmes (EANET and NEASPEC, correspondingly). More recently, UNEP has also encouraged interaction between government representatives and a broad range of stakeholders through the Asia Pacific Clean Air Partnership (APCAP) Joint Forum held in 2015 and 2018 to contribute solutions to improve air quality in the region. In parallel, the Asian Development Bank (ADB) and the Global Environment Facility (GEF) finance specific country and regional projects dealing with air quality with a strong focus on capacity building and technological transfer.

This diversity of actors is also observable in other part of the world. It is to some extent necessary to properly address the multi-level challenge of air quality. Nevertheless, this fragmentation can sometimes create duplications and overlaps in efforts between initiatives as well as co-ordination difficulties both at domestic and regional level.

1.2. Existing multilateral arrangements for co-operation on air quality in North East Asia

1.2.1. Overview of the main regional co-operation arrangements for air quality

A number of international co-operation arrangements have been established since the 1990s to deal with environmental challenges in North East Asia. The origin of these initiatives can be traced to a number of factors including a growing international awareness on environmental matters, increased levels of pollution following decades of rapid economic expansion, conflict over natural resources and increasing community activism over environmental issues (Reimann, 2014[22]). Notwithstanding the urgent challenge that air pollution posed for the region, environmental co-operation among countries only began in the 1990s, which is comparatively late considering that the first international agreement dealing with transboundary air pollution (the CLRTAP) was adopted in 1979.

There are four key regional co-operation arrangements addressing air quality involving China, Japan and Korea: the UN-served programmes of the North-East Asian Sub-regional Programme for Environmental Cooperation (NEASPEC); the Acid Deposition Monitoring Network in East Asia (EANET); the Tripartite Environment Ministers Meeting (TEMM) and the Joint Research Project on Long-range Transboundary Air Pollutants in North-East Asia (LTP). The first two arrangements are regional and UN-based. The other two are trilateral involving only China, Japan and Korea. Table 1.2 provides an overview of these agreements including date of establishment, participants, hosting international organisation, and scope.

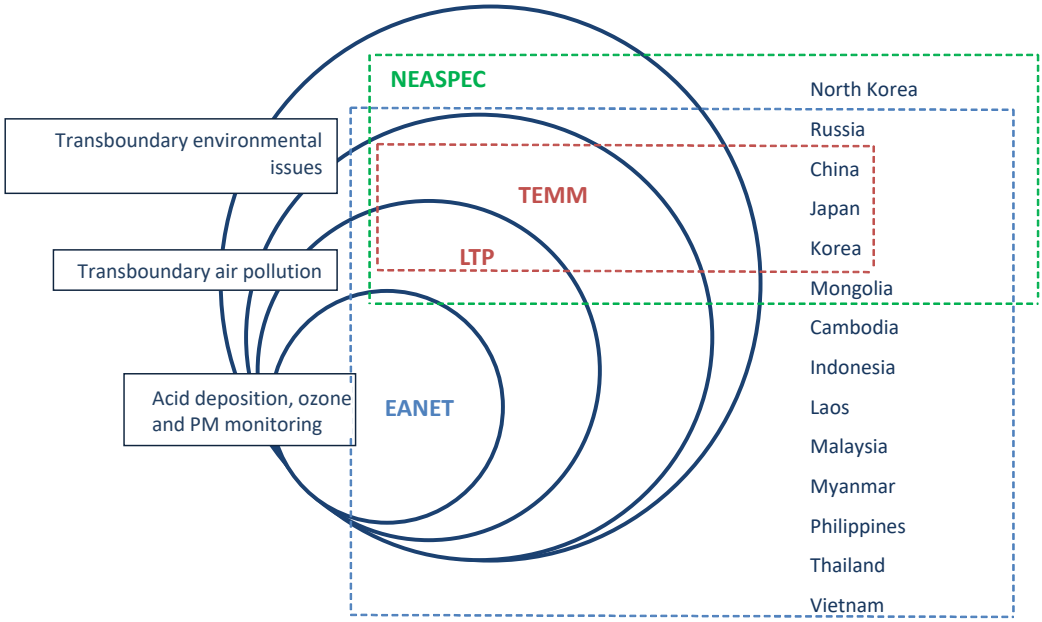
Table 1.2. Overview of main existing arrangements for regulatory co-operation on air quality in North East Asia

	Year of est.	International Organisation	Participants	Scope / Key elements
NEASPEC (North-East Asian Sub-regional Programme for Environmental Cooperation)	1993	UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific)	China, Japan, Mongolia, North Korea, Russia, South Korea	Comprehensive intergovernmental co-operation framework addressing environmental challenges in North-East Asia
LTP Project (Joint Research Project on Long-Range Transboundary Air Pollutants in North-East Asia)	1995	Not applicable	China, Japan, South Korea	Transboundary air pollutants.
TEMM (Tripartite Environment Ministers' Meeting)	1999	Not applicable	China, Japan, South Korea	Comprehensive intergovernmental co-operation on environmental issues including air quality.
EANET (Acid Deposition Monitoring Network in East Asia)	2001	(UNEP) United Nations Environment Programme	Cambodia, China, Indonesia, Japan, Laos, Malaysia, Mongolia, Myanmar, Philippines, Russia, South Korea, Thailand, Vietnam	Acid Deposition

This multiplicity of arrangements responds to a mix of factors: including the varying degree to which countries in the region are sources or receptors of transboundary air pollution, their preference for certain specific co-operation platforms and their competing interest in leading some arrangements. For instance, Japan has historically supported co-operation arrangements with broad coverage of Asia, such as EANET.

On the other hand, Korea favours a more targeted approach of collaboration within the sub-region. While each of these arrangements is independent from each other and differs in purpose, scope, membership, institutional set-up, *inter alia*, some significant features overlap (Figure 1.6).

Figure 1.6. Overlaps in constituencies and topics of IRC arrangements for air quality in North East Asia



One of the main differences across these arrangements is their membership. LTP and TEMM are trilateral initiatives that involve China, Japan and Korea. In addition to these countries, NEASPEC includes North Korea, Mongolia and Russia. EANET is the only regional co-operation arrangement focusing on environmental challenges. Its membership includes 13 countries in the broader Asian region.

There are also differences in the comprehensiveness of the scope of these environmental arrangements. NEASPEC and TEMM cover a broader range of environmental issues, including air quality. The other arrangements have a narrower focus: EANET addresses acid rain and the LTP looks specifically at transboundary air pollutants.

The arrangements also vary in terms of recipients and key focuses. Nevertheless, participants in these arrangements frequently overlap as a number of researchers and experts are simultaneously involved in the LTP, EANET and the TEMM's scientific subsidiary bodies. NEASPEC focuses on specific technical assistance programmes and has a mixed audience, targeting government officials and experts on the field of air quality. The TEMM was designed to promote a platform for high-level political dialogue between the Environment Ministers of the three countries. It has two technical bodies where scientific discussion takes place: the Tripartite Policy Dialogue on Air Pollution (TPDAP) and the Tripartite Cooperation Network for Environmental Pollution Prevention and Control Technologies.

On the other hand, the LTP and EANET are the pillars of scientific co-operation. LTP focuses on monitoring and modelling transboundary air pollution while EANET monitors acid rain depositions. The LTP participants are researchers and scientists appointed by member countries. EANET brings together government representatives (from relevant Ministries) as well as scientific experts. The LTP and EANET share certain data and some monitoring stations. Their work has certain overlaps including, for instance, the monitoring of long-distance transport of sulphur.

However, despite the existence of several scientific co-operation platforms, contributing experts have failed to agree on a common methodology for emission reporting, a consensus view on the source-receptor relationship between countries or key factors behind air pollution and its effects.

In terms of organisational structure, there are a number of similar features between arrangements, including the existence of permanent bodies and the celebration of annual meetings. With the exception of the TEMM, all initiatives are served by permanent secretariats. UN organisations serve as secretariat of EANET and NEASPEC, while the LTP is assisted by Korea's NIER. The TEMM has no permanent Secretariat as it is organised by the environmental authorities of each country on a rotating basis. These arrangements are financed through the voluntary contribution of members with certain countries playing a key contributing role.

In summary, the landscape of multilateral co-operation arrangements for air quality in North East Asia is fragmented and includes a number of mechanisms that frequently interact with each other. These co-operation efforts focus on the upstream part of the regulatory policy cycle and mainly centred on monitoring and exchange of information. Certain features of these arrangements overlap.

Despite dealing with the common challenge of air pollution, countries in the region are yet to advance into a common regulatory regime as those delivered by the CLRTAP and the Air Quality Agreement. A common feature of all the arrangements currently addressing air pollution in North East Asia is that they have focused on relatively soft collaboration mechanisms. Overall, co-operation for air pollution in the region has failed to produce a framework establishing a holistic strategy for transboundary air pollution and advancing towards abatement measures such as emission ceilings or other common regulatory tools.

1.2.2. The main regional co-operation arrangements for air quality

North-East Asian Sub-regional Programme for Environmental Cooperation (NEASPEC)

Membership and Participants

NEASPEC comprises six countries within North-East Asia: China, North Korea, Japan, Mongolia, Korea, and Russia. NEASPEC is the only regional co-operation mechanism for air quality that involves North Korea.

The main actors that participate in NEASPEC meetings are government officials from the Ministries of Environment or Foreign Affairs of the member countries. China, North Korea and Russia are represented by officials from their corresponding Ministries of Foreign Affairs whereas the representatives of Japan, Mongolia and South Korea come from the Ministries of Environment. In addition, representatives from international organisations, academics, independent experts, non-governmental organisations and other regional bodies participate in specific workshops or consultations organised by NEASPEC.

NEASPEC history

The origins of the NEASPEC can be traced back to the 1992 United Nations Conference on Environment and Development (Rio de Janeiro Earth Summit). It was established in 1993 during the Meeting of Senior Officials on Environmental Co-operation in North-East Asia organised by UNESCAP as a first attempt to address environmental issues at an official level in the region. The initiative was launched in co-operation with UNDP and UNEP following the example of other regional environmental co-operation programmes led by United Nation agencies.

NEASPEC's activities are guided by the annual Senior Officials Meeting (SOM). The first SOM meeting identified three priority areas for environmental co-operation: energy and air pollution; ecosystem management, in particular deforestation and desertification; and capacity-building. Interestingly, the

meeting recognised air pollution as one of the environmental issues needing the most urgent attention in the region (UN ESCAP, 1993[23]).

NEASPEC purpose

NEASPEC was established to address a comprehensive range of environmental problems and foster environmental co-operation in North East Asia. Its institutional framework was adopted in 1996, at the third SOM noting that the purpose was promoting sub-regional environmental co-operation and sustainable development efforts to enhance the quality of life and well-being in line with the spirit of United Nations Conference on Environment and Sustainable Development (UN ESCAP, 1996[24]). Later, the 2000 Vision Statement for Environmental Cooperation in North-East Asia included a call to "promote common policy dialogue on approaches and views and coordinated actions on sub-regional environmental issues" (UN ESCAP, 2000[25]).

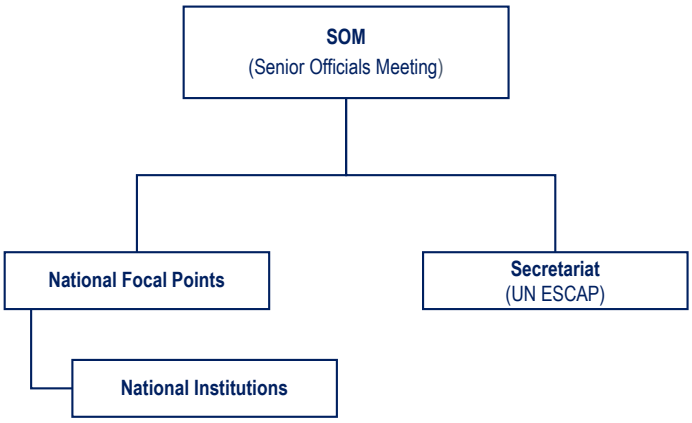
The long-term vision of NEASPEC its set forth in a 2016-2020 Strategic Plan that includes five programmes of work: transboundary air pollution; nature conservation; marine protected areas; low carbon cities; and desertification and land degradation. Each one of these areas is connected to one or more of the SDGs and intends to support their implementation in the region (NEASPEC, 2016[26]).

Governance structure

NEASPEC's governing structure is led by an annual SOM that acts as the main decision-making body. National Focal Points, mostly Ministries of Foreign Affairs, are in charge of activity co-ordination at domestic level.

The institutional arrangement of NEASPEC has gone through some adjustments. Originally, the Environmental and Development Division at the UNESCAP Headquarters in Bangkok acted as NEASPEC's interim Secretariat. In May 2011 this responsibility passed to UNESCAP's Sub-regional Office for East and North-East Asia, established in 2010, altering the status of the Secretariat from interim to permanent and relocating it to Incheon, Korea.

Figure 1.7. NEASPEC organisation chart



Source: NEASPEC (2016), *NEASPEC Strategic Plan 2016-2020*, NEASPEC, www.neaspec.org/sites/default/files/NEASPEC%20Strategic%20Plan_after%20SOM20.pdf.

Main forms of co-operation under NEASPEC

In practice, the objectives of NEASPEC for regional co-operation on air quality have a strong focus on promoting information sharing, technological transfer and capacity building across countries, rather than on the development of common regulatory instruments (such as standards or joint targets). Most recently, the efforts have centred on establishing the North-East Asia Clean Air Partnership (NEACAP), a pioneer formal regional instrument for air quality (Box 1.4).

In addition, between 1996 and 2012, NEASPEC and the ADB developed three regional technical assistance projects to mitigate transboundary air pollution from coal-fired power plants located in China and Mongolia. The project aimed at reducing sulphur emissions from plants and training government officials, experts and technicians on emissions standards, control and monitoring. The recommendations issued in 2011 following a final workshop on proposed emission standards for coal-fired power plants in Mongolia were adopted by the Mongolian government through a decree in 2012 (Low, 2012[27]).

Importantly, NEASPEC's work has served as the preparatory ground for promoting the development of a pioneer regional framework for transboundary air pollution in North East Asia. Following several rounds of consultations and expert meetings with national officials and representatives from other regional arrangements - including LTP and EANET- NEASPEC launched the North East Asia Clean Air Partnership (NEACAP) w at the 22nd SOM in 2018. The launch of this partnership is a significant milestone in formalising co-operation for air quality management in the region. The initial focus would nevertheless strongly remain on exchange of information and scientific rather than regulatory co-operation (Box 1.4).

Box 1.4. NEASPEC's North-East Asia Clean Air Partnership (NEACAP)

Between 2011 and 2012, NEASPEC held several rounds of consultation and assessment meetings to review the status of co-operation for air pollution management in the region. This work aimed at promoting a more coherent regional strategy or framework on transboundary air pollution and increasing the efficiency of existing mechanisms.

Building on this, between 2014 and 2016 NEASPEC launched a project to develop a "Technical and Policy Framework for Transboundary Air Pollution Assessment and Abatement in North-East Asia". The terms of reference for a North-East Asia Clean Air Partnership (NEACAP) were developed taking into account the work of existing mechanisms such as the LTP and EANET seeking to ensure complementarities.

The NEACAP would serve as a voluntary framework to address transboundary air pollution in North-East Asia, covering multiple pollutants: Particulate Matter (PM2.5 and PM10) and ozone as well as other relevant pollutants including SOx, NOx, black carbon, ammonia, and Volatile Organic Compounds (VOCs). The partnership would promote science-based and policy-oriented collaboration through exchange of information and data on emissions, modelling and development of emission inventories. For this purpose, it would co-ordinate with the existing arrangements, summarise their different results and potentially propose common technical and policy measures.

The 20th TEMM meeting held in June 2018, included an agreement to support NEACAP. The partnership was finally approved and launched in the 22nd SOM in October 2018. Countries noted the plan of setting up a Science and Policy Committee with two experts from each member State and to promote science-policy linkages through guiding technical assessments and dialogues.

Source: UNESCAP, "Review of Programme Planning and Implementation Transboundary Air Pollution. Note by the Secretariat" and UN ESCAP (2018), Report of the Twenty-second Senior Officials Meeting of the North-East Asian Subregional Programme for Environmental Cooperation, UN ESCAP, http://www.neaspec.org/sites/default/files//Report%20of%20the%20SOM-22_with%20proceeding_1.pdf.

