UNECE

Towards Cleaner Air

Scientific Assessment Report 2016: Summary for Policymakers

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Preface

This document was prepared under the auspices of the EMEP Steering Body and the Working Group on Effects at the request of the Executive Body of the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP). The EMEP Steering Body and the Working Group on Effects cover the scientific network within the UNECE region. This network was developed over the past 35 years in order to support effect-based cost-effective air pollution policies with the best available knowledge.

This assessment report summarises current scientific knowledge on transboundary air pollution issues within the UN ECE region and describes the effectiveness of air pollution measures in addressing large-scale effects on forests and lakes as well as in protecting human health and preventing other air pollution effects, such as loss in biodiversity and damage to crops, the built environment and cultural heritage.

The assessment of emission reduction achievements is based on a report on trends in air pollution and impacts coordinated by the Working Group on Effects[i], a report on air pollution trends between 1990 and 2012 by the EMEP Task Force on Measurements and Modelling[ii], and an assessment for North America by the U.S. Environmental Protection Agency (EPA) and Environment and Climate Change Canada[iii].
Opportunities identified for means to tackle remaining challenges are mainly based on work by the EMEP Task Force on Hemispheric Transport on Air Pollution, the Meteorological Synthesizing Centre-West, the Meteorological Synthesizing Centre-East, and the Centre on Integrated Assessment Modelling.

The aim of this assessment is to serve as a basis for considering new directions for policy development and for identifying policy-relevant research questions. The international co-operative approach, which includes interaction between science and policy, as developed under the Convention, provides a good basis for exploring synergies between air pollution and climate change, agriculture and biodiversity, and energy and public health policies on the urban, national, continental and hemispheric scale.

We are indebted to the editorial board of the Assessment Report: Markus Amann, Hilde Fagerli, David Fowler, Laurence Rouil and Martin Williams, as well as to the Secretariat of the Arctic Monitoring and Assessment Programme for the technical editing and production of this report. We thank the Nordic Council of Ministers and the governments of Germany, Netherlands, Norway, Sweden and Switzerland for their financial support and CCE, CEH, CEIP, IIASA, INERIS, IVL, JRC-IES, MSC-E, MSC-W, RIVM and WHO for their contribution in kind.

Rob Maas, Peringe Grennfelt, editors

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Key Findings

1 Abatement measures under the 1979 Convention on Long-range Transboundary Air Pollution (CLRTAP) and its protocols have achieved significant success. There has been a sharp decline in emissions, especially for sulphur, and economic growth and trends in air pollution have been progressively decoupled.

2 Despite successes – abatement has resulted in an extra year of average life expectancy in Europe, soil acidification has been halted in most parts of Europe, and declining acidification in lakes has led to fish stocks recovering in areas where they had largely disappeared – problems still exist.

3 A significant proportion of the urban population in Europe and North America is exposed to concentrations of fine particles and ozone that are near or above the WHO guideline level and, despite soils and lakes recovering from acidification across large parts of Europe, nitrogen deposition in many parts still exceeds the level below which harmful effects do not occur.

4 Because transboundary sources are often major contributors to urban pollution, many European cities will be unable to meet WHO guideline levels for air pollutants through local action alone. Even national and Europe-wide action may not be enough in some cases.

5 Long term risks due to ozone, heavy metals and persistent organic pollutants continue to exist in many UNECE countries. In addition to implementing CLRTAP Protocols, reducing background levels and exposure will require broader coordination beyond the European or North American scale, as well as coordination with with other international fora such as the Minamata Convention on Mercury and the Stockholm Convention on Persistent Organic Pollutants.

6 Technical measures to reduce fine particles and ozone and to avoid excess nitrogen in most nature areas to levels below the WHO guidelines are available in most parts of Europe and North America. Successful examples of healthy lifestyles that contribute to cleaner air are also available.

7 Air pollution control costs are generally significantly lower than the costs of damage to health and the environment. In many countries the net impact of abatement measures on national income and employment will be neutral because production of the technologies required will also create employment.

8 An integrated approach to climate change and air pollution could lead to significant co-benefits, as well as to reducing the risk of applying climate change measures with significant negative impacts on air quality.

9 Ratification and implementation of the 2012 revision of the Gothenburg Protocol would reduce emissions of sulphur dioxide, nitrogen oxides and particulate matter by 40–45% between 2005 and 2020, according to estimates made in 2011. For ammonia the reduction would be 17%. Ratification enables a regionally-level playing field for industries and so prevents countries from competing with each other at the expense of the environment and health. Exploring synergies between air pollution policy at the local, regional and hemispheric scale, as well as with energy, transport and agricultural policy, could help identify additional cost-effective measures.

10 International policy collaboration and coordination of air pollution science remains essential to harmonise methods for estimating emissions, monitoring air quality and impacts, and identifying cost-effective further steps.

