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Eighth Environment for Europe Ministerial Conference

**Batumi, Georgia
8–10 June 2016**

**Improving air quality for a better environment and
human health**



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Improving air quality for a better environment and human health

Improving air quality for a better environment and human health

Note by the Committee on Environmental Policy

Summary

The present document was prepared in accordance with the Reform Plan of the Environment for Europe process, which calls for the preparation of one official document per selected theme of each Environment for Europe ministerial conference (ECE/CEP/S/152 and Corr.1, annex I, para. 12 (d)). It follows the agreed questions for discussion under the theme “Improving air quality for a better environment and human health”, describing air pollutants and policies related to environment and human health, identifying the most polluting sectors and funding for relevant measures to reduce air pollution, and addressing the issues of public awareness and cooperation.

The document was developed with support from the United Nations Economic Commission for Europe secretariat in consultation with several partners, as indicated in the introduction to the document.

The document aims to facilitate the ministerial discussion on this issue by providing background information to support delegations in preparing for the Conference. It is expected that concrete national perspectives under each of the identified questions will be brought up during the ministers’ interventions and discussion.



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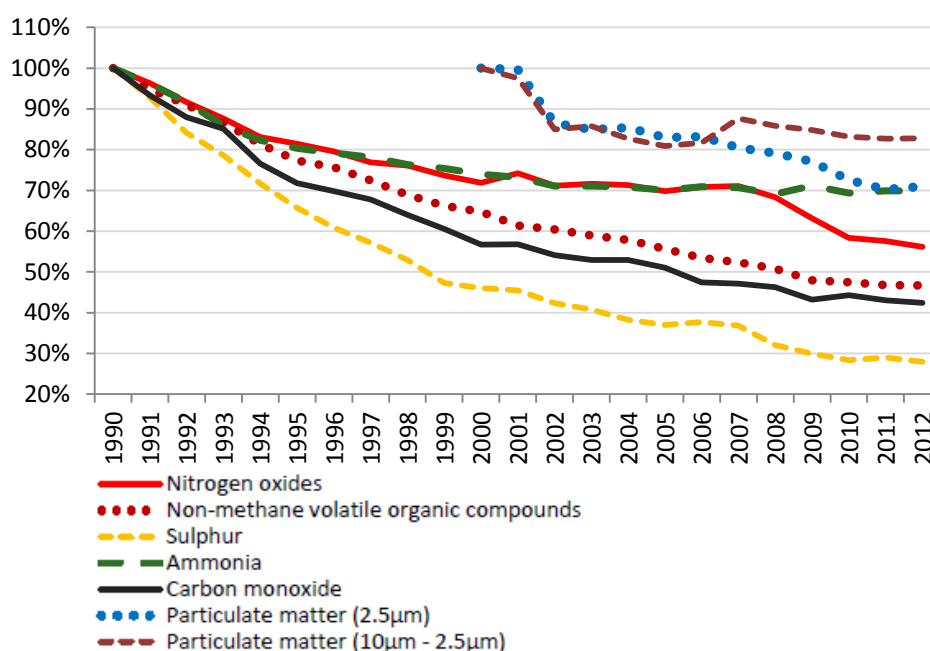
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Introduction

1. Good progress has been achieved in the United Nations Economic Commission for Europe (ECE) region over the past three decades in decreasing emissions of the main air polluting substances and, consequently, their impacts (see figure 1). The threat to lakes and forests due to acidification, especially from sulphur emissions, has been largely eliminated. The deposition of nitrogen was also reduced, but not as markedly as for sulphur.

Figure 1
Emission trends for key pollutants in the ECE region (excluding Canada and the United States of America) since 1990



Source: Centre on Emission Inventories and Projections.

2. In addition to environmental and health benefits, addressing air pollution may contribute to greening the economy. This can be achieved not only by the introduction of newer and greener technologies, but also through regulatory measures, as demonstrated by examples provided in the present document.