Main successes of NEASPEC

The North-East Asia Clean Air Partnership (NEACAP) is a promising step towards formalising co-operation for air quality in the region and eventually advancing into common regulatory action. The dual membership of Russia in NEASPEC and the CLRTAP has provided benefits to this initiative by sharing its experience as a member of a multilateral agreement to promote air quality.

NEASPEC is the only comprehensive environmental co-operation mechanism in the region covering a range of environmental challenges. The programme has a multi-disciplinary and multi-sectoral approach and engages with a range of stakeholders in its development and implementation. The outcomes of NEASPEC's technical assistance project on mitigation of emissions coal-fired power plants was successfully incorporated into domestic policies in Mongolia through a decree that formulated new emission targets for coal-fired power plants based on the recommendations of the project.

Main challenges

The comprehensiveness of NEASPEC's membership creates certain challenges as it brings together a range of countries in different stages of development. In addition, the willingness and commitment of countries to co-operate under this programme have suffered from geopolitical tensions in the region, which lacks a political body involving all countries that promote multilateralism and intergovernmental action.

The varying composition of delegates attending the SOM meetings reflects the uneven political commitment of members to NEASPEC's activities. China representatives are typically senior level officials from their corresponding Ministries of Foreign Affairs. By contrast, representatives from Russia and Mongolia come from the high ranks of their Ministries of Environment. Japan and Korea are typically represented by mid-level officials from the Ministry of Environment.

As consequence, NEASPEC's work on regional air pollution has been limited to specific programmes and projects. Additional factors possibly contributing to this might be inconsistent funding relying mainly on voluntary contributions and reduced staff capacities linked to the absence of a permanent Secretariat between 1993 and 2011 (Low, 2012[27]).

Efforts to advance towards the agreement of a regional framework on air pollution have been slow mainly due to the unbalanced interest of countries to enter into a formal co-operation framework on the subject.

Joint Research Project on Long-range Transboundary Air Pollutants in North-East Asia (LTP)

Participants

The LTP is a trilateral research project between China, Japan and Korea. Participants in the LTP are scientists and researchers from these three countries appointed by their corresponding Ministries of Environment. Since its inception in 1995 the LTP has been led by Korea.

LTP history

The LTP can be traced back to the First North-East Asian Workshop on Long-range Transboundary Pollutants held in Korea in 1995. The workshop gathered air pollution experts and government officials from China, Japan, and Korea and was followed by two subsequent meeting held in 1996 and 1997. Building on this initiative, the three countries agreed to conduct joint research for monitoring and modelling of transboundary pollution and in 1999 they adopted the terms of reference for the project.

Work under the LTP has been conducted in staggered phases. Between 2000-2004, countries established the basis for monitoring, modelling and emission inventories. During a second stage (2005-2007), the project focused on analysing monitoring data, and developing inventories and models on cross-border

transport of sulphur. The third phase (2008-2012) continued the analysis and extended the target pollutants to NO_x, ozone and PM. More recently, the project has focused on understanding the source-receptor relations between countries (NEASPEC, 2012[28]).

LTP purpose

The overall purpose of the LTP is to improve the understanding on long-range transport of air pollutants in North-East Asia. The stated objectives of the project are (Secretariat of Working Group for LTP Project, 2015[29]):

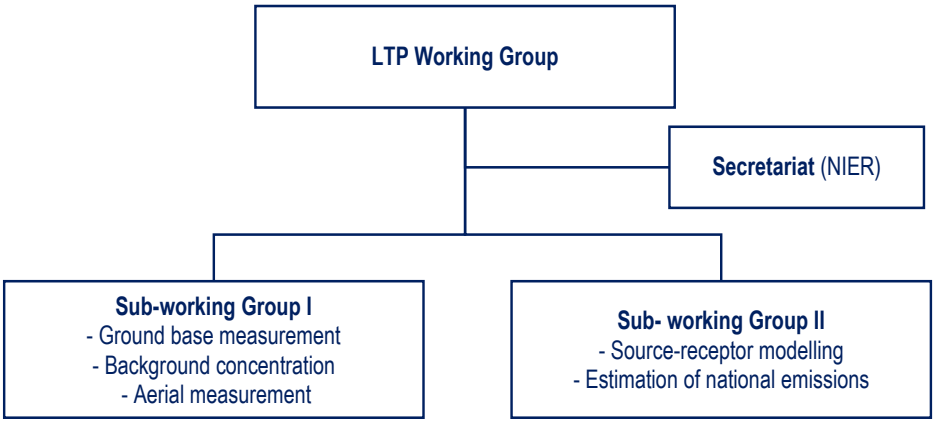
- Allowing participants to present and discuss research results of the preceding year through national report submitted by each country;
- Discussing scientific research needs to clarify uncertainties and knowledge gaps;
- Contributing to lay the foundation for research on transboundary air pollution; and
- Provide policy-makers with science-based information to prevent or reduce the adverse impacts of air pollution on the environment.

Governance structure

The LTP is served by a permanent secretariat placed at the National Institute of Environmental Research of Korea (NIER) that organises the annual LTP meeting, provides technical support for the project and co-ordinates the publications.

The LTP Working Group is the program's highest body and holds annual sessions. The Working Group is formed by nine members appointed by countries, typically government officials or researchers specialising in transboundary air pollution. In addition, the LTP has two sub-working groups: sub-working group I specialises in monitoring and is led by Japan; sub-working group focuses on modelling and is jointly led by China and Korea (Figure 1.8).

Figure 1.8. LTP governance structure



Source: NEASPEC (2012), *Review of the main activities on transboundary air pollution in Northeast Asia*, NEASPEC, www.neaspec.org/sites/default/files/Review%20of%20the%20main%20activities%20on%20transboundary%20air%20pollution%20in%20NEA.pdf

Main forms of IRC under LTP

The activities under the LTP cover the very early stages of the regulatory policy cycle, and mainly refer to data collection through monitoring, modelling and exchange of information.

The LTP monitoring of concentration of air pollutants is carried out through aircrafts and seven stations located across the region. These stations are located in China (Dalian and Xiamen), Japan (Rishiri and Oki) and Korea (Gangwha, Taean and Gosan) (Secretariat of Working Group for LTP Project, 2015[29]). Some of these monitoring facilities also serve EANET activities. The three countries have agreed on Quality Assurance and Quality Control (QA/QC) to standardise the measurement process and secure the accuracy and precision of the monitoring data (NEASPEC, 2012[28]). Modelling activities are carried out to conduct impact assessment of air pollutants and to establish source-receptor relationships dividing the countries into eight regions: five located in China, two in Korea and one in Japan (National Institute of Environmental Research, 2017[30]). However, the LTP has been unable to agree on a standardised methodology for monitoring and modelling hindering the comparability of the results by each country (Shim, 2017[31]).

Exchange of information under the LTP takes place during the annual meetings for which countries submit research results of the preceding year in the form of national reports conducted individually by countries. The LTP produces annual reports but these results are generally confidential and have not been endorsed by countries (Kim, 2014[32]).

Main successes of LTP

The LTP is the main scientific initiative on air quality bringing together experts from China, Japan and Korea. The project has been instrumental in developing links among the research communities working in the field and is generally highlighted as a milestone for co-operation in the region.

The LTP has strong connections to the TEMM. The outcomes of the LTP project are typically reported to the Ministers of Environment during this annual meeting and the LTP participants usually attend the TEMM's Tripartite Policy Dialogue on Air Pollution.

Main challenges

The main challenge under the LTP has been the limited connections with policy-makers from the member countries, resulting in a disconnect between research efforts and policy-measures. Furthermore, the participating countries have shown some reluctance to support the annual reports presented by the Secretariat and therefore the research results have not been published officially.

Korea is the biggest promoter and financial supporter of the LTP but the programme raises uneven interest from other member countries. These differences can be observed in their overall engagement in the project, including in the depth of their national reports and financial contributions.

Monitoring under the LTP remains limited to date and could be expanded to include more monitoring sites and pollutants, in particular hazardous air pollutants.

Tripartite Environment Ministers' Meeting (TEMM)

Participants

The TEMM is a trilateral effort between China, Japan, and Korea and is the highest level event on environmental co-operation in the sub-region. The TEMM brings together the ministers of environmental of the three countries on an annual basis as well as experts in a range of environmental fields that participate in the sub-bodies or activities of the programme.

TEMM history

The TEMM began in 1999 at the initiative of Korea and following the agreements reached in the 6th Session of the UN Commission on Sustainable Development (TEMM, 2011[33]). The first TEMM meeting was held in Seoul. Ministers agreed on the following priority areas of co-operation: raising awareness of the "environmental community" among the three countries; information exchange; strengthening co-operation on environmental research, environmental industry, and environmental technology; creating measures to prevent air pollution and to protect the marine environment; and strengthening co-operation on addressing global environmental issues such as the loss of biodiversity and climate change.

In 2010, during the TEMM12 countries agreed on their first 4-year Tripartite Action Plan on Environmental Protection, covering ten areas including climate change, dust and sandstorms, pollution control and environmental governance in North East Asia.

TEMM purpose

The main purpose of TEMM is to promote environmental management, take a leading role in regional environmental management, and contribute to global environmental improvement.

The 2015-2019 Tripartite Joint Action Plan on Environmental Cooperation adopted at TEMM17 in April 2015 in Shanghai, China, highlighted nine priority areas of work: Air Quality Improvement; Biodiversity; Chemical Management and Environmental Emergency Response; Circular Management of Resources/3R/Transboundary Movement of E-Waste; Climate Change Response; Conservation of Water and Marine Environment; Environmental Education, Public Awareness and Corporate Social Responsibility; Rural Environmental Management; and Transition to Green Economy (TEMM, 2017[34]).

In the area of air quality improvement, the Action Plan specifically recognises air pollution as one of the most urgent environment issues in the region Asia and calls for further co-operation on the matter.

Governance structure

The TEMM is hosted annually by each nation on a rotating basis. The meetings are organised by the Ministries of Environment and involve national research centres: the National Institute of Environmental Research of Korea, the Chinese Research Academy of the Environmental Science Institute and the National Institute for Environmental Studies of Japan. Unlike other regional arrangements for environmental co-operation, the TEMM operates without a permanent secretariat and the Ministry of Environment of the hosting country takes on the organising responsibilities.

A joint statement is issued following each annual meeting with the main agreements of the event and highlighting prominent regional efforts for environmental co-operation.[6] The joint statements typically includes language recognising and welcoming the progress achieved by regional mechanism addressing air pollution such as the LTP, EANET and NEASPEC. However, they typically do not go beyond to include mandates for specific joint action on the issue. For instance, in 2017 the Ministers noted the consultations on the NEACAP partnership and "recognised the need for further cooperation in strengthening technological capacity for air quality monitoring and emissions source inventory" (TEMM, 2017[34]).

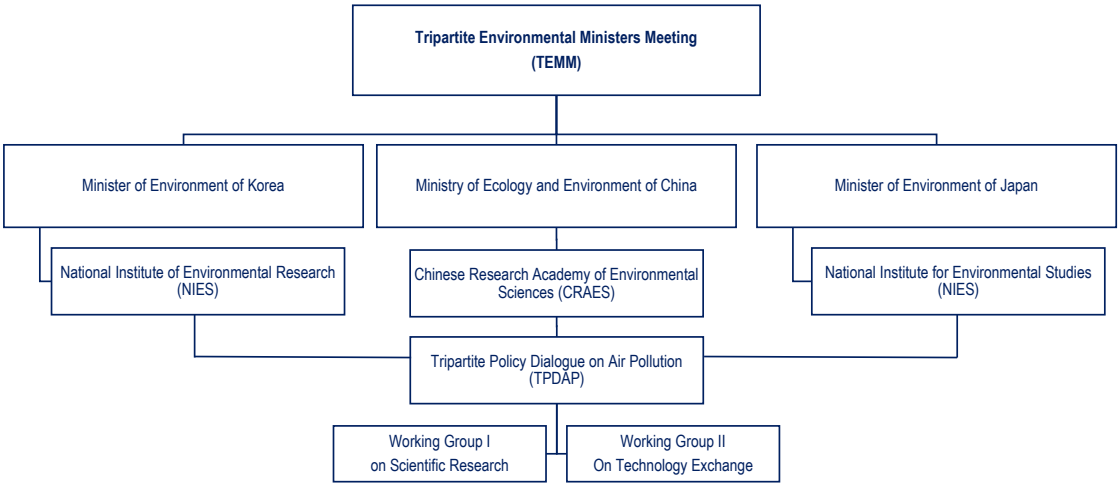
In 2013, the TEMM established a Tripartite Policy Dialogue on Air Pollution (TPDAP) that meets annually to promote co-operation on regional air pollution control through experience sharing among experts. The TPDAP has two subsidiary working groups where experts share experiences on scientific research, including VOCs control incentives and penalties, and petrochemical management, and exchange

[6] TEMM Joint Statements are publicly available at www.temm.org/.

information on technology for air quality monitoring, forecast and inventories based on domestic methodology and plans (Figure 1.9).

Figure 1.9. TEMM organisation chart

TEMM activities focused on air pollution



Source: Based on TEMM (2018), *TEMM Organisation*, http://www.temm.org/sub01/04.jsp.

Main forms of co-operation under TEMM

The main form of co-operation under TEMM in the field of air pollution is the exchange of information, methodologies and experiences that takes place in the TPDAP and its subsidiary bodies. However, although this initiative has strengthened the links between policy makers and experts, it has not developed into the establishment of common methodologies for emission reporting.

Main successes of TEMM

TEMM has enhanced the political visibility and awareness of the shared challenge of air pollution for China, Japan and Korea. The recent creation of specialised bodies addressing the issue further promotes the interaction between experts from different countries and contributes to build links between the science and policy communities. In addition, the support expressed in the TEMM Joint Statements has been key to advance certain initiatives such as the LTP project.

Main challenges

Notwithstanding its nature as a high-level dialogue, the TEMM has not managed to close the gaps between science and policy on regional air pollution by, for instance, mandating concrete measures to address jointly air pollution.

Acid Deposition Monitoring Network in East Asia (EANET)

Participants

Cambodia, China, Indonesia, Japan, Laos, Malaysia, Mongolia, Myanmar, Philippines, Russia, South Korea, Thailand, and Vietnam.

EANET history

EANET origins can be traced back to a number of expert meetings held between 1993 and 1997 to discuss the effects of acid deposition and promote co-operation on the issue. The meetings were organised by Japan and attended by scientist, government official and researchers from ten countries: China, Korea, Mongolia, Russia, Indonesia, Malaysia, the Philippines, Thailand and Singapore, along with representatives from UNEP, the European Monitoring and Evaluation Programme (EMEP) and the US National Acid Precipitation Assessment Programme.

Following these expert meetings, the First Session of the Intergovernmental Meeting of EANET was held in 1998 to agree on the main elements of the network. In 2000, a second meeting issued a Joint Announcement on the Implementation of EANET and the tentative design of the network.

EANET was established largely under the leadership of Japan and formally launched in 2001 at the Third Session of the Intergovernmental Meeting of EANET held in in Chiang Mai, Thailand (Kim, 2018[35]). In this meeting, countries adopted the Rules of Procedure of the network, including rules for admission, withdrawal and sessions of the Intergovernmental Meeting and relevant bodies.

EANET purpose

The overarching purpose of EANET is to create a regional monitoring network that delivers a common understanding of the status of acid deposition in East Asia providing inputs for decision making at various levels of government to prevent or reduce adverse impacts on the environment caused by acid deposition. In addition, it contributes to co-operation on acid deposition among the participating countries (ACAP-UNEP, 2011[36]).

Governance structure

The Intergovernmental Meeting is EANET's decision-making body. It holds annual meetings attended by representative of member countries that adopt the decision on the network activities.