Introduction

Viewed largely as a local issue during the 1950s and 1960s, air pollution began to be acknowledged as a larger-scale issue during the 1970s and 1980s. This is when it became clear that widespread acidification of forests and lakes in northern Europe could only have been caused by pollutants carried into the region by air masses moving across industrial regions in countries far away from the problems. These long-range impacts became the main drivers for the development of joint scientific and monitoring efforts as well as for policy negotiations under the Convention on Long-range Transboundary Air Pollution (CLRTAP).

Since its establishment in 1979, primarily to deal with problems of air pollution on a broad regional basis the Convention has promoted a mutual exchange of information between scientists and policymakers. Coupled with good intergovernmental cooperation this has resulted in a sharp reduction in emissions, particularly for sulphur dioxide. Soil acidification has been halted in most parts of Europe and declining acidification in lakes has resulted in the recovery of fish stocks in areas where they had all but disappeared.

Despite clear successes and good cooperation facilitated by the Convention among countries of the northern hemisphere, including those of North America, current scientific findings show air pollutants (including fine particles, ozone, nitrogen, heavy metals and persistent organic pollutants) are still causing health and ecosystem effects in the UNECE region.

Abatement measures see significant success

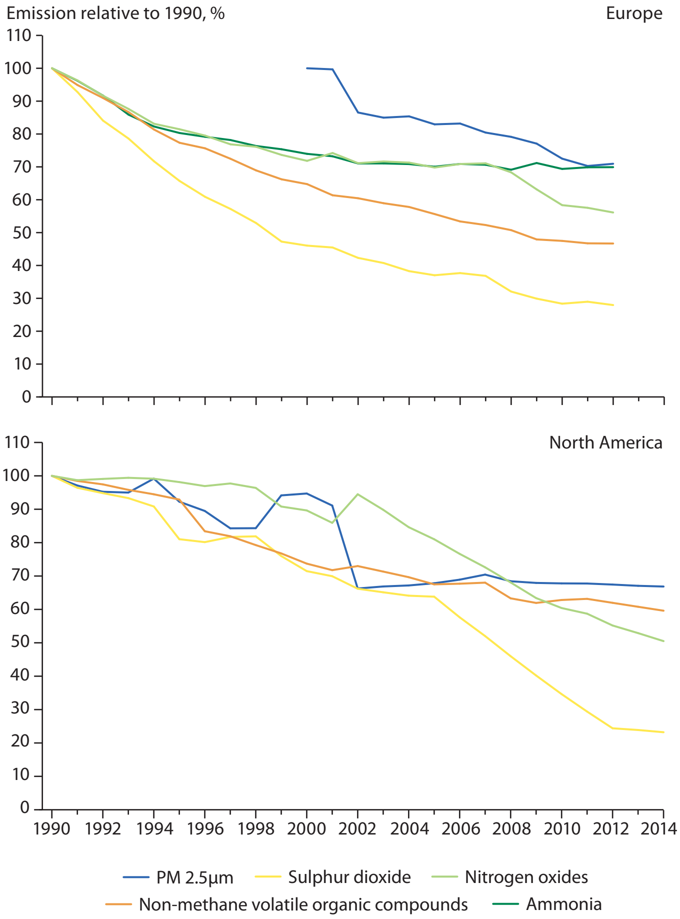
Abatement measures for sulphur under the Convention have prevented emissions in Europe from more than doubling over the past 30 years. In fact, by applying measures such as flue gas desulphurisation and low-sulphur fuels, countries have achieved a total reduction in sulphur emissions of about 80% since 1990. Abatement measures for nitrogen oxides, which include flue gas cleaning

ACIDIFICATION – A SUCCESS STORY

Addressing the health impacts of particulate matter presents comparable challenges to those of the acidification problem in the 1970s, in that the particles causing measurable effects primarily originate from long-distance sources. The successful international response to the highly visible acidification damage to lakes, forests and buildings was to address combustion sources and human and natural receptors simultaneously. This led to the understanding that most combustion sources emit compounds that affect both human and ecosystem health. For example, policy efforts to reduce acidification through sulphur abatement (and so improve ecosystem health) also resulted in lower particulate emissions (thus protecting human health). Another example concerns regulations to reduce nitrogen oxide and volatile organic compound emissions from vehicle exhaust; introducing the unleaded petrol needed for catalytic converters to work (originally aimed at improving ecosystem health) caused a decline in lead emissions (thus protecting human health). Acknowledging that action to reduce nitrogen emission from combustion sources had multiple benefits was the start of the multi-effect approach to tackling air pollution under the Convention.

and catalytic converters in cars have roughly halved emissions over this period. As the use of cleaner technologies in industry and transport within the UNECE region has increased so the costs of applying them have declined. Particulate matter concentrations at European EMEP sites declined by around a third between 2000 and 2012. The number of days on which ozone concentrations exceed the **WHO guideline level** is now about 20% lower than in 1990. Ambient levels of $PM_{2.5}$ have also declined in North America. Between 2000 and 2012, national average annual concentrations fell by 33% in the United States and 4% in Canada. The decline in fine particle emissions is largely through harmonized controls on diesel vehicles and engines. In the United States and Canada, national average ozone levels are now 23% and 15% (2014) lower than in 1990.