3. While the reduction of greenhouse gas emissions may have important co-benefits for decreasing air pollution, especially in the energy and industry sectors, some measures to mitigate climate change may have negative impacts on air quality. Such examples could be particularly found in the transport and residential heating sectors, as described in the chapters below. On the other hand, measures primarily targeted at improving air quality may also have important advantages in addressing climate change. One such example is black carbon, a component of fine particulate matter (PM_{2.5} or $\leq 2.5\mu\text{m}$ in diameter), which is both an air pollutant and a short-lived climate forcer.¹ Scientific tools, like the

¹ For detailed information, see, e.g., United Nations Environment Programme and World Meteorological Organization, *Integrated Assessment of Black Carbon and Tropospheric Ozone*

Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model,² can be used in addressing scenarios of air pollution and climate change mitigation simultaneously.

4. This document has been prepared to facilitate the discussion at the Eighth Environment for Europe Ministerial Conference, where participants will consider the issue of air quality and address persisting challenges in improving it for a better environment and human health. It is based on the four clusters of questions for ministerial discussion agreed by the ECE Committee on Environmental Policy.

5. The document was developed with support from the ECE secretariat and in consultation with the Bureau of the ECE Convention on Long-range Transboundary Air Pollution (Air Convention) and the European Environment and Health Ministerial Board, as well as the European Environment Agency (EEA), the Food and Agriculture Organization of the United Nations (FAO), the Organization for Economic Cooperation and Development (OECD), the United Nations Environment Programme (UNEP) and the World Health Organization Regional Office for Europe (WHO/Europe).

6. The final draft of the document was approved for submission to the Conference by the Committee on Environmental Policy at its special session in February 2016. It provides background information to support delegations in preparing for the Conference. It is expected that concrete national perspectives under each of the identified questions will be brought up during the ministers' interventions and discussion.

I. Pollutants and policies

Questions for discussion: *which air pollutants (indoor and outdoor) pose the highest risk to the environment and human health in your country, and how is this risk assessed (e.g., emission inventories, pollutants registers, air quality monitoring- and health-related data)? Which aspects of air pollution do you see as the most important to manage in the near future and in the longer term? How effective are current policies in addressing the impact of air pollution on public health, in particular in urban areas, as well as on ecosystems and crops? What can be done to make such policies more effective and how are the costs of inaction taken into account?*

A. Impacts of air pollution and associated costs

7. In spite of the progress made in recent decades, air pollution still has considerable effects on the environment and human health.

8. A persistently high number of people are exposed to harmful pollutants in outdoor air, such as particulate matter (PM), ozone (O₃) and nitrogen dioxide (NO₂). Outdoor air pollution, particulate matter, one of its major components, and diesel engine exhaust have been classified as carcinogenic to humans by the International Agency for Research on

(Nairobi, 2011), available from http://www.unep.org/dewa/Portals/67/pdf/BlackCarbon_report.pdf (accessed on 11 December 2015).

² Detailed information about the GAINS model is available from www.iiasa.ac.at/web/home/research/researchPrograms/GAINS.en.html.

Cancer.³ Indoor sources of air pollution, especially from household fuel combustion, also contribute to human exposure to particulate matter and a number of toxic chemicals.

9. In 2014, the World Health Organization (WHO) published its latest estimates of the burden of disease related to ambient (outdoor) and household (indoor) air pollution.⁴ For 2012, 576,000 premature deaths were attributable to ambient air pollution and 118,500 premature deaths to household air pollution in the ECE region (including ECE member States in North America). The majority of these deaths were due to cardiovascular, cerebrovascular and respiratory diseases, as well as lung cancer. While deaths from ambient air pollution occur in all countries of the region regardless of their income, those from household air pollution are over five times greater in low- and middle-income countries than in wealthier ones.

10. According to a recent joint report from WHO/Europe and OECD,⁵ the cost of the premature deaths and diseases caused by air pollution (outdoor and indoor) in the 53 member States in the WHO European Region was about US\$ 1.6 trillion in 2010. This economic value corresponds to the amount societies are willing to pay to avoid these deaths and diseases with necessary interventions.