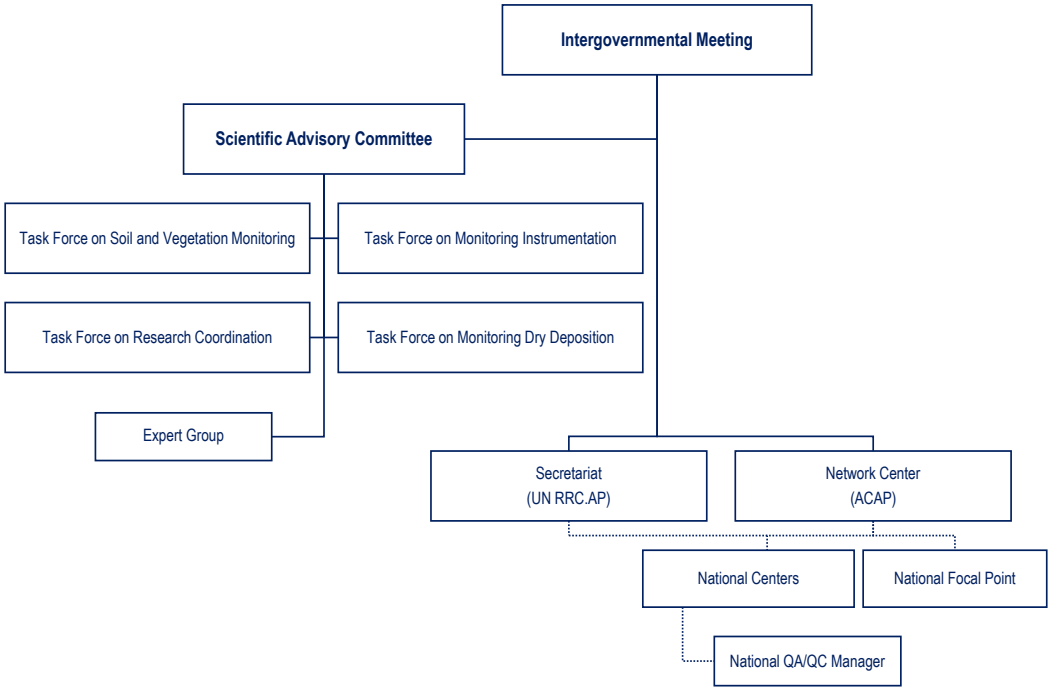
A Scientific Advisory Committee composed by experts nominated by the countries provides support to the Intergovernmental Meeting on scientific and technical issues. This committee prepares periodic assessment reports on the state of acid deposition in East Asia. In addition, a number of task forces and expert groups operate as subsidiary bodies of the Scientific Advisory Committee (Figure 1.10. EANET organisation chart).

The United Nations Environmental Programme Regional Resource Centre for Asia and the Pacific (RRC.AP) serves as Secretariat of EANET. The Secretariat co-ordinates the participation of countries, prepares meetings and promotes capacity building and public awareness activities.

The Asia Centre for Air Pollution Research (ACAP) located in Japan acts as the Network Centre. ACAP compiles, evaluates, analyses and stores the monitoring data and information. The Network Centre also prepares data reports on acid deposition in East Asia, provides technical assistance to countries and co-ordinates quality assessment and quality control activities.

At a domestic level, countries appoint National Focal Points – usually within the Ministry of Environment - to communicate with the Secretariat and Network Centre. National Centres are responsible for collecting domestic data and submitting it to the Network Centre (ACAP-UNEP, 2011[36]).

Figure 1.10. EANET organisation chart



Source: ACAP-UNEP (2011), *EANET Acid Deposition Monitoring Network in East Asia*, EANET, Niigata-Shi, www.eanet.asia/product/EANET_Brochure.pdf.

Main co-operation arrangements under EANET

EANET has created a regional monitoring network for acid deposition that includes 54 monitoring sites. The network assists countries in developing their monitoring plans and implementing the monitoring which is mainly focused on SO_2 and NO_X. Recently, the activities have extended to $PM_{2.5}$, PM_{10} and O_3, as pollutants related to acid rain. However, monitoring of these additional pollutants remains limited (EANET, 2016[37]).

The network operates under procedures established in a set of documents that include monitoring guidelines (EANET, 2000[38]), technical manuals (EANET, 2010[39]) and quality assurance and quality control programs (EANET, 2016[40]) that are regularly updated. Based on this monitoring data, every five years EANET publishes reports on the state of acid deposition in North East Asia. These reports are a relevant input for policy makers in participant countries that seek to understand the status of acid rain in the region. In addition, EANET conducts capacity-building activities for experts and monitoring facilities in participant countries.

Main successes of EANET

The geographical coverage of EANET is one of its mains achievements. It is the broadest network in East Asia addressing acid deposition; only three countries in the region are not members (Singapore, Brunei and North Korea). The monitoring sites cover rural and urban areas in the 13 participant countries.

The network has also progressed in the establishment of a standardised methodology for monitoring acid rain depositions through the procedures agreed in a range of technical documents. This is a relevant building block for the development of joint science on air pollution in the region.

Main challenges

The focus of EANET and its monitoring activities are on acidifying air pollutants. Although recently the monitoring activities have expanded to include additional pollutants that are relevant in the region (such as PM) the co-operation remains limited in this regard.

Similar to the other regional co-operation mechanisms for air pollution, monitoring under EANET remains voluntary and informal. Although the network has made progress towards standardised monitoring procedures, participation in EANET remains voluntary and internal decision-making follows a consensus-based approach. The network does not have enforcement mechanisms if a participant fails to deliver monitoring results or to follow the agreed technical procedures.

Chapter 2. The Case of the Convention on Long-Range Transboundary Air Pollution

This chapter examines the characteristics of the co-operation to address transboundary pollution under the Convention on Long-Range Transboundary Air Pollution (CLRTAP or Convention). The CLRTAP was the first multilateral instrument developed to curb transboundary air pollution. The Convention is the only international agreement on air pollution that addresses multiple effects and multiple pollutants through eight protocols that include national emission ceilings and regulatory commitments in key areas. It creates a complex organisational infrastructure for environmental co-operation among Parties establishing links between science and policy on air pollution. The agreement has allowed countries to make progress in fighting acidification of the environment and reducing ozone and photochemical smog, persistent organic pollutants and heavy metals. Simultaneously, the Convention has advanced joint scientific and technical co-operation to address transboundary air pollution extending through a large part of the Northern Hemisphere.

2.1. The context of the co-operation under the Convention on Long-Range Transboundary Air Pollution

2.1.1. Critical characteristics of transboundary air pollution that make the co-operation important

Air pollution in Europe was acknowledged as an international issue in the 1970s. An OECD report published in 1977 and updated in 1979 was pioneer in demonstrating that sulphur air pollutants travelled across European borders causing significant impact on the environment (OECD, 1979[9]). The report noted that countries could be distinguished between net receivers and net donors of sulphur pollution and concluded that measures taken within national borders to reduce sulphur depositions could only achieve limited results.

The presence of multiple sources of emissions spread throughout several neighbouring countries creates special challenges for transboundary air pollution in Europe (Siebenhüner, 2011[41]). Today, air pollution is recognised as an issue that requires action at all policy levels from local government to international institutions (OECD, 2014[7]). To date, human exposure to particulate matter (PM) in several areas of Europe is due to pollutants travelling long distances (UNECE, 2016[15]). The 2016Scientific Assessment Report of the Convention highlighted that due to the long-range transportation of air pollutants, an effective cross-border approach should extend into the hemispheric level because projections show that the UNECE region will continue to receive air pollution from outside its borders (UNECE, 2016[15]). This indicates that co-operation at the broader international level is necessary to effectively curb air pollution.

2.1.2. Scope of the Convention and intended objectives of regulatory co-operation in this area

The adoption of the CLRTAP was triggered by the increasing concern of European countries over the harmful effects of acid rain on the environment and on human health. The push for an agreement was led by Norway and Sweden and initially faced resistance from larger polluter countries in Western Europe, including the UK and Western Germany (Wetstone and Rosencranz, 1984[42]). The compromise was the adoption in 1979 of a framework instrument that advanced into binding obligations through Protocols adopted over the following years.

The Convention is designed as a broader instrument to address cross-border air pollution. In establishing the fundamental principles, Article 2 reads: "The Contracting Parties, taking due account of the facts and problems involved, are determined to protect man and his environment against air pollution and shall endeavour to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution." To date, the Convention and its protocols deal with a range of air pollutants and their effects on human health, the environment, agriculture, biodiversity, ecosystems and cultural heritage, through what is described as a "multi-pollutant multi-effect" approach.

The 1979 Convention provides a framework for co-operation. It includes general commitments to promote monitoring and exchange of information between parties and a notification and consultation mechanism. The first protocol of the Convention, adopted in 1984, sets a financing mechanism for the Co-operative programme for monitoring and evaluation of the long-range transmissions of air pollutants in Europe (EMEP), the scientific programme that provides much of the data and technical input for the Convention (see Section 2.2.2).

The Convention's focus on specific air pollutants builds on seven other protocols developed over the course of 15 years. These protocols contain legally binding targets for emission reductions of key air pollutants and technical annexes establishing best-available-technology obligations, among other measures. Emissions from transport, industrial and power sector are the main focus. Table 2.1 presents the details of each protocol. Over time, protocols have evolved into increasingly more sophisticated instruments.

In recent years, the CLRTAP has expanded its scope beyond the regional level through the establishment in 2004 of a Task Force on Hemispheric Transport of Air Pollution (TFHTAP) to analyse how air pollutants move across the northern hemisphere (Executive Body of the Convention on Long-range Transboundary Air Pollution, 2004[43]).

Table 2.1. CLRTAP Original Protocols

Year	Subject	Entry into force	Number of ratifications
1984	Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)	28 January 1988	47
1985	Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30%	2 September 1987	25
1988	Sofia Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes	14 February 1991	35
1991	Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes	29 September 1997	24
1994	Oslo Protocol on Further Reduction of Sulphur Emissions	5 August 1998	29
1998	Aarhus Protocol on Persistent Organic Pollutants	23 October 2003	33
1998	Aarhus Protocol on Heavy Metals	29 December 2003	34
1999	Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone	17 May 2005	27

Source: UNECE (2019), *Protocols to the Convention*, https://www.unece.org/env/lrtap/status/lrtap_s.html (accessed 15 May 2019).

2.1.3. The Convention in the landscape of existing international and domestic regulatory instruments and actors in transboundary air pollution

The Convention operates in a dense regulatory landscape that includes a host of international, regional and domestic actors and frameworks addressing cross-border air pollution directly, or issues related to air quality. The most notable of these frameworks are the European Union (EU) air pollution regulations, which are strongly connected to the CLRTAP framework. In addition, a number of States party to the Convention have signed bilateral agreements dealing with transboundary air pollution.

This diversity of frameworks results in some overlaps, specifically in their geographical scope, membership and commitments. Against this background, Article 3 of the Convention calls on parties to develop policies and strategies to curb air pollution "taking into account efforts already made at national and international levels." Considering this, some Protocols include references to other international agreements such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal and the Canada-United States Air Quality Agreement.

International instruments and organisations

The Convention complements a range of multilateral instruments and international organisations addressing issues related to air pollution. In recognition to this landscape, the CLRTAP engages in efforts to co-operate with relevant international organisations. Since 1997, collaboration with the WHO is formalised through a Joint Task Force on the Health Aspects of Air Pollution Co-operation that brings together experts to measure the effects of air pollution over human health and propose policy priorities (Bull et al., 2004[44])

Similarly, the long-term strategy for the CLRTAP specifically highlights the importance of increasing complementarities with the work of other international organisations and instruments including the World Health Organisation (WHO), World Meteorological Organisation (WMO), the United Nations Environment Programme (UNEP), the United Nations Framework Convention on Climate Change (UNFCCC), International Maritime Organisation (IMO), the Stockholm Convention on Persistent Organic Pollutants (Stockholm Convention of POPs) and the Convention on Biological Diversity (Executive Body for the Convention on Long-range Transboundary Air Pollution, 2010[45]).

Data and models developed under the CLRTAP support other international arrangements including the Stockholm Convention on POPs, the Minamata Convention on Mercury (Minamata Convention), the Climate and Clean Air Coalition (CCAC), the Baltic Marine Environment Protection Commission, and the Arctic Monitoring Assessment Programme under the Artic Council (UNECE, 2016[15]).

In addition, nearly all Parties to the CLRTAP have signed the UNECE'S Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention).[7] This Convention sets obligations to perform transboundary environmental impact assessments and includes notification and consultation obligations for large projects that may have significant cross-border impact.

Finally, a number of Parties to the Convention have signed bilateral agreements dealing with transboundary air pollution. For example, the 1989 Action Programme for the Purpose of Limiting and Reducing the Deposition and Harmful Effects of Air Pollutants Emanating from Areas near the Common Border of Finland and Russia and the 1991 Canada-United States Air Quality Agreement.

[7] CLRTAP parties that are not participants in the Espoo Convention are Georgia, Holy See, Monaco, San Marino and Turkey.

European Union regulations

EU air pollution regulations were first developed in the 1970s and accelerated in the following decades simultaneously with the adoption of the Convention its protocols. Further, some of its directives were adopted as a reaction to the CLRTAP in an effort to transpose the commitment into EU legislation[8] (Byrne, 2015[46]). To date, both regimes are institutionally interlinked through a range of functional and political connections (Selin and VanDeveer, 2011[47]). From a geographical perspective, both regulatory frameworks cover the European region. The 28 EU members and the European Union are among the 51 parties to the Convention, although the latter covers a wider area including Switzerland, Norway, Canada, the United States, Eastern Europe, the Caucasus and Central Asia. In addition, the two frameworks regulate similar air pollutants including sulphur dioxide, nitrogen oxides, non-methane VOCs, ammonia and fine particulate matter.

The scientific tools developed under the Convention have been instrumental in the development of EU air pollution policies, including the development of the Clean Air for Europe (CAFE) programme, the 2005 Thematic Strategy on Air Pollution, and to the establishment of national emission ceilings , among others (Selin and VanDeveer, 2011[47]). These scientific tools include EMEP data, the critical loads approach and the Regional Air Pollution Information and Simulation (RAINS) model (and its extension the model on Greenhouse Gases Air Pollution Interactions and Synergies model (GAINS)), an integrated assessment model that deals with air quality and its effects in Europe (Alcamo, Shaw and Hordijk, 1991[48]).

Additional important factors that have contributed to enhance the interactions between the CLRTAP and the EU frameworks are the adoption of national emission ceilings (NECs) for EU member States and the enlargement process though which CLRTAP parties have become members to the EU (Selin and VanDeveer, 2011[47]). In 2016, the EU established new NECs with emission reduction commitments for five main air pollutants: NOx, non-methane VOCs, SO_2, NH_3 and $PM_{2.5}$ (Directive 2016/2284). The new directive transposes the reduction commitments for 2020 agreed under the 2012 amendment to the Gothenburg Protocol. Overall, the EU air pollution regulations have contributed to harnessing the commitments of the parties under the Convention and its protocols (Byrne, 2015[46]).

Finally, EU regulations include a Directive on Environmental Impact Assessment amended in 2014 (Directive 2014/52/EU) that is aligned with the commitments under the Espoo Convention and includes provisions for cases where projects implemented in one Member State is likely to have significant effects on the environment of another Member State, including air pollution.

2.1.4. Short history of the development of the Convention

The CLRTAP was signed in 1979 following the increase in awareness over acid rain and its consequences on river, lakes and forests in Scandinavian countries. The Convention was the first multilateral instrument specifically designed to address transboundary air pollution. Since its entry into force in 1983, the CLRTAP has acted as a flexible framework to curb cross-border air pollution through eight protocols, seven of which deal with key air pollutants.

The focus on transboundary air pollution in Europe was spearheaded by the OECD through the creation in 1972 of a Co-operative Technical Programme to Measure the Long-Range Transport of Air Pollutants. The programme gathered 11 members of the organisation and aimed to estimate the contribution of domestic and foreign sources to sulphur compounds to air pollution in the region.[9] Findings from the

[8] Council Directives 84/360/EEC of 28 June 1984 on the combating of air pollution from industrial plants and 88/609/EEC of 24 November 1988 on the limitation of emissions of certain pollutants into the air from large combustion plants.