Economic growth (growth in production and consumption) and trends in air pollution (changes in emissions) have been progressively decoupled. In western Europe, environmental measures were responsible for around a third of this decoupling.



▲ *For a range of pollutants, in the European ECE-region (upper) and North American ECE-region (lower), the decline in emissions over recent decades is steepest for sulphur.*[vi]

WHO GUIDELINE LEVELS In order to protect health, in 2005 the WHO formulated scientifically-based air quality guideline values that can be used by countries as long-term targets on a voluntary basis. Based on the latest science and including the WHO guidelines, the EU, the US, Canada and other countries have each put in place air quality standards that also take into consideration a number of other factors. The values for these air quality standards are reviewed and updated as appropriate, on a regular basis.

Energy policy and general technological progress were also important. Environmental measures and energy policy will continue to drive future improvements in air quality.

In the United States, implementing the Clean Air Act between 1970 and 2014 achieved a 69% reduction in emissions of carbon monoxide, lead, nitrogen oxides, volatile organic compounds, particulate matter and sulphur dioxide, despite a marked increase in GDP (238%), vehicle miles travelled (172%), energy consumption (45%) and population (56%). In Canada, the period 1990 to 2014 saw a marked reduction in emissions of $PM_{2.5}$ (57%; excluding open sources), sulphur dioxide (63%) and nitrogen oxides (33%) together with strong growth in GDP (75%) and population (28%).[iv]

If economic growth and air pollution trends had not been decoupled, exceedance of **critical loads** for acidification in Europe would have been 30 times higher than today, and three times higher for nitrogen. Average **$PM_{2.5}$** levels would have been similar to levels in current European 'hot spots', with three times more health impacts than today and the premature death of 600,000 more people. Health impacts from ozone would have been 70% higher and ozone damage to crops 30% higher. Overall, average life expectancy is today 12 months more than in the hypothetical unabated world.[v]

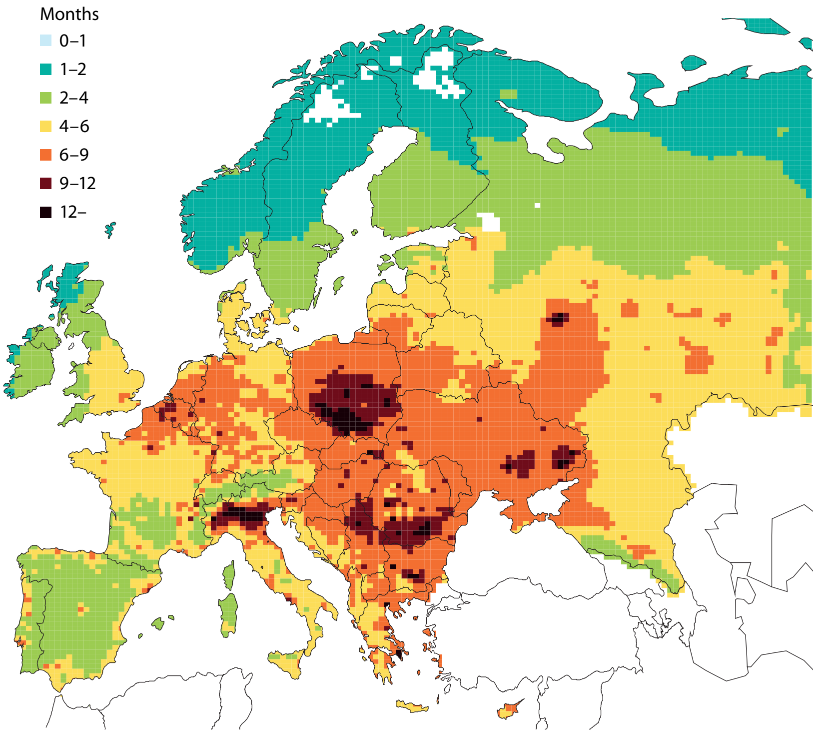
$PM_{2.5}$ Tiny solid or liquid particles less than 2.5 µm wide, including soot and aerosols formed from gaseous pollutants such as sulphur dioxide, nitrogen oxides and ammonia. Their very small size allows them to enter the air sacs deep in the lungs where they may cause adverse health effects.

CRITICAL LOAD A quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Exceedance of a critical load is defined as the atmospheric deposition of the pollutant above the critical load.

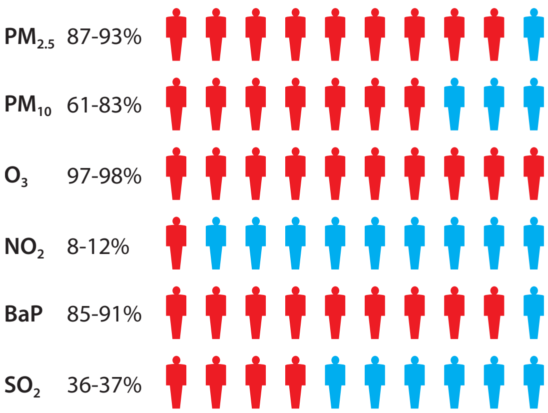
Despite successes, concerns still widespread

Although abatement measures under the Convention have seen significant success, air pollution is still the primary environmental cause of premature death in Europe. Harmful pollutants in outdoor air include particulate matter, ozone and nitrogen dioxide; diesel engine exhaust (a major source of fine particles in urban air) has been classified as carcinogenic to humans by the WHO's international Agency for Research on Cancer. Premature deaths attributable to outdoor and indoor air pollution in the UNECE region in 2012 (including North America) totalled 576,000 and 118,500, respectively.