Box 1

Costs versus benefits of reducing air pollution: European Union Clean Air Policy Package case study

The impact assessment⁶ accompanying the European Union Clean Air Policy Package states that over 406,000 premature deaths were estimated to be related to long-term PM_{2.5} and short-term ground-level ozone exposure in 2010. On average across the European Union, a baseline projection of pollution reduction due to the policy package suggests a decline in the loss of statistical life expectancy attributable to exposure to PM_{2.5} from 8.5 months in 2005 to 5.3 months in 2025. Depending on the valuation methodology, the health-related external costs from air pollution ranged between €330 billion and €940 billion in 2010, and would be reduced in the baseline case to €210–€730 billion in 2030 (2005 euro prices).

The corresponding benefits of the proposed air policy package can be monetized, resulting in about €40–€140 billion per year in 2030, while the costs of pollution abatement to implement the package are estimated to reach €3.4 billion per year in 2030. The impact assessment states that the monetized benefits will therefore be about 12 to 40 times higher than the costs.

³ For details, see World Health Organization, “IARC: Diesel Engine Exhaust Carcinogenic”, press release No. 213, 12 June 2012, available on the IARC media centre website from <http://www.iarc.fr/en/media-centre/iarcnews/2012/mono105-info.php> (accessed on 11 December 2015).

⁴ World Health Organization, “Burden of disease from Ambient Air Pollution for 2012: summary of results”. Document available online from www.who.int/phe/health_topics/outdoorair/databases/AAP_BoD_results_March2014.pdf (accessed on 11 December 2015).

⁵ World Health Organization Regional Office for Europe and Organization for Economic Cooperation and Development, *Economic cost of the health impact of air pollution in Europe: Clean air, health and wealth* (Copenhagen, 2015). Available from <http://www.euro.who.int/en/media-centre/events/events/2015/04/ehp-mid-term-review/publications/economic-cost-of-the-health-impact-of-air-pollution-in-europe>.

⁶ Available from http://ec.europa.eu/environment/air/clean_air_policy.htm.

11. The pan-European region thus continues to face environmental, health and economic impacts of air pollution that require actions at the local, national and regional levels.
12. Some examples of measures taken by countries targeting different pollutants and sectors are outlined below. They are by no means exhaustive and are set out here to inform discussions at the Batumi Ministerial Conference.

B. Data collection and monitoring

13. Monitoring of air quality and its effects is realized through a combination of tools, which are commonly embedded in the national legislation. To assess the population's exposure to air pollution at the local level, air quality monitoring is accomplished through monitoring stations located mostly in urban areas. However, such urban ground-level monitoring is limited in some countries in Eastern Europe, the Caucasus and Central Asia.

14. Improved assessment of the exposure of the population to air pollution is now facilitated through the use of advanced technologies, such as the remote-sensing satellite technology. Such tools can complement, but do not replace, data generated from ground-level monitoring stations. These techniques enable better assessment of the health risks of air pollution and allow for a comprehensive estimation of the burden of disease from air pollution, especially when ground-level data are not available.

15. Mathematical models also provide a well-established methodology to predict the dispersion of air pollution by combining different available data sets, including meteorological input data.

16. More than 200 monitoring sites over 40 ECE countries contribute to measuring background concentrations of air pollutants under the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants (EMEP) under the Air Convention. Moreover, Parties to the Air Convention and its protocols submit data on emission inventories and projections, which in turn facilitates atmospheric and integrated assessment modelling for the purposes of the Convention. EEA also provides a regular overview and analysis of air quality in Europe through its review reports.