[9] Participant countries included Austria, Belgium, Denmark, Finland, France, Germany, Netherlands, Norway, Sweden, Switzerland and the United Kingdom. Canada participated as observer.

programme published in 1979 demonstrated that foreign sulphur emissions were responsible for the acidification of lakes and forest in Norway and confirmed that air pollutants could travel long distances and across European borders (OECD, 1979[9]). This programme was the precursor of EMEP, the scientific backbone of the CLRTAP. However, UNECE was chosen as the negotiating platform for the Convention as its membership was broader than the OECD and included Eastern European Countries.

The adoption of the CLRTAP was also preceded by two relevant international events that helped build political momentum for multilateral solutions to address environmental problems: the United Nations Conference on the Human Environment held in Stockholm in 1972 and the 1975 Conference on Security and Co-operation in Europe (CSCE) held in Helsinki (Wetstone and Rosencranz, 1984[42]). Principle 21 of the 1972 Stockholm Declaration notes that States have "the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction." In the Final Act of the Helsinki CSCE countries agreed to co-operate on a range of issues, including long-range transport of air pollutants.

Formal negotiations on the Convention began in 1977 during the cold war détente process in which environmental issues arose as a possible area to promote co-operation between East and West countries (Wettestad, 2011[49]). The negotiations were led by Norway and Sweden and developed under UNECE, a regional organisation that at the time gathered 34 countries from East and West Europe and North America.

In 1979, 32 countries signed the Convention during a High-level Meeting on the Protection of the Environment organised by UNECE. The Convention entered into force in 1983 and has so far been ratified by 51 parties (United Nations Treaty Collection, 2018[50]). The CLRTAP was the first international legally binding instrument to deal with problems of air pollution on a broad geographical area.

Since its adoption, the Convention has gone through different stages (Sliggers, Kakebeeke and UNECE, 2004[51]). A first stage focused on trust-building among parties, as such the 1979 Convention was designed as a broad framework for co-operation though exchange of information, scientific collaboration and a consultation and notifications system. In the initial stage, between 1979 and 1984, countries were reluctant to agree on emission reduction commitments regarding specific pollutants. In a second stage, binding abatement measures for key air pollutants were developed through seven protocols signed between 1985 and 1999.

At present, the work focuses on addressing implementation and compliance with the Convention. Moreover, three protocols were updated in 2009 and 2012 to ensure their relevance. The revised Gothenburg Protocol includes emission reduction commitments for PM2.5. Table 2.2 presents the scope of each amendment and number of Parties, certain annexes of the amendments enter into force for the Parties which have accepted them on the 90th day after the date on which two thirds of the Parties have deposited their instruments of ratification. The Convention is currently focused on promoting ratification and implementation of its protocols and developing strategies to address remaining air pollution issues.

Table 2.2. Recent CLRTAP Protocol Amendments

The three most recent protocols to the Convention were amended between 2009 and 2012

Protocol	Year	Scope of amendment	Parties	Entry into force
1998 Protocol on Persistent Organic Pollutants	2009	Includes seven new substances and revises certain obligations including emission limit values for waste incineration. Introduces ratification flexibility mechanisms for economies in transition, regarding timeframes for application of certain measures and BAT. Updates guidance on BAT to control emissions of POPs.	19	Not yet in force except for Annexes V and VII: 13/12/2010

Protocol	Year	Scope of amendment	Parties	Entry into force
1998 Protocol on Heavy Metals	2012	Adopts more stringent controls of heavy metals emissions and introduces flexibilities to facilitate accession of new Parties, mainly countries in EECCA. Updates guidance on BAT.	18	Not yet in force except for Annex III: 09/01/2014
1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone	2012	Includes national emission reduction commitments to be achieved by 2020 and beyond. Includes emission reduction commitments for particulate matter, including short-lived climate pollutant black carbon as a component of particular matter. Revises several technical annexes with updated sets of emission limit values for key stationary and mobile sources. Introduced flexibilities to facilitate accession of new Parties, mainly countries EECCA. Introduces a flexibility mechanism that allows Parties to propose adjustments to their emission inventories or emission reduction commitments, under qualified circumstances.	17	Not yet in force except for Annex I: 5/06/2013

Note: Certain annexes of the amendments enter into force for the Parties which have accepted them after two thirds of the original Parties have deposited their instruments of ratification.
Source: UNECE (2019), *Protocols to the Convention*, https://www.unece.org/env/lrtap/status/lrtap_s.html (accessed on 15 May 2019).

2.2. Main characteristics of regulatory co-operation in the context of the Convention

2.2.1. Parties and participation

Participation in the Convention is open to UNECE Members and states with consultative status to the organisation. Adherence to the protocols is open to Parties of the Convention. Currently, the CLRTAP has 51 parties that include EU members, Russia, former Soviet Union countries, Canada and the United States.[10] At the outset, in 1979, 32 countries from Europe and North America signed the Convention. The adoption by additional States was consistent during the following years and increased notably following the disintegration of the Soviet Union and former Yugoslavia. The ratification of the Convention and its protocols continued in the 2000s as the EU encouraged countries such as Albania, Croatia and Macedonia

[10] The current Parties are: Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Canada, Croatia, Cyprus,[1] Czech Republic, Denmark, Estonia, European Union, Finland, France, Georgia, Germany, Greece, Holy See, Hungary, Iceland, Ireland, Italy, Kazakhstan, Kyrgyzstan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russia, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, the former Yugoslav Republic of Macedonia, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and the United States of America (United Nations Treaty Collection, 2018[50]).

[1] *Footnote by Turkey:* The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue". Footnote by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

to increase their CLRTAP-efforts as part of the accession process (Selin and VanDeveer, 2011[47]). In 2006, Montenegro became the latest party to the Convention.

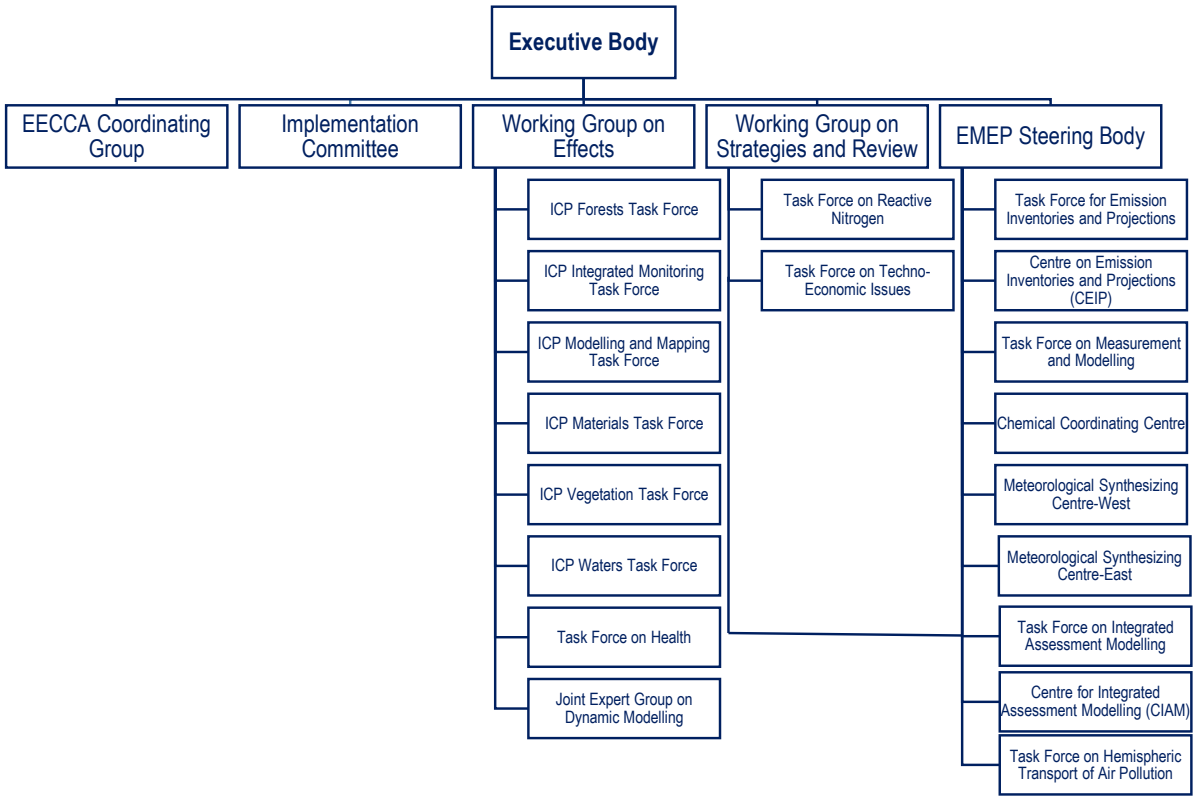
Further to this, the Convention established a Coordinating Group focusing on promoting compliance and participation among countries in Eastern Europe, the Caucasus and Central Asia (EECCA Coordinating Group). In addition, the CLRTAP has broadened its focus to address transboundary air pollution on an enlarged regional scale through the Task Force on Hemispheric Transport of Air Pollution that includes countries outside the European region.

2.2.2. Institutional organisation and operational modalities of the CLRTAP

Governance structure

The CLRTAP is supported by a multilayer institutional architecture that deals with scientific and technical research, air pollution monitoring, policy-making, and implementation oversight. A key feature of this design is the separation between scientific and technical activities from the political negotiation process which has allowed to insulate the scientific work (Bull et al., 2004[44]). The Convention is governed by an Executive Body supported by two scientific and technical bodies: the Steering Body for EMEP and the Working Group on Effects. The Working Group on Strategies and Review is a policy and negotiating body that advises the Executive Body, while compliance is overseen by the Implementation Committee. The structure also includes a number of task forces and research centres. UNECE serves as Secretariat to the Executive Body and its subsidiary bodies.

Figure 2.1. CLRTAP Organisational Chart



Source: UNECE (2018), CLRTAP Organisation Chart, 2018, http://www.unece.org/fileadmin/DAM/env/documents/2018/Air/website/CLRTAP_Structure_May_2018.pdf (accessed on October 2018).

Executive Body

The Executive Body is the main governing and decision-making body of the Convention. It is formed by representatives from all Parties and led by an eight-member Bureau that includes a chair, three vice-chairs and the heads of all subsidiary bodies and the Implementation Committee. According to the Rules of Procedure decisions within these bodies are made by consensus (Executive Body of the Convention on Long-Range Transboundary AIr Pollution, 2009[52]).

The Executive Body meets annually and is responsible for establishing subsidiary bodies that deal with the implementation and development of the Convention and prepare the reports, recommendations and documentation of the instrument. The Executive Body approves the long-term strategy that sets a 10-year vision for the Convention as well as biennial implementation work plans.

EMEP Steering Body

EMEP was launched in 1977 and merged into the Convention in 1979. Together with the Working Group on Effects, EMEP is the scientific and technical pillar of the CLRTAP. EMEP is responsible for atmospheric monitoring and modelling, emission inventories and projections, and integrated assessment to address cross- border air pollution (Executive Body of the Convention on Long Range Transboundary Air Pollution, 2009[53]). The financing mechanism of EMEP was agreed in the first protocol to the Convention, adopted in 1984.

A Steering Body comprised by scientific authorities of countries party to the Convention meets annually and oversees the work under the programme. The design includes four task forces that report to the Steering Body and five programme centres hosted and supported by Parties. The Chemical Coordinating Centre (CCC), hosted by the Norwegian Institute for Air Research (NILU) is responsible for chemical measurements and analysis. The Meteorological Synthesising Centre East (MSC-E) supported by the Russian Federation performs the evaluation of meteorological data together with the Meteorological Synthesising Centre West (MSC-W) hosted by the Norwegian Meteorological Institute (MET.NO). The Centre on Emission Inventories and Projections (CEIP) of the Austrian Environment Agency (UBA) and the Centre for Integrated Assessment Modelling (CIAM) of the International Institute for Applied Systems Analysis (IIASA) in Austria are also part of EMEP (UNECE, 2018[54]).

Working Group on Effects

The Working Group on Effects (WGE) is the additional pillar of the scientific and technical work under the Convention. It is responsible for reporting on the harmful effects of multiple pollutants on the environment and health, with a focus on nitrogen and particulate matter including black carbon, ozone, sulphur, heavy metals and POPs. This working group plans, co-ordinates and reports on all the effects-related activities of the Convention and alerts the Executive Body on potential threats produced by air pollution that may require policy action (Executive Body for the Convention on Long-range Transboundary Air Pollution, 2012[55]).

The working group operates through the task forces of six international co-operation programmes, a Joint Task Force on the Health Aspects of Long-range Transboundary Air Pollution led by WHO and the ECEH, and a Joint Expert Group on Dynamic Modelling.

Working Group on Strategies and Review

The Working Group on Strategies and Review (WGSR) is the main negotiating body under the Convention and gathers officials from all Parties. This working group meets annually and is responsible for assisting the Executive Body in the discussions of new protocols or amendments to the existing ones. It also proposes new strategic developments under the Convention and operates as a platform for reporting on new domestic strategies, policies and measures for air pollution abatement. This working group has been key in building the links between science and policy under the Convention (Wettestad, 2011[49]).

Implementation Committee

In 1997, the Executive Body created an Implementation Committee to oversee compliance with the obligations under the protocols to the Convention. The committee is comprised of legal and technical experts of nine parties to the Convention elected by the Executive Body among countries that are Party to at least one of the Protocols on Heavy Metals, Persistent Organic Pollutants; or Gothenburg. Members and the Chair are elected for two-year terms. The committee meets twice a year and is serviced by the UNECE secretariat.

The committee is responsible for reviewing compliance by Parties with the reporting requirements of the protocols and considers all submissions or referrals in relation to these reports. It also considers systemic compliance issues that are identified in the reporting process (Executive Body of the Convention on Long Range Transboundary Air Pollution, 2012[56]).

UNECE Secretariat

UNECE is a multidisciplinary organisation with activities covering a diverse range of issues including environment, sustainable energy, trade, transport, innovation and competitiveness, among others (OECD/UNECE, 2016[1]). It was established in 1947 and aims to pursue sustainable development, regional co-operation and economic among its 56 member States. The CLRTAP is one of five multilateral environmental agreements negotiated under the auspices of UNECE.[11]

Taking advantage of its broad regional membership, UNECE was the negotiation forum for the Convention and serves as Secretariat to the instrument and other four conventions (Box 2.1). The Secretariat responsibilities include organising meetings and linking the work of the different bodies under the Convention. These functions are performed by UNECE's Environment Division.

Box 2.1. The CLRTAP in the context of UNECE multilateral environmental agreements

UNECE currently serves as Secretariat to the governing bodies of five conventions negotiated under its auspice during the 1990s to address multilateral environmental issues. All of these conventions are in full force.

Together with the CLRTAP, these conventions include:

- The 1991 Espoo Convention on Environmental Impact Assessment in a Transboundary Context;
- The 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes;
- The 1992 Convention on the Transboundary Effects of Industrial Accidents; and
- The 1998 Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters.

Convention is synonym with generic term treaty. The latter has a generally accepted definition in international law according to the 1969 Vienna Convention of Law of Treaties "an international agreement concluded between States in written form and governed by international law, whether embodied in a single instrument or in two or more related instruments and whatever its particular designation". Treaties

[11] Other instruments are: the 1991 Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention); the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes; the 1992 Convention on the Transboundary Effects of Industrial Accidents; and the 1998 Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention).

are self-standing, legally binding instruments usually negotiated and concluded by States. Treaties can be concluded under the auspices of international organisations following, for instance, a diplomatic conference, or outside the framework of these organisations.

Conventions are part of the international rulemaking system and typically serve as building blocks of a broader framework to address specific areas. Conventions and treaties are deployed together with other instruments forming a continuum rather than a series of distinct elements: between legally binding and voluntary tools, between policy and technical standards, between normative and guidance documents.

Source: UNESCAP, Environmental Policy Conventions and Protocols, https://www.unece.org/env/treaties/welcome.html and (OECD, 2019[57])*"The Contribution of International Organisations to an International Rule-Based System"*, https://www.oecd.org/gov/regulatory-policy/IO-Rule-Based%20System.pdf.