▼ Loss in life expectancy due to fine particulates ($PM_{2.5}$) is highest in northwestern continental Europe, eastern Europe and the Po Valley.[vii]



▶ The proportion of the population living in areas exceeding WHO air quality guideline values varies by pollutant, with over 87% of the EU population exposed to high levels of fine particles ($PM_{2.5}$) and 98% to high levels of ozone (O_3).[viii]



The majority were due to cardiovascular, cerebrovascular and respiratory diseases, as well as to lung cancer. The number of premature deaths due to air pollution in the EU is ten times higher than those caused by traffic accidents.[ix]

Exposure to recent air pollution has been responsible for 1 in 20 deaths in the United States. Studies suggest that reducing exposure to fine particulate matter and ozone by 33% would avoid 43,000 premature deaths, tens of thousands of non-fatal heart attacks and respiratory and cardiovascular hospitalizations, and hundreds of thousands of acute respiratory symptoms. Around 57 million people in the United States were exposed to air quality levels above the national ambient air quality standards in 2014. Air pollution in Canada is associated with 21,000 premature deaths each year and over 28% of Canadians are exposed to outdoor levels of ground-level ozone that exceed current air quality standards. Average ozone levels in Canada decreased by 15% between 1998 and 2012.

The number of life-years lost to outdoor air pollution shows wide regional variation: the rate in Western Europe is twice that of North America and the rate in EECCA countries (including West-Balkan) is 20% higher again. Average loss in life expectancy due to fine particles is currently about 5 months in Europe but can be more than 12 months in some urban areas. A recent survey showed air pollution to be the number one environmental concern for the general public.

Heavy metals and persistent organic pollutants are known for their toxicity, and even low environmental levels may cause significant exposure over time due to their accumulation along food chains. Despite lower emissions and fewer 'hotspots' near industrial areas, long-term risk for human and environmental health still exists in many UNECE countries. For example, critical loads for mercury (a neurotoxin) are still exceeded in large parts of Europe.[x]

Acidification of soils, freshwaters and ecosystems following high levels of sulphur and nitrogen deposition across large parts of Europe and eastern North America is in decline or slowing. Successful reductions in sulphur dioxide emissions from their peak in 1980 means deposition is now much lower and some forests and lakes are showing signs of recovery. Although acidification is still an issue in many areas, the pace is much slower.

Nitrogen deposition in excess of critical loads affects plant communities, possibly favouring dominant species over protected species. This could have knock-on consequences for butterflies, other insects and birds. It could also favour plants and insects that cause allergies or disease, and could contribute to an increase in the occurrence of algal blooms.

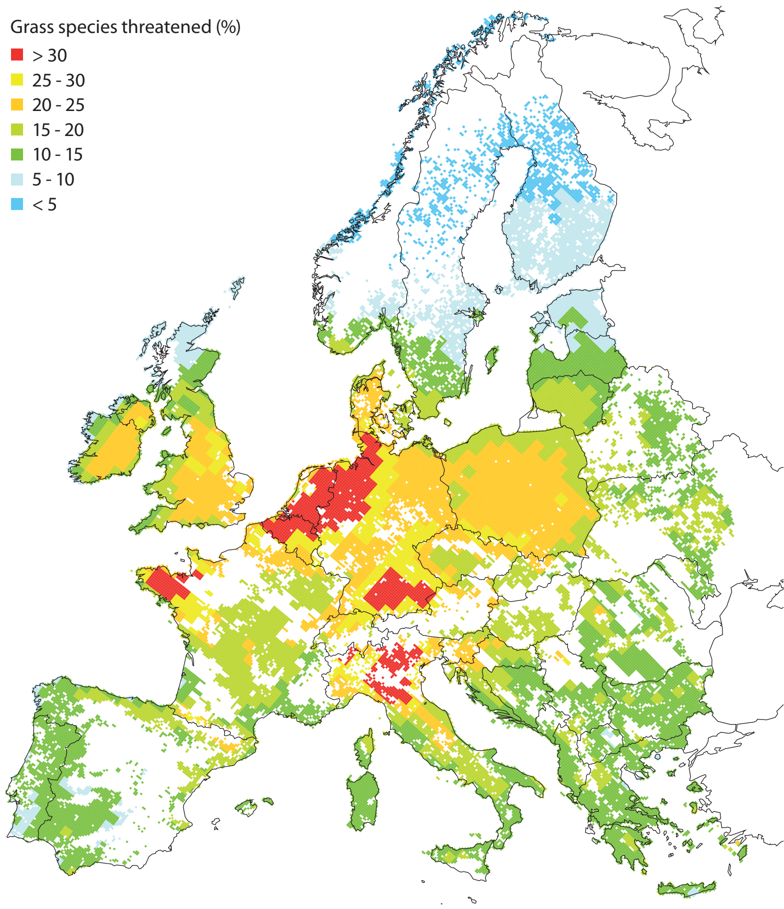
Paying the price

In financial terms, the costs of damage to human health from air pollution are greater than for the other damage categories that can be costed (such as damage to crops or buildings). Costs are also incurred through damage to ecosystems and ecosystem services but these air pollution impacts are difficult to monetise.