Box 2

Air quality monitoring in Georgia

In addition to a number of monitoring points, the first semi-automated transboundary EMEP monitoring station was installed in Abastumani, Georgia, in 2007 with the help of the Government of Norway. This station, which was upgraded in 2010, supports monitoring and evaluation of the long-range transport of air pollutants in Europe under the Air Convention and measures ions in precipitation, particulate matter (as PM₁₀ or ≤10 µm in diameter) in the air, as well as ground-level ozone.

17. Another tool for the collection and provision to the public of information on air pollutants is provided by pollutant records established in accordance with the Protocol on Pollutant Release and Transfer Registers (Protocol on PRTRs) to the ECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) (see section III).

C. Main pollutants

Reactive nitrogen

18. In 2012, the road transport sector was the largest nitrogen oxides (NO_x) emitter in the European Union, with a 39 per cent share of emissions, followed by energy production and distribution (22 per cent) and the commercial, institutional and households sectors (14 per cent). The evidence on the health effects of NO₂ has strengthened in recent years, including stronger evidence linking long-term exposure to NO₂ with mortality. The international scientific community now considers that there is an effect on health of NO₂ that is at least partially independent from the effects of long-term exposure to PM_{2.5}.⁷

19. The reduction in emissions of NO_x in the ECE region now exceeds 40 per cent as compared with 1990 levels, with an average decrease of NO₂ and nitrate in precipitation by about 23 and 25 per cent, respectively, since 1990⁸. The emission reduction rates, however, have slowed down significantly since the late 1990s, threatening the achievement of emission reduction targets under the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol)⁹ to the Air Convention. The specific challenge for meeting the targets for NO_x emissions is posed by the transport sector.

Box 3

Norwegian tax on NO_x emissions

Compliance with emission reduction ceilings set out in the Gothenburg Protocol was the main driver behind the implementation of a tax scheme on NO_x emissions by Norway. Companies with activities that are covered by the tax scheme and which commit themselves to reduce their NO_x emissions are exempted from the tax. Following the successful implementation of the first NO_x scheme agreement for a period of three years (2008–2010), a second agreement (2011–2017) was set up for a further seven years. For the second agreement, the objective was to reduce annual emissions by a total of 16,000 tons over the period of the agreement. As a result of the implementation of the NO_x tax scheme, as of 2013, Norway's emissions of NO_x have decreased below its national ceiling under the Gothenburg Protocol. Further, the scheme has led to new market opportunities, e.g., related to the increased use of liquefied natural gas as a marine fuel.

20. Smaller reductions in ammonia emissions (NH₃) have been achieved since 1990, which were mainly related to the declining economic situation in the eastern part of the ECE region and to a lesser extent to improvements in nitrogen use efficiency in agriculture. So far, a limited number of countries have committed to active policy measures to reduce ammonia emissions, though those that have done so have achieved major emission reductions (up to more than 50 per cent) while further developing their farming sectors. With the increasing scientific evidence of the contribution of ammonia to the formation of

⁷ World Health Organization Regional Office for Europe, Review of evidence on health aspects of air pollution — REVIHAAP Project: final technical report (Copenhagen, 2013). Available from www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications.

⁸ K. Tørseth and others, "Introduction to the European Monitoring and Evaluation Programme (EMEP) and observed atmospheric composition change during 1972–2009", *Atmospheric Chemistry and Physics*, vol. 12, June 2012, pp. 5447–5481. Available from www.atmos-chem-phys.net/12/5447/2012/acp-12-5447-2012.html.

⁹ The legal text of the Protocol is available from www.unece.org/env/lrtap/status/lrtap_s.

PM_{2.5},¹⁰ with its negative health effects, countries should take effective measures in their agricultural sectors to reverse the current emission trend.

21. There are tools available to countries to improve nitrogen use efficiency and thus reduce ammonia emissions. For example, under the Air Convention, the guidance document on preventing and abating ammonia emissions from agricultural sources (ECE/EB.AIR/120) is aimed at policymakers and provides different options for ammonia abatement according to the required level of ambition, while the Framework Code for Good Agricultural Practice for Reducing Ammonia Emissions (ECE/EB.AIR/129) is designed to assist farmers in applying emission reduction techniques in their daily life.