2.2.3. Forms that co-operation is taking

Cooperation under the CLRTAP is formal and legally binding (Box 2.1). At the core of the Convention is the development of scientific and technical activities to create a common view on transboundary air pollution and abatement policies. The protocols to the Convention set emission ceilings for key air pollutants that have moved from flat-rate percentages applicable to all Parties, to country-specific ceilings. Simultaneously, technical annexes to the protocols promote the use of certain abatement technologies with varying degrees of legal force (e.g. voluntary best available techniques (BAT) or mandatory emission limit values (ELVs)). The Convention promotes the exchange of information and sets periodical reporting requirements for its Parties.

Main functions being co-ordinated under the Convention

The Convention is a co-ordination framework across different stages of the rulemaking process (Table 2.3). The activities co-ordinated under the Convention include exchange of information and the development of joint scientific research and technical initiatives. Since 1997, the Convention has a built-in compliance monitoring mechanism through an Implementation Committee. Although the Agreement includes a dispute settlement mechanism, it does not itself include penalties or sanctions for non-compliance. This is observable also in other international environmental instruments where a coercive approach has been avoided in favour of encouraging and enabling international co-operation. (Bodansky, 2010[58])

Table 2.3. The CLRTAP role in the rulemaking process

Stage of the rulemaking process	CLRTAP Role
Ex ante exchange of information	Exchange of information on a host of issues related to air pollution including effects and trends through a range of bodies
Agenda setting / setting goals / strategies	Review of strategic developments under the Convention and possible amendments through the Working Group on Strategies and Review
Formulation of rules / norms / standards	Establishment of binding emission reduction targets and other regulatory measures through Protocols and technical annexes
Data collection	Reporting on emissions and strategies and policies implemented to achieve reductions
Monitoring of instrument	Compliance monitoring through the Implementation Committee
Enforcement – imposition of sanctions	None
Dispute resolution	Resolution through negotiation by the parties or by arbitration or through the International Court of Justice, if jurisdiction is recognised by a party
Crisis management	None

Scientific and research activities

Advancing common scientific knowledge on air pollution is at the core of the CLRTAP. The Convention has a dedicated infrastructure for monitoring and modelling air pollution with EMEP, the Working Group on Effects and their subsidiary bodies at the core of these efforts (UNECE, 2016[15]). The interaction between science and policy is typically seen as one of the main achievements of the CLRTAP (Tuinstra, Hordijk and Kroeze, 2006[59]) (Byrne, 2015[46]).

The Convention has delivered two key scientific tools to implement cost-effective air pollution abatement policies: the critical loads concept, the RAINS model and its related GAINS model (Sundqvist, 2011[14]). The concept of critical loads was developed as a commitment in the 1988 NOx Protocol and put into use in the 1994 Second Sulphur Protocol. Critical loads aim to establish critical environmental thresholds below which there is no environmental harm, setting a quantitative value on an acceptable level of pollution load to ecosystems (Hettelingh et al., 2004[60]).[12] The critical loads approach is operationalised through integrated assessment models (IAM) that gather the data provided by Parties and CLRTAP bodies to deliver cost-effective emission control strategies. Modelling efforts under the Convention are led by the Task Force on Integrated Assessment Modelling (TFIAM) while the Greenhouse Gas–Air Pollution Interactions and. Synergies (GAINS) model acts as the main model for the CLRTAP. The work of the TFIAM has allowed to map the different quantitative scenarios for policy decision and change the focus of CLRTAP protocols from emissions to effects (Tuinstra, Hordijk and Kroeze, 2006[59]).

Emission Reduction Targets

The protocols to the Convention include emission reduction targets for key air pollutants. The approach to these emission ceilings has increased in complexity over time. The three initial protocols adopted between 1985 and 1991 addressed single pollutants (SO_2, NOx and VOCs) and included flat-rate reduction obligations with equal emission reduction goals for all Parties or a stabilisation commitment in the case of NOx.[13] In contrast, protocols since the 1994 Second Sulphur Protocol have established country-specific ceilings for emissions, shifting to an effect-based approach supported by the critical loads concept. The adoption of differentiated targets for each country aimed to balance environmentally and politically sensitive commitments among Parties (Byrne, 2015[46]). Further, the 1994 Second Sulphur Protocol creates more stringent measures for a special sulphur oxides management area (SOMA).[14]

The complexity of protocols has also increased in the number of pollutants and effects covered. The 1998 protocols on POPs and heavy metals were the first protocols setting emission limit values for different groups of pollutants. The 1999 Gothenburg Protocol was the first multi-pollutant multi-effect protocol. It was directed to simultaneously abate acidification, eutrophication and ground-level ozone (vegetation and human health) and included country-specific national emission ceilings for SO_2, NOx, Ammonia (NH_3) and VOCs (Maas et al., 2004[61]).

Technology standards

The CLRTAP has advanced the application of abatement technologies to control emissions in a host of sectors including energy, traffic, agriculture and industry. The 1979 Convention included the commitment of Parties to develop national control measures using the best available technology economically feasible

[12] The Second Sulphur Protocol defines critical loads as “a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur, according to present knowledge”. Similarly, critical levels are defined as “the concentration of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur, according to present knowledge”.

[13] The 1984 Protocol on Sulphur, the 1988 Protocol on NOx, and the 1991 Protocol on VOCs.

[14] This is an area of 1 million km2 in south-east Canada.

(BATEF). Since then, all pollutant-related protocols other than the 1985 Sulphur Protocol have included technical annexes with examples of best available technology (BAT) and obligatory emission limit values (ELVs) or standards (Szell, Keizer and Kuokkane, 2004[62]). The approach among protocols varies. For example, the 1988 NOx Protocol included mandatory national standards based on best available technology for new sources. The 1994 Sulphur Protocol went further and included emission limit values for large stationary combustion sources. The 1998 Protocol on VOCs also included guidance on best available technologies and on management of VOC-containing products. In addition, guidelines are available to support the implementation by parties (Lindau, Jagusiewicz and Kovacs, 2004[63]).

Several of these standards are based on previous agreements or domestic regulations, including EU legislation. For example, the Second Sulphur Protocol includes standards for major new stationary combustion sources similar to those included in a previous EU Directive (Directive 88/609/EEC) (Lindau, Jagusiewicz and Kovacs, 2004[63]).

Exchange of Information and Emissions Reporting

Parties to the Convention and its protocols agree to exchange a host of information related to air pollution. The breadth of this information has increased with the complexity of protocols and includes, inter alia, information on use of best available technologies and emission limit values. Data collection is done at a national level but in accordance to a standardised methodology. Exchanges occur through a range of mechanisms including national submissions to EMEP's Centre on Emission Inventories and Projections, reports to the international co-operation programmes under the Working Group on Effects, work under other bodies and periodical reporting to the Implementation Committee that in turns reports to the Executive Body (Bull et al., 2004[44]). Official data submitted annually by the parties is available at online at EMEP's Centre on Emission Inventories and Projections site.[15]

The complexity of the emissions reporting commitments has also increased under each protocol. Under the 1979 Convention, these commitments were included among the exchange of information obligations. However, since then both obligations have decoupled and the new protocols include specific commitments that require Parties to report not only on their emissions but also on the strategies and policies implemented to achieve reductions (i.e. through use of certain abatement technologies) (Szell, Keizer and Kuokkane, 2004[62]). Since 2013, the sessions of the Working Group on Strategies and Review are the format for reporting on strategies, policies, and measures referenced in the different protocols (Executive Body of the Convention on Long-range Air Pollution, 2013[64]).

Dispute settlement

Article 14 of the 1979 Convention does not include a formal procedure to resolve controversies arising from the interpretation or application of the instrument and requires parties to seek solution by negotiation or by any other dispute resolution mechanisms acceptable to them. The three first protocols to the Convention include identical language.

However, in addition to this mechanism, the 1994 Sulphur Protocol and the 3 subsequent protocols, indicate that if Parties choose to negotiate and fail to reach a resolution the controversy will be settled by a conciliatory commission specially appointed to recommend an award. These protocols also include a provision that gives Parties the option to submit a declaration recognising the jurisdiction of the International Court of Justice or an arbitration to solve controversies related to the interpretation or application of the instrument. To date, however, there have been no formal disputes under the Convention and its protocols (Byrne, 2015[46]). In addition, a non-contentious submissions and referral mechanism overseen by the Implementation Committee allows parties to deal with non-compliance under the

[15] Data is submitted to EMEPs by the parties. It is available at: https://ceip.at/ms/ceip_home1/ceip_home/webdab_emepdatabase/reported_emissiondata/.

Convention. This mechanism may be triggered by submissions or self-submissions by Parties or referrals by the Secretariat.

2.2.4. Mechanisms to ensure that the co-operation is effective and leads to tangible impacts.

Implementation oversight

The CLRTAP's main compliance oversight mechanism is the Implementation Committee established by the 1994 Sulphur Protocol and inspired by a similar body of the Montreal Protocol (Szell, Keizer and Kuokkane, 2004[62]). The Committee applies to all protocols to the Convention. Its responsibilities include supervising the fulfilment of the Parties reporting obligations on emissions, while the strategies, policies and measures are reported to the Working Group on Strategies and Review (Executive Body of the Convention on Long-range Air Pollution, 2013[64]).

The Implementation Committee is also responsible for overseeing situations of non-compliance with the Convention. It considers submissions and self-submissions by parties or referrals by the Secretariat to address non-compliance by a country of its emission reduction obligations under the Convention. The committee reports on these matters to the Executive Body. The Convention does not include formal non-compliance procedures, in these cases Parties are urged to meet their emission reduction obligations and invited to present follow-up reports (Szell, Keizer and Kuokkane, 2004[62]). In 2017, the Implementation Committee followed-up on the status of 15 referrals initiated by the Secretariat between 2013 and 2016 that were still in consideration and 9 new referrals submitted in 2017 (Implementation Committee, 2017[65]).

Oversight by the Implementation Committee has had a positive impact in the fulfilment of the emission reporting obligations by the Parties. For instance, emission data reported for the 1985 Sulphur Protocol increased from 86% in 1998 to 99% in 2003. Similarly, data reported for the 1988 NOx Protocol went from 82% in 1998 to 99% in 2003 (Szell, Keizer and Kuokkane, 2004[62])

Periodical reviews

The 1998 Protocol on Persistent Organic Pollutants, the 1998 Protocol on Heavy Metals, and the 1999 Gothenburg Protocol include periodical procedures to assess their sufficiency and effectiveness taking into consideration the progress achieved and the latest available scientific and technical knowledge.[16] Following these reviews, these protocols were amended between 2009 and 2012 to include additional pollutants and update the commitments (Table 2.2. Recent CLRTAP Protocol Amendments).

Insertion in domestic legislation

Insertion of CLRTAP commitments into the countries domestic legal frameworks has been high and mainly driven by the EU integration via Directives. Canada and the United States have also advanced pollution abatement measures through domestic regulation. Yet, the ratification of protocols and implementation in countries in Eastern Europe, the Caucasus and Central Asia has been uneven and remains a challenge (Executive Body for the Convention on Long-range Transboundary Air Pollution, 2010[45]).

[16] Article 3 (12) of the Gothenburg Protocol, Article 10 (3) of the Protocol on Persistent Organic Pollutants, Article 10 of the Protocol on Heavy Metals.

2.3. Assessment of the impact and success of regulatory co-operation through the CLRTAP

The CLRTAP was a pioneer instrument for international co-operation to address transboundary air pollution. Despite the complexity nature of the issue, in 40 years of co-operation the Convention has delivered significant progress to curb emissions.

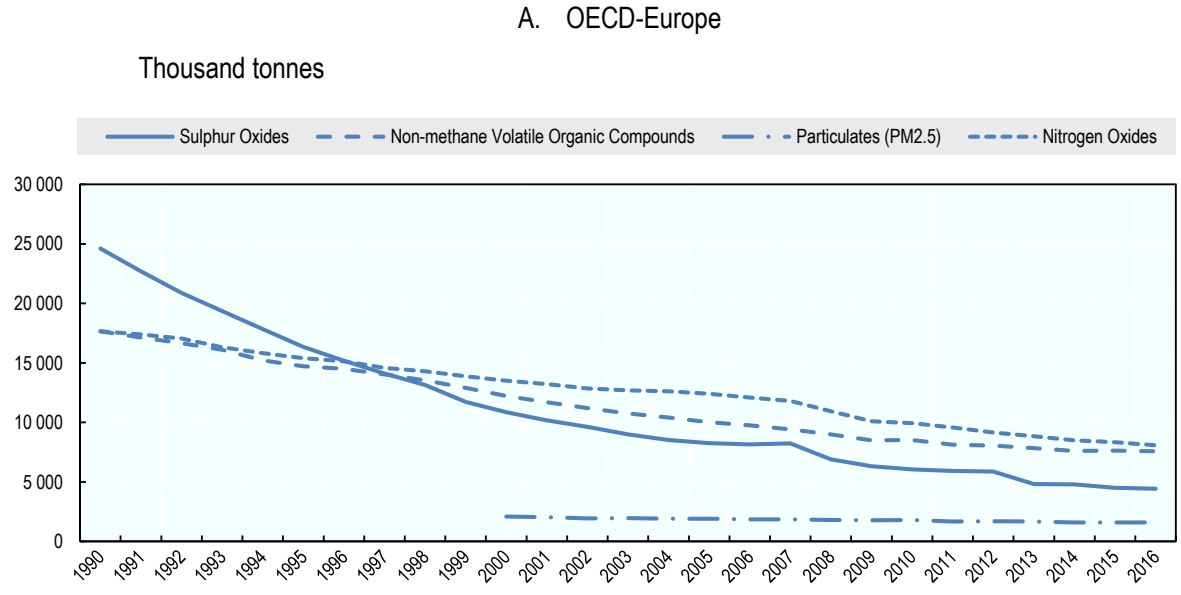
2.3.1. Assessment of success

A number of aspects need to be considered when assessing the success of international regulatory co-operation under the CLRTAP. These include its impact on emission reductions, the creation of a successful platform for science-policy interaction through a framework that is flexible and adaptable enough to include new pollutants and developments, its insertion into domestic regulatory measures and its unique geographical coverage.

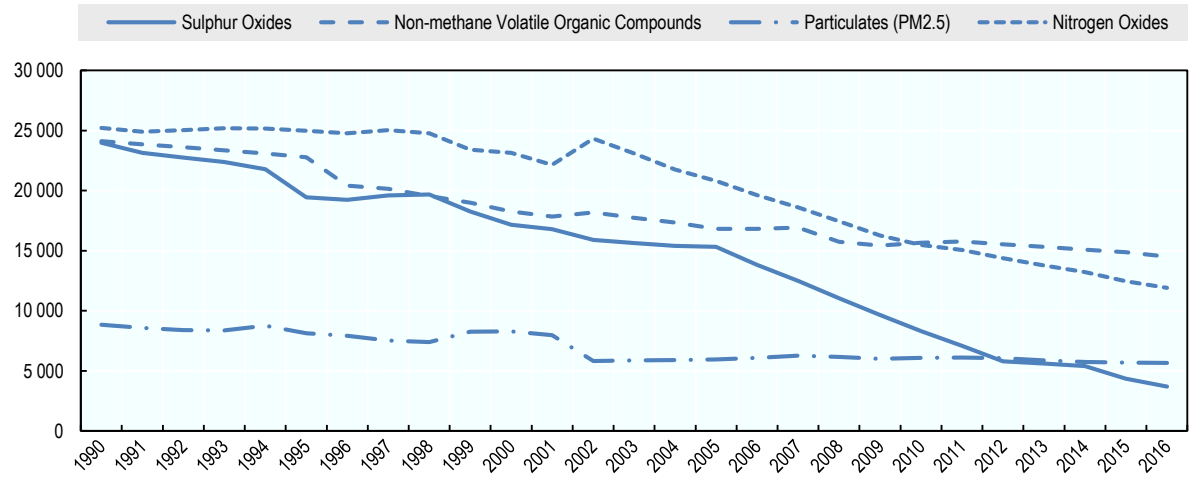
Impact of abatement measures under the Convention

The region has seen declines in sulphur dioxide emissions, soil and lakes acidification, and other pollutants. A 2016 UNECE Scientific Assessment Report noted that emission reductions under the Convention have generally been successful, particularly in the case of sulphur while challenges remain concerning other pollutants (Figure 2.2). Since 1990 countries have achieved a total reduction of sulphur emission of roughly 80% (UNECE, 2016[15]). There has also been a progressive decoupling of economic growth and trends in air pollution (UNECE, 2016[15]).