The total economic costs of premature death related to air pollution across the European UNECE region are about EUR 1 trillion, with the costs of illness due to air pollution (such as hospitalisation and medicine) adding another 10%. For half the UNECE countries, the total health costs of air pollution represent more than 10% of GDP.[xi] Air pollution also has major productivity consequences for the economy, accounting for 5–10% of sickness-related absence. In fact, for the EU28, emission reductions proposed by the European Commission in 2013 could result in cost-savings to industry through less sickness-related absence that are greater than the costs of additional air pollution abatement.

For North America, 18% of people in the United States live in counties exceeding the US air quality standards, and 28% of Canadians live in communities where ground-level ozone levels exceed air quality standards. The annual economic cost of premature deaths, heart attacks, hospital admissions, emergency department visits, and missed school work exceeds USD 1 trillion in the United States, while the annual costs of air pollution related impacts on human health in Canada are more than CAD 8 billion.

Ground-level ozone concentrations are reducing the production of crops and wood in Europe by up to 15%, depending on species sensitivity. In terms of effects on wheat production alone, the loss is valued at EUR 4.6 billion per year in Europe. Ozone could also affect future agricultural productivity through a decline in pollination. Damage to the built environment and cultural heritage in Europe is estimated at over EUR 2 billion per year.



▲ *Models suggest that the share of grassland species threatened by nitrogen deposition in 2020 under the revised Gothenburg Protocol will be greatest for regions in northwestern Europe with the most intensive agriculture.*[xii]

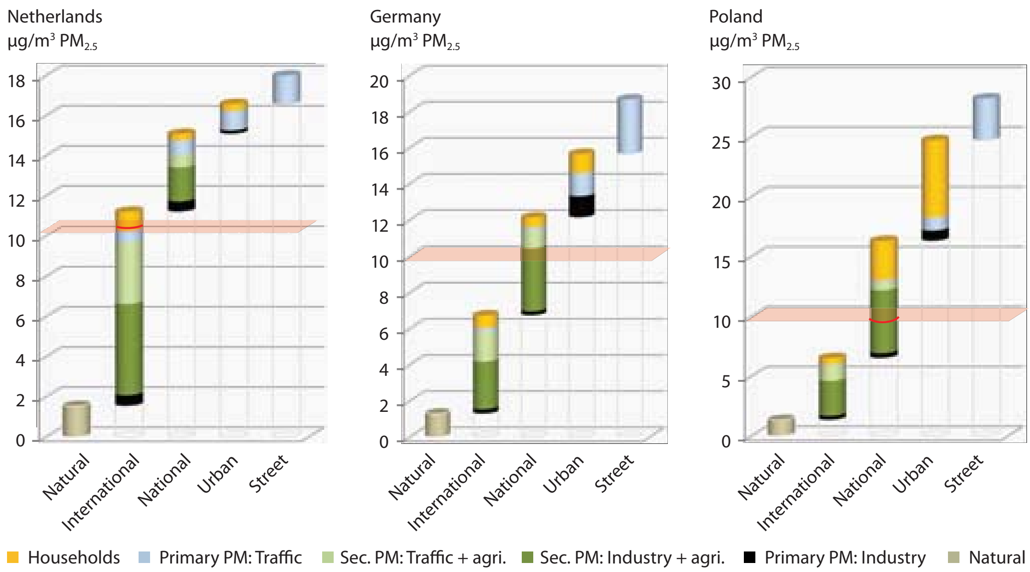
A global problem

In several parts of Europe, human exposure to fine particulate matter is largely due to ammonium-nitrate and ammonium-sulphate particles arriving via long-range transport. Known as secondary particles, they are formed in the air from precursors (ammonia, sulphur dioxide and nitrogen oxides) picked up by air masses travelling over the source regions. Ozone concentrations are also largely influenced by transboundary (even transcontinental) transport of ozone and its precursors (nitrogen oxides, volatile organic compounds and methane).