22. Both documents are structured in accordance with the sequence of emissions and provide recommendations on improving animal feeding strategies, animal housing systems, manure storage systems and manure spreading techniques. The reduction of ammonia emissions from the use of mineral fertilizers is also addressed. The recommendations can be used by countries at different levels of technological advancement in agriculture, and may be applied at the national level, even without being Party to the Gothenburg Protocol, contributing to greening agriculture.

23. Work under the Air Convention has increasingly demonstrated the benefits of developing a more holistic approach to nitrogen management, which could tackle emissions of different nitrogen compounds from different sectors. At present, it remains an open question how to better link the relevant policy processes, including climate, biodiversity and marine issues. One potential approach could be to develop the “nitrogen policy arena” as a mechanism for strengthening cooperation, and as a basis for policy development across the ECE region and globally.

24. Finally, measures taken at the regional level can contribute to achieving global objectives, e.g., those covered under the Aichi Biodiversity Targets 7 and 8 under the Convention on Biological Diversity.

Fine particulate matter

25. Fine particulate matter can be emitted directly, e.g., by vehicles or residential fuel combustion, or formed in the atmosphere from primary pollutants, e.g., emitted by industry or agriculture. In spite of the success in decreasing the overall emissions, in most cities in the region,¹¹ the air pollution due to PM_{2.5} remains a major threat to public health. More than 90 per cent of the population in European cities is exposed to annual levels exceeding the WHO air quality guideline values for PM_{2.5}.¹²

26. Based on data from EEA, the commercial, institutional and household sector is presently the most important source in the pan-European region for PM_{2.5} emissions, with a 52 per cent share.¹³ The second major contributor is the transport sector.

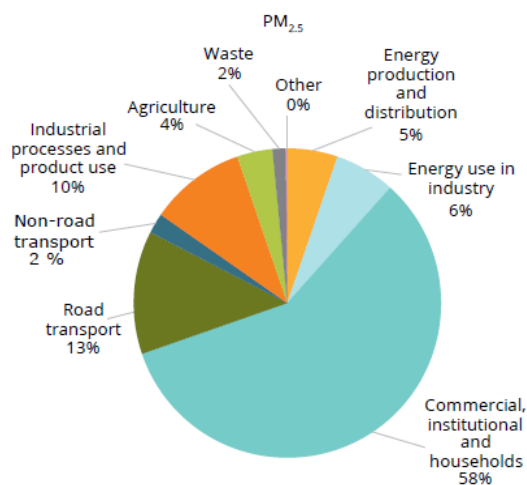
¹⁰ See e.g., Maxine Beauchamp and others, “Sensitivity analysis of ammonia emission reductions on exceedances of PM air quality standards”, European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM) technical paper No. 2013–12 (the Netherlands, Bilthoven, ETC/ACM, 2013). Available from <http://acm.eionet.europa.eu/reports>.

¹¹ For details, see, e.g., the WHO air pollution database by country and city, available from www.who.int/phe/health_topics/outdoorair/databases/cities/en/.

¹² European Environment Agency, *Air quality in Europe — 2014 report*, EEA report No. 5/2014 (Luxembourg: Publications Office of the European Union, 2014). Available from www.eea.europa.eu/publications/air-quality-in-europe-2014.

¹³ United Nations Economic Commission for Europe, *Diesel Engines Exhausts: Myths and Realities*, discussion paper (Geneva, 2014). Available from www.unece.org/index.php?id=35546.