Figure 2.2. SO_2, NO_x, non-methane VOCs and PM2.5 emissions in OECD-Europe and Canada-US, 1990-2016



B. Canada-US



Note: PM data for OECD-Europe is only available as of 2000.
Source: OECD Stats.

Establishment of a successful framework for science-policy interaction

The CLRTAP includes a complex institutional architecture that has allowed it to influence national air pollution policies and build bridges between science and policy in the field of air pollution. The scientific tools designed under the Convention have allowed it to advance into an effects-based approach to air pollution abatement and been instrumental in the development of air pollution policies under other arrangements including the EU. These tools build on a strong expert network throughout the UNECE region and provides a platform for scientific exchange.

Flexibility and capacity to adapt to new developments

The Convention has adapted to new scientific developments and emerging pollution challenges through a series of protocols that deal with key air pollutants. Furthermore, the Convention has played a leading role in addressing new pollutants such as heavy metals, POPs, back carbon and particulate material. This work has acted as a precedent for two other multilateral instruments dealing with air pollutants: the 2001 Stockholm Convention on POPs and the 2013 Minamata Convention on Mercury.

Over the years, the CLRTAP has developed a mix of tools to facilitate implementation by Parties. These include country-specific emission ceilings, guidelines to promote abatement technologies and the designation of specific sensitive areas (e.g. SOMA). The Convention aims to create a level-playing field among its Parties and assists those who are facing challenges in building the necessary capacity to implement the protocols.

Insertion into domestic rule-making

The Convention has been successfully embedded into domestic regulations in Europe. At the EU level this process has been spearheaded by a series of Directives, notably the Directive on NECs addressing five main pollutants adopted in 2016.

Geographical coverage

The Convention covers most of the Northern Hemisphere including countries in Europe, Eastern Europe, Caucasus and Central Asia, and North America. It has extended the reach of its activities by also placing a focus on hemispheric air pollution through a specially designated task force.

2.3.2. Benefits, costs and challenges

Benefits

Generally speaking, an integrated approach to air pollution science and policy allows to create a level playing field among countries and avoid competition that hinders human health and the environment and simultaneously expanding the market for clean technologies (UNECE, 2016[15]).

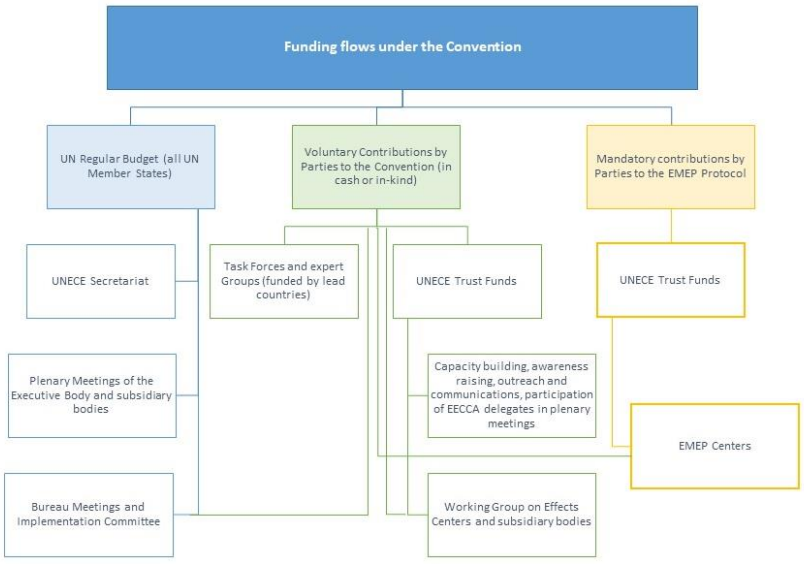
The critical loads approach and integrated assessment modelling allow the design of cost-effective abatement measures under the Convention. For instance, assessments from 2011 indicate that implementing the 2012 amendment of the Gothenburg Protocol would result in emission reductions for SO_2, NO_X and PM of around 40 to 45% between 2005 and 2020 (UNECE, 2016[15]).

Costs

The activities under the Convention are financed through a mix of resources provided by the United Nations regular budget, the EMEP Protocol adopted in 1984, and voluntary contributions by Parties. The secretariat is financed by UNECE. A General Trust Fund created by the EMEP Protocol supports the scientific activities. This fund gathers mandatory contributions calculated according to the UN scale of assessment and voluntary contributions. Table 3 shows the funding flows under the CLRTAP. In 2017, contributions paid by parties for the long-term financing of EMEP totalled USD $2,276,769 (CLRTAP Secretariat, 2017[66]).

The scale of contributions is revised regularly and approved by the Executive Body. The annual budget for EMEP is decided by the Steering Body and covers the costs of the five international scientific centres that collaborate with EMEP. In addition, parties support activities not covered by the EMEP General Trust Fund through voluntary contribution, financing activities directly and in-kind contributions (Executive Body for the Convention on Long-range and Transboundary Air Pollution, 2017[67]).

Figure 2.3. Funding flows from the Convention



Source: CLRTAP Secretariat (2017), *Funding flows and mechanisms under the Convention*, UNECE, Geneva, https://www.unece.org/fileadmin/dam/env/documents/2017/air/eb/final_final_informal_document_no._5.pdf.

Challenges

Notwithstanding the progress made by the CLRTAP in curbing transboundary air pollution in the UNECE region challenges persist on a number of fronts. A new long-term strategy for the Convention will take effect in 2020 setting out a vision for the 2020-2030 period and guiding the work and priorities of the Convention to address some of its outstanding challenges (Executive Body to the Convention on Long-Range Transboundary Air Pollution, 2018[68])

- *Environmental and health effects of air pollution.* Air pollution continues to be the primary environmental cause of premature death in Europe (UNECE, 2016[15]). The new Long-term Strategy for the Convention for 2020-2030 highlights challenges posed by pollutants including ozone, PM, nitrogen, sulphur, POPs and heavy metals, inter alia.
- *Implementation.* The implementation of protocols among parties remains uneven. Work on the Convention currently centres at promoting ratification and implementation particularly in countries in Eastern and South-Eastern Europe, the Caucasus and Central Asia (Executive Body for the Convention on Long-range Transboundary Air Pollution, 2010[45]). For this purpose, a Trust Fund for Assistance to Countries in Transition was created in 1994 to support implementation in developing countries (Wettestad, 2011[49]). Further, the time gap between the adoption of the protocols and their entry into force has proven challenging for the Convention. For instance, the Gothenburg Protocol adopted in 1999 only entered into force in 2005, after it had achieved the required ratification level of two thirds of the parties. At times, this has hindered the instruments ability to keep pace with technological developments and rendered the annexes obsolete (Lindau, Jagusiewicz and Kovacs, 2004[63]). The new Long-term Strategy for the Convention for 2020-2030 notes that ratification remains a challenge notwithstanding the flexibilities included in the amended Protocols to promote implementation.
- *Multi-level action.* Intercontinental long-range transboundary of certain air pollutants covered by the Convention significantly affects local air pollution, including in urban areas. The Convention should continue to promote co-operation at a hemispheric level together with local and regional action for air quality.
- *Links between air pollution and other science-policy issues.* The new Long-term Strategy for the Convention for 2020-2030 highlights that its scientific bodies need to prioritise exploring the interactions and synergies between air pollution, climate change, ecosystem biogeochemistry and biodiversity, and land-use management.
- *Monitoring.* The CLRTAP's monitoring, modelling and assessment system is unique and requires the continuous provision of resources for its effective long-term operation.

Chapter 3. The Case of the Canada-United States Air Quality Agreement

This chapter examines the characteristics of regulatory co-operation to address transboundary pollution between Canada and the United States. It focuses on the 1991 Canada-United States Air Quality Agreement (Air Quality Agreement), a bilateral instrument developed to reduce the impact of cross-border pollution from acid deposition and ground-level ozone. The agreement is a flexible framework that includes emission reduction goals for specific air pollutants and sets commitments to align regulations in key areas. It builds on the long-standing tradition of environmental co-operation between Canada and the United States. The agreement has allowed both countries to make progress in reducing acid rain and ground-level ozone and advancing joint scientific and technical co-operation on transboundary air pollution.

3.1. The context of regulatory co-operation between Canada – United States on air quality

The Air Quality Agreement is a binding bilateral mechanism designed to address transboundary air pollution between Canada and the United States with a focus on pollutants that are precursors to acid rain and ozone. These efforts take place against a backdrop of extensive bilateral co-operation between both countries to manage their common geography and integrated economies. In addition, the Agreement coexists with a number of international and domestic mechanisms that deal with transboundary air pollution with varying degrees of specialty and legal force.

Canada and the United States share an 8 900 km border that includes four of the Five Great Lakes (the largest freshwater body in the planet), rivers, watersheds and wildlife species. The two countries have a history of long-standing cross-border environmental co-operation to manage and protect the environmental quality and ecosystems in the border region. To address these, the federal governments of Canada and the United States have implemented over 40 international agreements (OECD, 2017[69]).

Co-operation between the two countries goes beyond environmental issues extending to areas that include trade, investment, migrations and regulatory policy, among other. Canada and the United States have highly integrated economies, with bilateral trade in goods and services exceeding USD 673 billion in 2017 (USTR, 2018[70]). The United States is Canada's largest direct foreign investor with around 52% of FDI in 2016. The integration also includes over 400 000 daily border crossings. The two countries have committed to strong regulatory co-operation in a number of trading sectors through a Canada-US Regulatory Cooperation Council created in 2011 (OECD, 2013[71]).

3.1.1. Critical characteristics of transboundary air pollution that make regulatory co-operation important

Air pollution from mobile and stationary sources in Canada and the United States moves across the border causing significant impact on human health and the environment in both countries. A report on Continental Pollutant Pathways prepared by the Secretariat of the Commission for Environmental Cooperation (CEC)[17] noted that the interconnectedness of North American air pollution problems was extensive (Commission

[17] The CEC was created under the 1993 North American Agreement on Environmental Cooperation (NAAEC). See section 1.1.3. of this case study.

for Environmental Cooperation, 1997[10]). However, although the two countries contribute to transboundary air pollution, most of the air pollution originates in the United States (OECD, 2005[72]).

Air pollution is a challenging issue to address at the domestic level and the fact that airborne pollutants are transported across the US-Canada border means that the countries have limited capacity to achieve their air quality goals only through domestic policy. Addressing transboundary air pollution requires a co-ordinated response between Canada and the United States to complement the activities and measures that each country is undertaking domestically. In light of this, the OECD has recommended that Canada and the United States bolster their efforts to improve air quality in the border region and strengthen the relationship between the relevant authorities (OECD, 2005[72]).

3.1.2. Scope of the Air Quality Agreement and intended objectives of the Canada-US regulatory co-operation in this area

The development of the Air Quality Agreement was triggered by the need to agree on bilateral action to reduce acid rain, which at that time was the most high-profile air pollution issue between Canada and the United States. The Agreement was amended in 2000 to address ground-level ozone, a key component of smog. -It also acts as a framework to effectively address shared concerns regarding transboundary air pollution. For example, the agreement has fostered co-operation on bilateral work plans to address air emissions from mobile transportation sources and the oil and gas sector. Currently, the Agreement addresses acid-rain causing depositions and ground-level ozone precursors in both countries.

A set of broad definitions gives the agreement flexibility to act as a framework to cover different cross-border air pollutants. The instrument defines air pollution as: “the introduction by man, directly or indirectly, of substances into the air resulting in deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems and material property and impair or interfere with amenities and other legitimate uses of the environment”. It specifies that transboundary air pollution is that which originates, wholly or in part, in the area under the jurisdiction of one of the parties having adverse effects in the area within the jurisdiction of the other.

More specific scopes and objectives of the Agreement are identified in three annexes, two of which have been part of it since its adoption in 1991. Annex 1 or the Acid Rain Annex establishes national reduction commitments for sulphur dioxide (SO_2) and nitrogen oxides (NO_X) emissions from stationary and mobile sources. This annex includes provisions to facilitate compliance monitoring and to prevent air quality deterioration and visibility protection. Annex 2 focuses on Scientific and Technical Activities and Economic Research, and includes joint commitments to co-ordinate monitoring activities, use compatible data management procedures and methods, and exchange information, *inter alia*.

In 2000, the Agreement was amended to further reduce and control NO_X and address VOCs, two ground-level ozone precursors and contributors to transboundary air pollution (Ozone Annex). Certain commitments under this annex only apply to a defined geographical region in both countries known as the Pollution Emission Management Area (PEMA) where emission reductions are key to curbing transboundary ozone (UNECE, 2016[15]). This area covers central and southern Ontario and southern Quebec in Canada as well as 18 US- states and the District of Columbia.[18]

3.1.3. The Air Quality Agreement in the landscape of existing international and domestic regulatory instruments and actors in transboundary air pollution

The Air Quality Agreement operates in a crowded regulatory space where a number of international and domestic arrangements dealing with transboundary air pollution coexist. Canada and the United States have adopted a range of bilateral regional and multilateral environmental co-operation instruments

addressing cross-border pollution, including water management. These instruments have varying degrees of legal force, ranging from non-binding declarations adopted in the context of high-level UN meetings to legally binding treaties and conventions. In addition, both countries have domestic environmental regulations and instruments that address cross-border pollution originating from domestic sources. This diversity of mechanisms produces some complementarities and overlaps. Yet, the Air Quality Agreement remains the only mechanism focusing exclusively on air pollution concerns between Canada and the United States.

International regulatory instruments

Canada and the United States are signatories of a number of non-legally binding instruments that advanced international principles for cross-border pollution. Both countries adopted the 1972 Stockholm Declaration of the United Nations Conference on the Human Environment, a landmark event in the development of international environmental law that set the principle of States' external responsibility for transboundary pollution (Hall, 2007[5], Weiss, 2011[4]).[19] The two countries endorsed subsequent instruments where this principle has been reaffirmed, including the 1992 Rio Declaration on Environment and Development and the United States General Assembly Resolution adopted in 2012 after the Rio+20 United Nations Conference on Sustainable Development. In addition, Canada and the United States are also adherents to a set of non-binding OECD recommendations adopted in the 1970s to address transboundary pollution focusing mainly on the polluters-pay principle and equal access to justice for trans-frontier pollution plaintiffs.[20] Canada and the United States also collaborate under the United Nations Environment Programme (UNEP) where two resolutions on air quality were brought forward by the United States in 2014 and Canada in 2017. Implementation of these resolutions is key to achieving broader co-operation on air quality outside of North America and Europe.

Canada and the United States have signed a number of legally-binding multilateral instruments dealing with transboundary air pollution. However, the commitment to these efforts has been uneven as some of these instruments or their amendments are pending ratification thus lacking legal force in the corresponding country. Both countries are parties to the Convention on Long-Range Transboundary Air Pollution (CLRTAP) signed in 1979 and currently ratified by 51 States (UNECE, 2018[73]). The CLRTAP was the first international legally binding instrument to deal with air pollution on a broad regional basis and is generally seen as a successful international instrument promoting environmental co-operation. The Convention has been extended by eight protocols, seven of which cover specific air pollutants. Canada and the United States have a varying degree of adoption of the CLRTAP Protocols (Table 3.1). The two countries have signed and ratified (UNECE, 2018[73]). In addition, Canada and the United States signed the 1991 Convention on Environmental Impact Assessment in a Transboundary Context, which sets obligations to perform transboundary environmental impact assessment, and the 2001 Stockholm Convention on Persistent Organic Pollutants. These Conventions where ratified by Canada in 1998 and

[19] Principle 21 of the Stockholm Declaration provides: "States have […] the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction."

[20] These recommendations are the following: 1972 Recommendation on Guiding Principles Concerning International Economic Aspects of Environmental Policies; 1974 Recommendation of the Council on the Implementation of the Polluter-Pays Principle; 1974 Recommendation of the Council on Principles concerning Transfrontier Pollution; 1976 Recommendation of the Council on Equal Right of Access in Relation to Transfrontier Pollution (abrogated in 2017); and 1977 Recommendation of the Council for the Implementation of a Regime of Equal Right of Access and Non-Discrimination in Relation to Transfrontier Pollution.