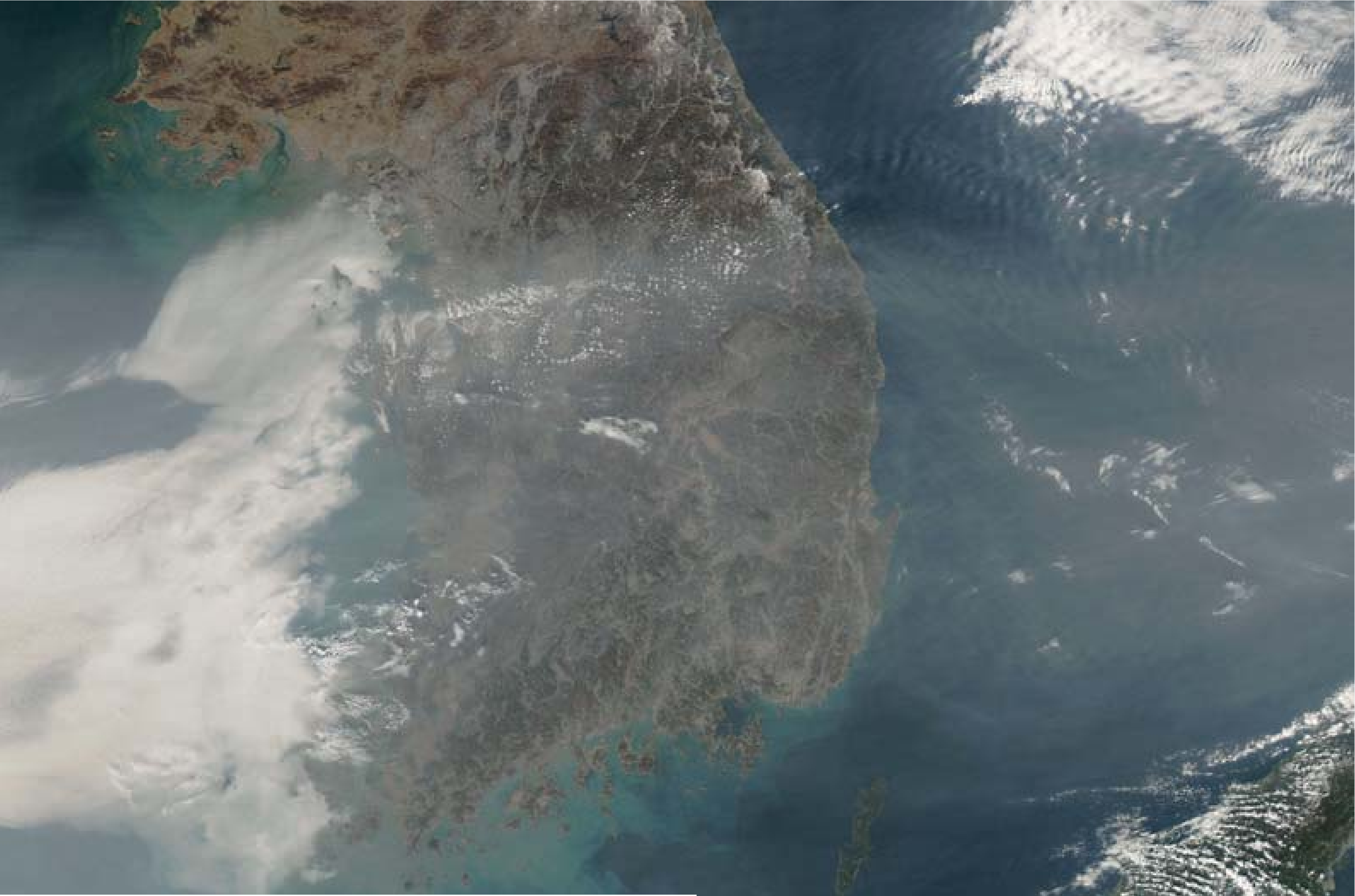
Intercontinental transport is also an increasingly important issue for mercury and some persistent organic pollutants (harmful chemicals that remain intact in the environment for long periods and achieve a wide geographical spread). As many of the local 'hotspots' have now been tackled and little improvement has been noted since significant emission reduction prior to 2005, the remaining challenge is to reduce global background levels. The global aspect was a major factor underlying the development of the Stockholm Convention on Persistent Organic Pollutants (adopted in 2001) and the Minamata Convention on Mercury (adopted in 2013).

Peak ozone exposure has declined since the 1990s (through reductions in precursors). But to protect human health, the issue is not just reducing the occasional peaks in exposure but reducing longer-term exposure to much lower levels, and background concentrations are not declining. Because emissions in other parts of the northern hemisphere contribute substantially to ozone concentrations in Europe and North America, co-ordination beyond the European and North American scale will be needed to decrease ozone levels. This is also the case for some persistent organic pollutants (e.g. hexachlorobenzene, dioxins, polychlorinated biphenyls) and mercury.


NASA



Comparing the origin of fine particles at street level shows local $PM_{2.5}$ concentrations are strongly influenced by secondary particles from transboundary sources. The data are averages based measurement sites in several cities.[xiii]



Solutions are available

Much of the reduction in air pollution has been the combined result of end-of-pipe abatement measures and structural changes in the energy, industry, transport and agricultural sectors. Coherent scenarios for climate change and air pollution policy show that future trends in air quality could benefit from climate- and energy-related measures as well as environmentally-friendly agricultural policy. Technical measures are available (for combustion facilities, vehicles, ships and farms) to meet the WHO guideline levels (or comparable ambient air quality standards) for fine particles and ozone in most places in Europe and to avoid excess nitrogen in most European nature areas. Behavioural changes in energy use, transport and diet could also play an important role. Measures are also available for heavy metals and persistent organic pollutants, and coordination with other international agreements and policy frameworks could provide further opportunities for solutions.