Figure 2
PM_{2.5} emissions in the 28 States members of the European Union — share of emissions by sectoral groups in 2013

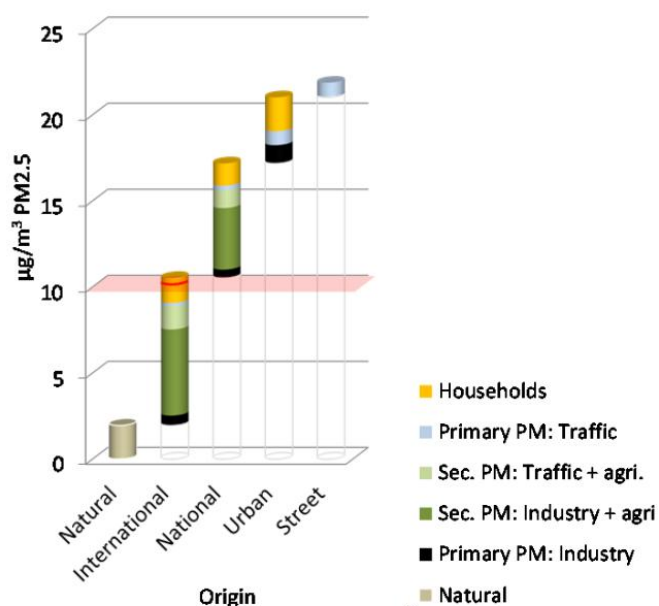


Source: *European Union emission inventory report 1990–2013 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)*, EEA Technical report No. 8/2015 (Luxembourg, European Environment Agency, 2015), available from www.eea.europa.eu/publications/lrtap-emission-inventory-report.

27. The problem cannot be solved solely by taking measures at the local or national level as the transboundary component of air pollution remains important. According to a recent report by the International Institute for Applied Systems Analysis (IIASA),¹⁴ in many countries more than a third of the urban PM_{2.5} concentrations can be attributed to transboundary sources. This means that coordinated international action to reduce the transboundary component of air pollution is paramount to attaining the WHO annual guideline value of 10 micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) for PM_{2.5} concentrations.

¹⁴ Gregor Kiesewetter and Markus Amman, *Urban PM_{2.5} levels under the EU Clean Air Policy Package*, TSAP Report #12, Version 1.0 (Laxenburg, Austria, International Institute for Applied Systems Analysis, August 2014). Available from www.iiasa.ac.at/web/home/research/researchPrograms/MitigationofAirPollutionandGreenhousegases/TSAP_12_final_v1.pdf.

Figure 3
Components of PM_{2.5} concentrations in Hungary



Source: IIASA GAINS.

Abbreviations: agri = agriculture; Sec. = secondary.

Notes: Contributions to ambient PM_{2.5} at urban traffic stations in Hungary, in the base year 2009. The pink shading demarcates the WHO annual guideline value of 10 µg/m³ for PM_{2.5} concentrations. The red band shows the crossing point to better visualize where the level exceeds the WHO annual guideline value.

Ground-level ozone

28. Ozone is formed in the atmosphere from its precursors (including volatile organic compounds and nitrogen oxides). It negatively affects human health and vegetation, including agricultural crops and forests. It also contributes to global climate warming. There is evidence that short-term exposure to O₃ is associated with morbidity (adverse effects on pulmonary function, lung inflammation, lung permeability, respiratory symptoms and increased medication use) and mortality.¹⁵ A considerable portion of the European population is exposed to O₃ levels exceeding the WHO guideline value for a part of the year.

29. Due to the ability of ozone precursors to travel long distances in the atmosphere, the problem of exceedance of O₃ exposure cannot be solved entirely by measures taken in Europe. According to the Air Convention Task Force on Hemispheric Transport of Air Pollution studies (2010), intercontinental transport of O₃ may contribute from 20 to more than 50 per cent of O₃-related premature adult mortality in a given receptor region. Global crop yields losses of major staple crops due exposure to O₃ are estimated at between 3 and 16 per cent. Similarly, intercontinental transport may be responsible for about 5 to 35 per cent of such losses.

¹⁵ For details see Environment and Health Information System at http://data.euro.who.int/eceh-enhis/Default2.aspx?indicator_id=22.