2001, correspondingly, and they have not been ratified by the United States (UNECE, 2018[74]) (UNEP, 2018[75]).

Table 3.1. Status of ratification of CLRTAP Protocols by Canada and the United States

Protocol	Status of ratification		
	Canada	United States	Total
1984 Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)	R	R	47
1985 Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30%	R	/	25
1988 Sofia Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes	R	R	35
1991 Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes	S	S	24
1994 Oslo Protocol on Further Reduction of Sulphur Emissions	R	/	29
1998 Protocol on Persistent Organic Pollutants	R	S	33
1998 Protocol on Heavy Metals	R	R	34
1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone	R	R	27

Note: Signature (S) Ratification or Acceptance (R). Ratification indicates the States' consent to be bound to a treaty if the parties intended to show their consent by such an act.
Source: UNECE (2018), *Protocols to the Convention*, https://www.unece.org/env/lrtap/status/lrtap_s.html (accessed 19 October 2018).

Trilateral co-operation between Canada, Mexico and the United States extends to environmental affairs, including transboundary air pollution. The United States-Mexico-Canada Agreement (USMCA) signed in 2018 in replacement of the former North America Free Trade Agreement (NAFTA) includes a special environment chapter. The chapter identifies a comprehensive range of environmental topics to be addressed through regional co-operation including a section on air quality that recognises the importance of curbing domestic and transboundary air pollution. In the context of the USMCA, the three countries adopted the Environmental Cooperation Agreement (ECA). The ECA requires countries to effectively enforce their environmental protection laws and continues the work of the Commission for Environmental Cooperation (CEC) to oversee environmental actions and enforcement activities. The USMCA includes a submission process that allows stakeholders to raise to the CEC environmental enforcement concerns including those related to air pollution.

Domestic regulatory instruments

Domestic regulations in both countries foresee mechanisms to address the cross-border nature (or impacts) of air pollution originating from national sources. These mechanisms include integrating transboundary considerations into the environmental impact assessment (EIA) process and allowing national authorities to take ex *post action* to prevent cross-border air pollution.

The environmental assessment process regulated in the Canadian Environmental Assessment Act (2012) requires the evaluation of projects subject to EIA to consider not only domestic effects but also changes that would occur to the environment outside of Canada. The US EIA process established under the National Environmental Policy Act (1979) does not include an express reference to the cross-border effects of projects under assessment. However, a 1997 guidance issued by the Council on Environmental Quality requires agencies to include analysis of reasonably foreseeable transboundary effects of proposed projects (Council on Environmental Quality, 1997[76]).

In addition, both countries grant their environmental authorities powers to take action against domestic air pollution affecting other countries. Section 115 of the US Clean Air Act (1970) allows the EPA Administrator to launch a process requiring US states authorities to review their State Implementation Plans to prevent

or eliminate air pollutant or pollutant emissions that may reasonably endanger public health or welfare in another country. The Canadian Environmental Protection Act (1999) authorises the Minister of Environment and Climate Change to take action, under certain circumstances, to prevent or control air pollution originating from Canadian sources that may pollute air in another country or where pollution violates an international agreement binding on Canada.[21]

3.1.4. Short history of the development of the Air Quality Agreement

The Air Quality Agreement was signed in 1991 following over a decade of negotiations triggered by the shared concern of Canada and the United States over acid rain. Its development was accelerated by increased regulatory efforts to address air pollution in both countries. The instrument builds on existing bilateral institutions and policies developed in the context of the two countries water management framework, notably the International Joint Commission (IJC or Commission). Since its adoption, the agreement has operated as a flexible mechanism to address air pollution issues including through the addition of new pollutants (NOx and VOCs) through a 2000 amendment.

The 1909 Boundary Waters Treaty is the foundational landmark for co-operation on transboundary pollution between the two countries (Hall, 2007[77]). The central purpose of the treaty was agreeing on the management of shared boundary waters, including the lakes, rivers and connecting waterways in the border region. The treaty includes the first formal provision dealing with transboundary pollution between both countries regulating cross-border pollution of boundary waters.

Most notably, the Boundary Waters Treaty created the IJC, a bilateral institution responsible for studying or settling disputes under the treaty with a broad mandate to examine or resolve controversies referred by Canada and the United States.[22] The IJC was the first permanent US-Canadian body (Holsti and Levy, 1974[78]) and over the years its mandate has been extended to cover cross-border air pollution matters. In use of its powers, in 1949 the IJC resolved the Trail Smelter Arbitration in a decision that established the principle of external responsibility in the field of international environmental law.

In 1972, Canada and the United States adopted the Great Lakes Water Quality Agreement (GLWQA) to establish water management objectives for the group of lakes placed in the border area. Recognising that some of the contamination of the Great Lakes originated in atmospheric sources, in 1978 both countries signed a new agreement that included the development of joint pollution control programs on airborne pollutants affecting the Great Lakes ecosystem (Rasmussen, 1979[79]). This built momentum for bilateral co-operation on air quality through the establishment of a Bilateral Research Consultation Group on Long-Range Transport for Air Pollution that delivered the 1979 Joint Statement on Transboundary Air Quality (Roelofs, 1993[80]).

In 1980 both countries signed a Memorandum of Intent Concerning Transboundary Air Pollution. In the memorandum, the parties established a joint bilateral committee responsible for negotiating an agreement and decided to take interim actions to fight transboundary air pollution.

Yet, progress towards the development of the agreement stalled during the 1980s until both countries implemented domestic regulations against acid rain that paved the way for a formal bilateral instrument on air pollution. These regulations include Canada's 1984 measures to reduce sulphur emissions and the 1990 United States Clean Air Act Amendment that recognised acid rain as an issue of international significance laying the ground for a formal bilateral agreement.

The Air Quality Agreement was finally signed on 13 March, 1991, in Ottawa, Canada. It focused initially on reducing acid deposition levels in both countries but was amended in December 2000 to accommodate an Ozone Annex that added precursors to ground-level ozone to the pollutants covered by the instrument.

[21] CEPA Part 7 Division 6.

[22] Boundary Waters Treaty Articles IX and X.

The amendment arose from the 1997 Program to Develop a Joint Plan of Action for Addressing Transboundary Air Pollution in which both Canada and the United States agreed to define next steps towards the transboundary management of ozone and particulate matter (Air Quality Committee, 1998[81]). It proved the adaptability of the Agreement to cover the emerging or evolving challenges on transboundary air pollution between Canada and the United States.

The Agreement has allowed Canada and the United States to analyse broader air pollution issues, including the possibility of developing a new annex to address particulate matter (PM). The 2013 Transboundary Particulate Matter Science Assessment prepared by the AQC updated a 2004 report on this issue to provide scientific and technical basis for discussions of this potential new annex (Air Quality Committee, 2013[82]). The 2014 Air Quality Agreement Progress Report noted that, while PM remains a significant concern for both countries due to the potential risks to public health and ecosystems, the findings from the Science Assessment did not support adding a specific annex to the Agreement. Yet, the document stressed the importance of continuous collaboration to reduce $PM_{2.5}$ concentrations (Air Quality Commitee, 2014[83]).

The Air Quality Agreement provides a framework for the specialised environmental agencies in Canada and the United States to initiate further co-operation projects in specific transboundary air pollution issues. For example, between 2003 and 2005, three Border Air Quality Projects were developed to explore further areas of collaboration: a feasibility study to develop a cross-border cap and trading program for a SO_2 and NO_X; an international air-shed strategy for the Georgia Basin-Puget Sound airshed and a pilot project to co-ordinate air management measures in the Southeast Michigan-Southwest Ontario region (Air Quality Commitee, 2006[84]). In recent years, the ECCC and the EPA have worked together to reduce emissions from mobile transportation sources and from the oil and gas sectors in both countries (Air Quality Commitee, 2016[85]).

As all of the emission reduction commitments included in the Agreement have been met, officials from the two countries are engaged in exploratory discussions on updating the Agreement.

3.2. Main characteristics of regulatory co-operation in the context of the Air Quality Agreement

3.2.1. Institutional organisation and operational modalities of the Air Quality Agreement.

The national agencies responsible for the implementation of the Agreement are Environment and Climate Change Canada (ECCC) and the United States Environmental Protection Agency (EPA). The institutional design to oversee the implementation of the Air Quality Agreement borrows from the Canadian and United States experience and framework for managing transboundary water. It relies on two bilateral bodies comprised of government representatives: the Air Quality Committee, created specifically under the Agreement and similar to the Great Lakes Executive Committee established under the GLWQA; and the IJC, created in 1909 under the Boundary Waters Treaty.

Air Quality Committee

The Agreement creates a bilateral Air Quality Committee (AQC or Committee) that oversees its overall implementation. The Committee is co-chaired by representatives from the ECCC and the US Department of State; it has members from a range of institutions including federal environmental agencies and other federal institutions, representatives from border states and provincial governments. The Committee meets at least once a year and its work is supported by two specialised bilateral bodies: a Subcommittee on Program Monitoring and Reporting and a Subcommittee on Scientific Co-operation.

The responsibilities of the Committee are mainly focused on reviewing the implementation of the Agreement by preparing and submitting biennial progress reports to the countries, referring these reports to the IJC for public consultation and making them available to the public.[23]

International Joint Commission

Although water management issues are the core of the IJC's activities, the institution has been involved (mainly in the past) in managing or resolving transboundary air pollution controversies between Canada and the United States (Box 3.1). In 1991, the Air Quality Agreement extended the responsibilities of the IJC to cover certain transboundary air pollution issues following its success as fora for bilateral conflict resolution. To date, the IJC leads the public consultation process of the reports prepared by the AQC and Canada and the United States can request the IJC to resolve disputes between them under the Agreement (See section 1.2.2. of this case study). Until 2012, the IJC had a specialised Air Quality Advisory Board that advised on air quality issues with cross-border implications (International Joint Commision, 2018[86]).

Box 3.1. The International Joint Commission's Decisions on Transboundary Air Pollution

The IJC was initially created to deal with controversies under the 1909 Boundary Waters Treaty. However, over time its responsibilities where extended to deal with key transboundary air pollution transboundary air pollution disputes between Canada and the United States in significant arbitral awards

Trail Smelter Arbitration

In 1928 the governments of Canada and the United States requested the Commission to assess the facts and economic compensation due to farmers in Washington State in the United States for damages caused by pollution from a zinc and lead smelter located along the bank of the Columbia River in British Columbia, Canada.

In 1931, the IJC awarded Washington farmers USD 350,000 for economic damages and prescribed the adoption of emission control measures for the smelter.

The case was later reopened and decided by a three-member panel that awarded and additional compensations and set specific pollution control measures for the smelter. However, the Trail Smelter case was the first international ruling on transboundary air pollution recognising State's responsibility for extraterritorial environmental damages.

Three Detroit-St. Clair River Region References

In a series of three references made in 1949, 1966 and 1975 the Canadian government called the IJC to report on cases alleging that air pollutants from industries located in Detroit, Michigan were causing damage to Canadian sites.

In a number of reports the IJC analysed the air pollution situation and made recommendations for preventive and remedial measures, including the adoption of air quality objectives, air pollution monitoring efforts, and requesting authority to continue supervising regional air quality

Source: Buhi, J. and L. Feng (2009), The International Joint Commission's Role in the United States-Canada Transboundary Air Pollution Control Regime: A Century of Experience to Guide the Future, Vermont Journal of Environmental Law, Vol. 11, http://bwt.ijc.org.

[23] Air Quality Agreement Article VIII.

The IJC is formed by six commissioners appointed in equal numbers by each country. The Commission has a Canadian and a United States section, each led by a Chair elected among its commissioners. The sections act jointly as a secretariat with a range of responsibilities including organising meetings and hearing, receiving and filing applications, *inter alia*. The IJC meets at least twice a year and has permanent offices located in Ottawa, Canada and in Washington D.C., United States (Commission, 2011[87]).[24] The activities of the IJC are conducted in accordance with a set of Rules of Procedure adopted in 2011 and a 2015-2020 Strategic Plan that sets its guiding principles and priorities for work (International Joint Commission, 2015[88]). Forms that the co-operation is taking.

Co-operation under the Agreement is formal and legally binding. The agreement recognises that Canada and the United States have different approaches to addressing air pollution and establishes several country-specific obligations that reiterate national objectives (e.g. emission reduction goals in Annexes 1 and 3) or require the implementation or amendment of specific domestic regulations. Simultaneously the agreement sets commitments to align regulations in key areas such as vehicle emission and fuel standards using US standards as a benchmark. It also includes strong commitments on exchange of information and consultation and notification mechanisms to deal with existing or potential sources of cross-border air pollution. Finally, the agreement includes scientific and technical activities that have helped develop a common understanding of cross-border air pollution.

Main functions being co-ordinated under the Agreement

The Air Quality Agreement is a platform for co-ordination between countries in areas such as exchange of information and the development of joint scientific research and technical initiatives. The Agreement has an in-built monitoring mechanism to evaluate its implementation as well as a notification and consultation system. Although the Agreement includes a dispute settlement mechanism it does not include penalties or sanctions for non-compliance.

Co-ordinated exchange of information

Canada and the United States agree to exchange a broad range of information on: monitoring; emissions; technologies, measures and mechanisms for controlling emissions; atmospheric processes and the effects of air pollutants. These information exchanges take place on a regular basis through the Air Quality Committee. Annexes 2 and 3 include a detailed list of the information that both countries agree to share, including specific reporting requirements for NO_x and VOC emissions in the PEMA region.

Co-operative scientific and technical activities

Addressing transboundary air pollution requires a degree of consensus between scientific communities in the affected countries. At the time of the adoption of the Agreement, there was no common view or science between experts in Canada and the United States on acid rain (Air Quality Committee, 2012[89]). The Agreement has since helped to advance the development of a shared understanding on transboundary air pollution between both countries through a series of air quality modelling, monitoring and research commitments detailed in Annex 2.

Emission inventories are key for air quality management as they identify sources of pollution, provide data for models and track trends and progress in control strategies (Air Quality Committee, 1998[81]). Canada and the United States have made efforts to improve the consistency, quality and comparability of their emission inventories. Both countries currently have emission inventories and projections for a range of pollutants including PM, SO_X, NO_X and VOCs (Air Quality Commitee, 2016[85]).

[24] Rules of Procedure of the International Joint Commission (2011).

Co-operation for air pollution monitoring efforts began with both countries working to integrate data sets from their acid depositions networks (Air Quality Committee, 2000[90]). The two main monitoring networks in Canada are the National Air Pollution Surveillance program (NAPS) and the Canadian Air and Precipitation Monitoring Network (CAPMoN). On the other hand, the United States has a number of monitoring networks run by state, local or tribal agencies. In addition, a multipollutant monitoring network (NCore) led by the EPA began operating in 2011 (Air Quality Commitee, 2014[83]). Since 2001, real-time reporting and mapping for air quality Canada and the United States takes place through AIRNOW, an initiative led by the EPA and available online[25] (Air Quality Committee, 2000[90]).

Furthermore, scientific co-operation under the Agreement has extended to binational work on other pollutants (e.g. 2004 and 2013 Transboundary Particulate Matter Science Assessments). This co-operation has helped to inform discussions on amendments to the Agreement to address ozone and, possibly, PM levels.

Emission control and reduction goals

The Agreement includes country-specific commitments for emission control and reduction of certain air pollutants. Annex 1 contains the limitations for SO_2 and NO_X -the main precursors of acid rain- while Annex 3, sets specific objectives for ground-level ozone precursors (NO_X and VOCs).

In defining these commitments, Canada and the United States refer to standards and limitations included in existing regulations. The United States' commitments are usually set in connection with standards and limits set in the Clean Air Act and the National Ambient Air Quality Standards for Ozone. Canadian commitments are based on domestic measures or involve the implementation of new regulations such as for vehicles and fuels that align to United States standards. As such, the Agreement recognises that each country has different approaches to addressing air pollution. As a consequence, both countries recognise that the regulations, guidelines and caps referenced in their specific obligations may be amended in their domestic legal process.[26]

Interestingly, while emission reduction goals set in Annex 1 apply nationally, Annex 3 introduces specificity by narrowing down the application of certain targets to a specially designated area in both countries where emission reductions are significant to address transboundary ozone i.e., the PEMA.