Benefits exceed costs

Economic models suggest the direct costs of additional measures needed to ratify the revised Gothenburg Protocol will be negligible; for EU-countries less than 0.01% of European GDP. Although jobs will be lost in some sectors (e.g. fossil fuel) they will be gained in others (e.g. building and equipment). The overall impact on employment is expected to be small. Cost-benefit analyses of abatement policies consistently show that societal benefits are substantially higher than the costs for some sectors. Over the long term, environmental policy will favour the economy through more efficient use of resources. Some economic benefits will be felt immediately, for example, the impacts of new measures on sickness-related absence.[xiv, xv]

A larger market for clean technologies will reduce production costs, in turn reducing the costs of abatement. Countries that move first in this market will maximise their possibilities for growth in a clean tech industry.

Overall, abatement costs are projected to be significantly lower than the benefits achieved by improving human and ecosystem health.

Action needed at various levels

Air pollution policy is currently driven by public health concern at a range of levels – from cities to international fora.

Episodes with high levels of pollution ('smog days') raise public concern, cause health complaints and sometimes make air pollution literally visible. Many local initiatives are taken to develop 'healthy' cities. But because sources outside cities often contribute significantly to local air pollution, many European cities will be unable to meet WHO guideline levels for air pollutants by local action alone. In fact, even national and continent-wide action may not be enough in some cases (e.g. to prevent ozone damage).

Acknowledging that measures within the Convention area may also be insufficient to reduce background levels for many air pollutants, scientific collaboration on long-range transport at the northern hemispheric scale is currently being promoted through the CLRTAP Task Force on Hemispheric Transport of Air Pollution. This Task Force showed that further protection of health and ecosystems would require reduction of all ozone precursors, including methane.

Synergies and cooperation with other international agreements and organisations are currently being increased. For example, with the Stockholm Convention, the Minamata Convention, the Arctic Monitoring and Assessment Programme, regional seas conventions such as HELCOM and OSPAR, and the Climate and Clean Air Coalition.

MOVING TOWARDS THE WHO GUIDELINE VALUES FOR $PM_{2.5}$

The UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP) focusses on setting emission targets and technical emission standards with the goal of reducing damage to health and ecosystems. The WHO Air quality guidelines provide a basis for future target setting. Reductions in particulate matter precursor emissions are essential for meeting the WHO guideline level for fine particles of 10 µg/m³. Meeting this guideline level would reduce the average loss of life expectancy in Europe by almost 6 months relative to 2005.

Based on the climate and energy measures proposed by the EU in the context of the UN Framework Convention on Climate Change (UN FCCC) and implementation of technically available abatement measures for air pollution, WHO guideline values for fine particles could become feasible in most parts of Europe in the coming decades. Possible action for moving towards the WHO guideline for PM2.5 is outlined below. Action would be needed at different levels.

Convention level:

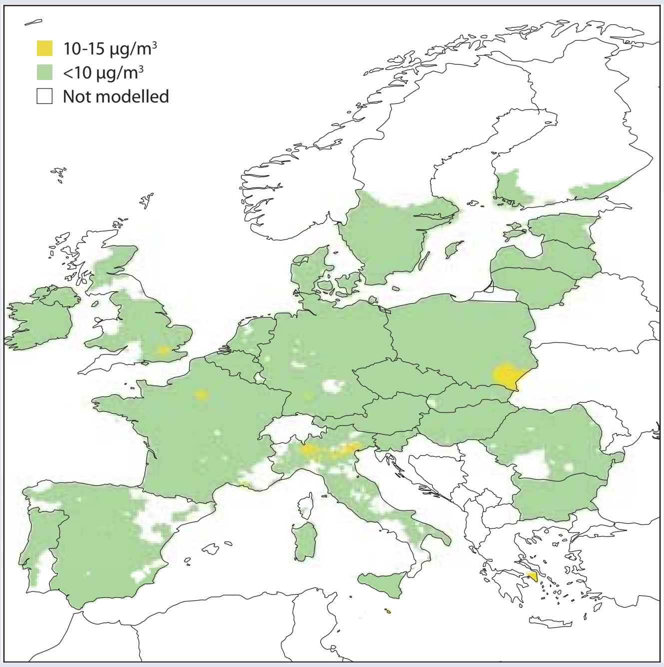
- Ensure that vehicle emission standards work in reality
- Implement climate and energy targets
- Implement emission standards for non-road mobile machinery, domestic stoves and installations for biomass burning
- Develop ammonia emission standards for large cattle farms.

National level:

- Ratify and implement CLRTAP protocols
- Implement effective control to maintenance schemes for vehicles
- Introduce scrappage schemes for old vehicles and motorcycles
- Implement climate and energy policies
- Enforce emission standards for farms and domestic stoves.

Local (urban) level:

- Introduce low emission zones to encourage early scrappage of old vehicles
- Introduce speed limits on highways near urban areas
- Encourage use of electric vehicles
- Improve infrastructure for public transport, cycling and walking
- Inform the public about air pollution from wood burning and ways to reduce pollution.



Projected $PM_{2.5}$ concentrations in 2050 after the implementation of climate and energy policies by EU countries to meet the 2°C target of the United Nations Framework Convention on Climate Change, and a shift towards low-meat diets. Only a few regions in Europe with high traffic or domestic burning of solid fuels remain likely to moderately exceed the WHO guideline.[xvi]

Importance of an integrated approach

Air pollution policy cannot be viewed in isolation as it is closely linked to climate and energy policies, to transport and trade policies, and to agricultural and biodiversity policies. An integrated approach takes into account the co-benefits of linking climate and air policies, and the potential impacts of action in one area on another.

Most climate policy measures will contribute to cleaner air and have health and ecosystem benefits. Pollutants such as sulphur dioxide, nitrogen oxides, volatile organic compounds and fine particles ($PM_{2.5}$) largely result from the use of fossil fuels. As in past decades, future changes in the fuel mix and measures to increase energy efficiency will generally lead not just to lower carbon dioxide emissions, but also to lower emissions of sulphur dioxide, nitrogen oxides, volatile organic compounds and fine particles ($PM_{2.5}$). Reducing primary emissions of fine particles could also have co-benefits in terms of lower exposure to some heavy metals and persistent organic pollutants. Emissions of mercury and combustion-related persistent organic pollutants will also decline if less coal is used.

Measures to address climate change in isolation from the aims of air pollution abatement policies could lead to more air pollution. For example, an isolated focus on reducing carbon dioxide emissions by encouraging the use of wood stoves, diesel cars or biofuels, could result in co-damage to air quality by increasing exposure to fine particles.

Air pollution can have short-term regional climate effects. Some pollutants act as cooling agents (e.g. sulphates), while others contribute to warming (e.g. black carbon, and ozone and its precursors). To minimise additional warming due to air pollution policy, attention would be needed on the abatement of black carbon emissions, such as from diesel vehicles. The Euro-6 standards and controls on diesel vehicles and engines in North America include such an approach. Use of biomass or measures to reduce methane from agriculture are other examples where there are linkages between air pollution and climate change, and where there would be benefit from considering climate and air pollution together in order to limit adverse health effects.

According to current knowledge a warmer climate is conducive to higher ozone concentrations. To help avoid these, more effort would be required to abate ozone precursors in the northern hemisphere. This would need a co-ordinated approach that goes beyond the current domain of the LRTAP Convention and includes major emitters in South and Southeast Asia. Limiting methane emissions is of major importance for controlling ozone concentrations over the coming decades.

In Europe, future ammonia emissions are linked to changes in farming practice and developments in livestock and population diets. Current knowledge suggests that ammonia emissions would not increase under a warmer climate. Ammonia-related problems such as human exposure to secondary particles (the formation of which may become more important in the future when more biogenic aerosols are released from forests owing to higher global temperatures) and biodiversity loss will not decrease due to climate policy. In Europe, some measures to reduce ammonia emissions would imply financial benefits as they include a more efficient use of nutrients within agriculture. The potential for technical options to reduce ammonia emissions is significant, but more limited than for sulphur dioxide or nitrogen oxides. Non-technical options for ammonia include reducing livestock densities in and around sensitive nature areas, reducing food waste and encouraging low-meat diets. Reducing the amount of meat in the diet would lead to less manure and lower ammonia emissions during production.

Next steps for further co-operation

By meeting current commitments through ratification and implementation of LRTAP protocols, many Parties would see more cost-effective reductions in health and environmental impacts than could be achieved by unilateral action alone. The more Parties ratify the protocols, the larger the scale of the market for cleaner technologies, and the lower their costs. Implementation would also ensure 'a level playing field' for industry, and prevent Parties competing with each other at the expense of human and environmental health.

Incomplete and uncertain emission data may hinder ratification of the revised Gothenburg Protocol, especially by EECCA countries because national emission ceilings and/or emission reduction obligations are difficult to define when emission sources are missing, or when it is unclear which abatement options have already been implemented. Even for EU countries, uncertainties in the implementation of legislation can prove a challenge in meeting national emission ceilings.

Although the actual costs of reducing health impacts are generally much lower in EECCA countries than in the EU or North America, as a percentage of GDP the costs of meeting a comparable level of ambition for health protection are significantly higher in EECCA countries.[xvii]

The LRTAP Convention offers a framework for mutual learning and solution finding. Further improving emission inventories, developing better projections and harmonising the monitoring of air quality as well as health and ecosystem impacts, will strengthen assessment and modelling capabilities in support of policy progress. Exploring synergies between air pollution policy at the local, regional and hemispheric scales, as well as with energy, transport and agricultural policy could help to identify additional cost-effective measures.

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