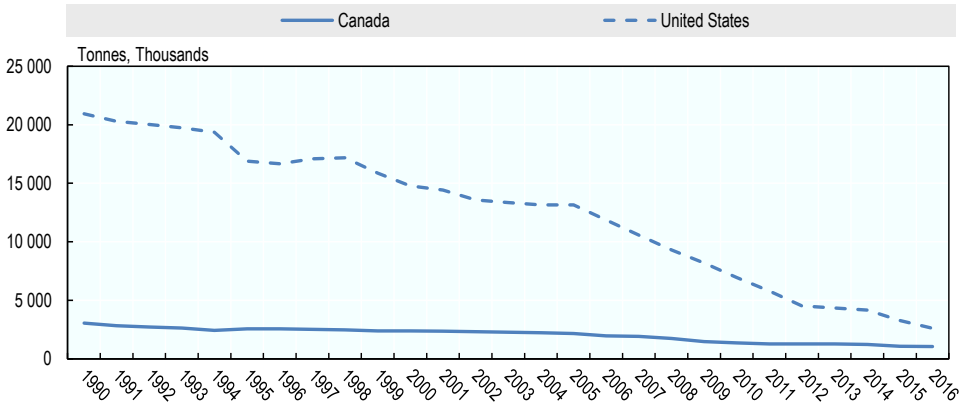
The target periods for emission reduction goals under the annexes have passed and both countries have met their goals and achieved progress in addressing acid rain and controlling ozone pollution (Figure 3.1, Figure 3.2 and Figure 3.3). The 2016 Agreement Progress Report noted that between 1990 and 2014, SO_2 emissions decreased by 63% in Canada and 79% in the United States. Similarly, between 1990 and 2014, the countries achieved emissions reductions of 51% for NOx and 38% for VOCs and in the PEMA region.

Building on the Agreement, in 2016 both countries issued on a Joint Statement on Climate, Energy, and Artic Leadership where they committed to collaborate on programmes, policies, and strategies to reduce oil and gas methane emissions. This Joint Statement also included the commitment to curb these emissions by 40% to 45% below 2012 levels by 2025 (Office of the Press Secretary, 2016[91]).

[25] https://airnow.gov/.

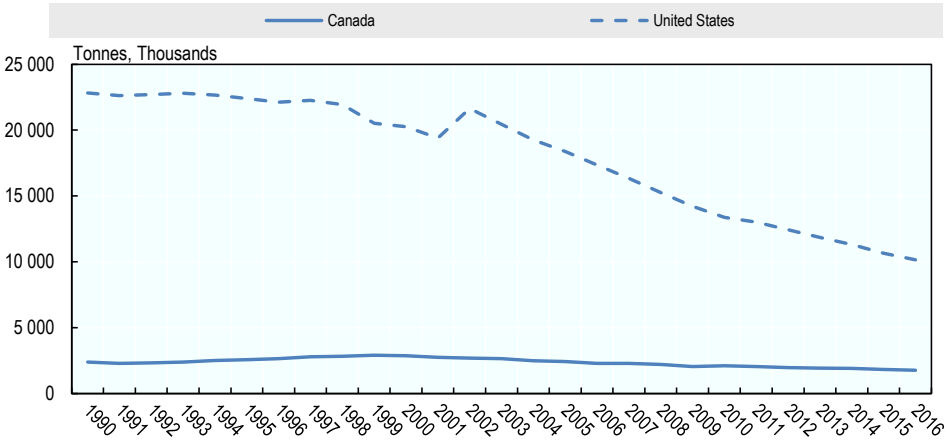
[26] Annex 3 Part III C.

Figure 3.1. National SO_2 Emissions in Canada and the United States from man-made sources, 1990-2016



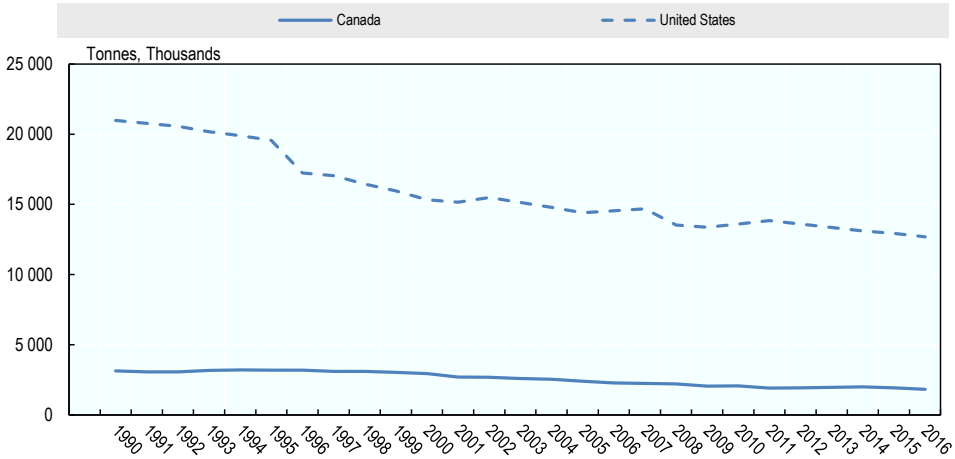
Source: OECD Stats.

Figure 3.2. National NO_x Emissions in Canada and the United States from man-made sources, 1990-2016



Source: OECD Stats.

Figure 3.3. National non-methane VOCs Emissions in Canada and the United States from all sources, 1990-2016



Source: OECD Stats.

Regulatory harmonisation

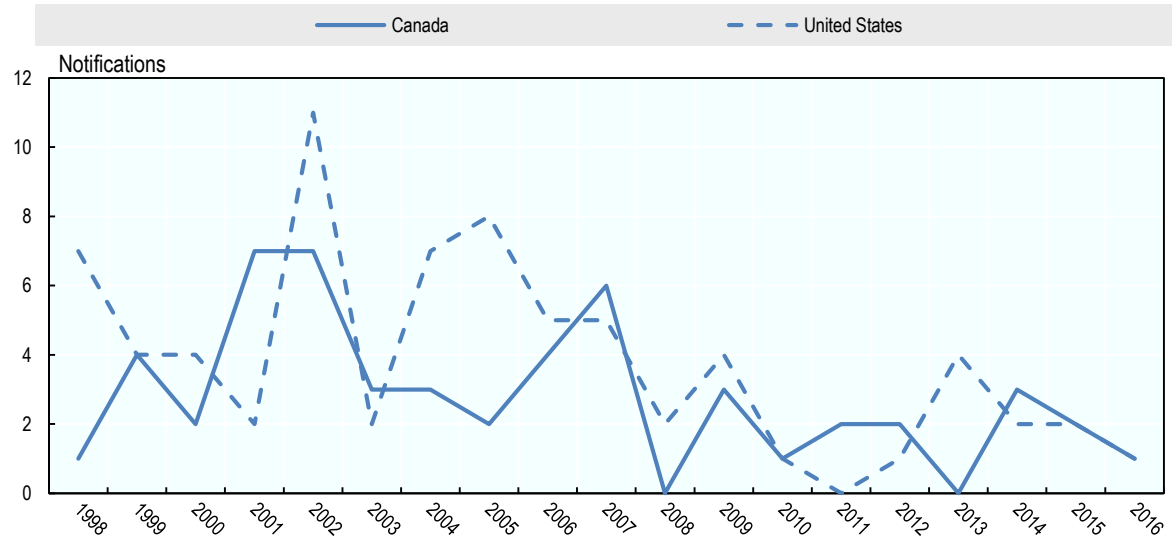
The Agreement has allowed Canada and the United States to align regulations in a number of areas related to air pollution where appropriate to their national circumstances. For example, Canada committed to align its regulations for engines, on-road vehicles and fuels to United States EPA standards. As a recent example, in 2015 Canada passed regulations amending the *On-Road Vehicle and Engine Emission Regulations and Other Regulations Made Under the Canadian Environmental Protection Act (1999)* to align its air pollutant emission standards for new passenger cars, light trucks and some heavy duty vehicles with the EPA standards. Also in 2015, Canada amended its *Sulphur in Gasoline Regulations* in alignment with EPA Tier 3 Standards. On the other hand, the United States committed to require States in the PEMA region to implement a number of regulatory amendments to achieve reduction commitments.

Assessment, mitigation and notifications commitments

The Agreement requires Canada and the United States to assess new projects or modifications to existing sources that, if implemented, would likely cause significant transboundary air pollution, and consider appropriate mitigation measures.

Additionally, countries are required to notify the other party of any proposed action, activity and project under assessment in advance of any decision. This notification system began operating in 1994 and is led by the EPA and ECCC. It applies to all actions taking place within 100 km of the Canada-US border or beyond this area if a government estimates that transboundary air pollution can occur (Air Quality Commitee, 2014[83]). Between 1998 and 2016, there were a total of 125 notifications, 72 made by the United States and 53 by Canada. Figure 3.4 shows the number of notifications per country.

Figure 3.4. Notifications under the Air Quality Agreement (1998-2016)



Source: ECCC https://www.canada.ca/en/environment-climate-change/services/air-pollution/issues/transboundary/canada-united-states-air-quality-agreement/notifications/applicants.html and EPA https://www3.epa.gov/ttn/gei/uscadata.html.

Consultation, Referral and Dispute Resolution Mechanisms

The Agreement includes a broad consultation mechanism that extends to any matter within the scope of the instrument.[27] These consultations take place on a case-by-case basis and need to commence no later than 30 days from the date of receipt of a request from the other country. If, after consultations, an issue

[27] Article XI.

remains concerning a proposed or continuing action, activity or project that is causing or likely to cause significant transboundary air pollution, the matter is referred to an appropriate third party in accordance with agreed terms of reference. In addition, Canada and the United States are required to consult each other on specific issues including any ongoing action, activity or project that may be causing transboundary air pollution, and on regulatory or legislative changes that would have potential effects on transboundary air pollution. The consultation process follows the guidelines adopted in 1998 by the Air Quality Committee.

A set of dispute settlement provisions regulate the resolution of issues or disagreements connected to the Agreement. If, after consultations a dispute remains between the parties, over the interpretation or implementation of the Agreement, the parties will seek to resolve the dispute through negotiations between them. These negotiations shall start no later than 90 days from the date of receipt of the request for negotiations. If the dispute is not solved through negotiations, both countries can consider whether to submit the issue to the IJC or to another agreed on mechanism for resolution. Finally, Article IX of the Agreement gives the IJC a broad mandate to resolve disputes referred by Canada and the United States as appropriate for the effective implementation of the instrument. The absence of IJC enforcement powers over its decisions in these disputes has been criticised by some commentators (Roelofs, 1993[80]; Hall, 2007[77]).

To date, however, no disputes have risen under the Agreement.

3.2.2. Mechanisms to ensure that the co-operation is effective and leads to tangible impacts.

Insertion in the domestic decision making process

The emission reduction goals established in the Agreement mirror the national objectives included in each country's domestic legislation. However, the instrument does require both countries to enact any additional legislation necessary for its implementation or to require the local authorities to do so.

Comprehensive review mechanism

The Agreement has a comprehensive review and assessment mechanism. Every two years the Air Quality Committee issues a progress report on its status of implementation. In addition, every five years Canada and the United States produce a comprehensive review and assessment of the Agreement and its implementation. To date, both countries have published 13 progress reports and 4 Five-Year Reviews (1996, 2002, 2006 and 2012).

Following these reviews and assessments, Canada and the United States may consider appropriate actions including amending the Agreement or changing existing policies, measures or programs. For example, the 2012 Review and Assessment specifically addressed the issue of future expansion of the agreement noting the ongoing analysis over possible amendments dealing with PM as well as air pollution across the western regions of Canada and the United States.

Public consultation mechanisms

One of the main characteristics of the Air Quality Agreement is a built-in consultation mechanism that expands on a similar feature of the GLWQA. Each of the biennial progress reports prepared by the Air Quality Committee is referred to the IJC to invite comments from the public, including through public hearings as appropriate. The IJC then prepares a synthesis of these comments that is sent to the governments of both countries and published.

IJC data suggests that interest in participating in this public consultation process has decreased over time. This may be explained by the fact that attention over the Agreement has diminished as both countries have reached their emission reduction targets and met their commitments (International Joint Commission, 2015[92]). Additional factors that may contribute to this are the fact that public comments are received once

the progress reports are finalised and the lapse of time between the date of publication of the reports and the launch of the public consultation procedure. For example, the consultation process for the 2016 Progress Report took place between March and August 2018. Table 3.2 shows the number of comments received in the public consultation process between 2002 and 2014.

Table 3.2. Comments received in the consultation process of the Air Quality Agreement Progress Report between 2002 and 2014

Year	Number of comments received
2002	32
2004	35
2006	25
2008	15
2010	12
2012	4
2014	3

Source: International Joint Commission (2015), *Synthesis of Public Comment on the 2014 Progress Report under the Canada-United States Air Quality Agreement*, International Joint Commission, http://ijc.org/files/publications/Synthesis-of-Public-Comment-2014-CAN-US-AQA-Progress-Report-December_2015.pdf.

In addition to the mandatory consultation mechanism for progress reports, the Agreement also requires the parties, as appropriate to consult with provincial or state governments, interested organisations and the public throughout the implementation of the agreement.[28]

3.3. Assessment of the impact and success of regulatory co-operation through the Air Quality Agreement

3.3.1. Assessment of the success of the Air Quality Agreement

Over its 27 years of existence, the Air Quality Agreement has allowed Canada and the United States to address *shared concerns on transboundary air pollution on a number of fronts.*

- *Contributing to emission reduction goals.* Although the Agreement essentially follows the targets set in each country' domestic regulation, it has allowed Canada and the United States to strengthen their national goals by turning them into bilateral commitments. Since 1991, both countries have significantly reduced their SOX, NOX and VOCs emissions and have met and exceeded their goals under the Agreement.
- *Providing an adaptable framework to address emerging bilateral air pollution challenges.* The Agreement has provided a platform for officials in both countries to jointly address emerging challenges in transboundary air pollution, such as ozone and PM. The 2000 Ozone Annex demonstrates that the Agreement is able to adapt to addressing new transboundary air issues of concern between Canada and the United States. However, is noteworthy that no other annexes have been added to the Agreement since, thus its capacity to adapt has only been tested once.
- *Encouraging regulatory alignment.* Commitments under the Agreement have resulted in greater regulatory alignment between Canada and the United States towards more stringent vehicle emission and fuel standards, resulting in a more coherent regulatory framework to address air pollution in certain sectors. Furthermore, the assessment, notifications and mitigation mechanisms

[28] Article XIV.

in the Agreement effectively allow both countries to have some influence on each other's air pollution policies.

- *Building scientific consensus over key air pollution issues.* The Agreement has allowed the scientists and officials in both countries to develop a common view on the challenge of transboundary air pollution which is critical to advancing co-operation in this field.
- *Embedded consultation mechanism.* The stakeholder engagement mechanism that allows the public to participate in the implementation reviews of the Agreement has been noted as one of the most significant features of the instrument even though public inputs are sought only after the publication of the reviews (Hall, 2007[77]).

3.3.2. Costs and challenges

Costs

There are at least the following costs associated with carrying out the co-ordination of the Agreements:

- Direct administrative costs arising from the expenditures of the Institutional arrangement set in place to guarantee the implementation of the Agreement, e.g. increased responsibilities of the IJC and the creation of the Air Quality Committee.
- Costs arising under the obligations of the Agreement itself, e.g. implementation of new regulations; indemnity and/or mitigation measures.

Challenges

The Agreement has been a useful tool for bilateral co-operation to address transboundary air pollution between Canada and the United States. However, the evidence suggests that the relevance of the instrument has decreased over the years. The Agreement has not been amended since the 2000 Ozone Annex and emission reduction goals have long been met. Further, evidence from the consultation process of the Agreement's Progress Reports suggests decreased interest by the public in the instrument.

As the Agreement has not been translated into US-law through specific legislation the commitments under it lack statutory provision status (Hall, 2007[77]). In addition, the absence of penalties and sanctions for breaches to the Agreement, and de facto no use of the dispute resolution mechanisms available in the Agreement, leave no alternative for action in response to non-compliance.

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