30. An integrated assessment of black carbon and tropospheric ozone by UNEP and the World Meteorological Organization also demonstrated that, if rapidly and widely implemented, the measures targeting those two air pollutants and climate forcers will bring significant improvements in human health, the wider environment and the climate in the near term.

Heavy metals and persistent organic pollutants

31. Deposition of heavy metals in the region continues to decrease. According to a study¹⁶ by the Air Convention's International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops, between 1990 and 2010 the average cadmium and lead concentration in mosses declined by 51 and 77 per cent, respectively, whereas the average modelled cadmium and lead deposition in the EMEP domain declined by 51 and 74 per cent, respectively. Between 1995 and 2010, the average mercury concentration in mosses declined by 23 per cent, whereas the average modelled mercury deposition in the EMEP domain declined by 27 per cent. Concentrations of heavy metals in mosses thus closely correlate with the modelled deposition levels.

32. Effects of historical heavy metals emissions on catchments remain significant. As such, high-levels of catchment retention for cadmium, lead and mercury was demonstrated by a study covering 15 catchments in the years 1997–2011.¹⁷ Emissions of cadmium, lead and mercury are regulated at the pan-European level by the 1998 Protocol on Heavy Metals to the Air Convention (amended in 2012).

33. Comparably lower reductions in mercury deposition could be due to large emissions from other continents. The recently adopted Minamata Convention on Mercury addresses mercury emissions at the global level and, once in force, will require contracting Parties to control their emissions through measures addressing both new and existing sources of pollution.

Box 4

Reduction of mercury emissions in the chlor-alkali sector in Spain

In Spain, voluntary agreements were signed in 1999 and 2006 between the chlor-alkali sector companies, on the one hand, and the regional governments and the Spanish Environment Ministry, on the other, with the objective of reducing sector-related mercury emissions. The agreements consisted of setting up multi-annual mercury emission limit values for the whole sector, investments to update installations and training of staff on safety and hygiene issues. Annual review meetings were perceived as a key measure to keep emission reductions on track. As a result of the first agreement, mercury emissions into the air were reduced by 48 per cent. The second agreement resulted in an additional 43 per cent of reductions.

34. While major achievements have taken place in the reduction of persistent organic pollutants (POPs), major discrepancies exist in different parts of the pan-European region. For instance, while the reduction of concentrations of dioxin/furans in some Western European countries exceeded 90 per cent, in some countries of Central Asia the improvements have been negligible. Moreover, the polycyclic aromatic hydrocarbons (PAHs) concentrations have increased in some countries of the Caucasus and Central Asia

¹⁶ See ECE/EB.AIR/WG.1/2013/13.

¹⁷ See ECE/EB.AIR/WG.1/2013/9.

as compared with 1990 levels. PAHs emissions also remain relatively high in some Western and Central European countries due to the increasing use of wood for residential heating, partly as a measure to mitigate climate change. In some countries of Eastern Europe, the Caucasus and Central Asia, waste is a contributing factor to the increase of POPs emissions into the air. POPs emissions come from waste dumps, the number of which is constantly growing while the condition of existing landfills is worsening. In particular, the lack of waste segregation leads to wastes contaminated with POPs being disposed of in landfills.

35. Actions to reduce and eliminate the production, use and releases of POPs are regulated by the 1998 Protocol on POPs (amended in 2009) to the Air Convention and the global Stockholm Convention on POPs.

D. Specific challenges of urban air pollution

36. The air pollution in cities in the pan-European region continues to pose a threat, especially to the health of residents. Emissions from the transport sector contribute to concentrations of NO_x, PM_{2.5} and O₃, which in many cases exceed the WHO guideline levels.

Box 5

Air pollution across Western European cities prompts action

Recent episodes of high air pollution in Paris prompted the French Government to announce a series of actions to reduce short-term pollution levels, including the temporary introduction of free public transport in the Paris area. In addition, reduced traffic speed limits in certain areas were introduced, as well as controls on the spreading of fertilizers.

Madrid has achieved substantial reductions in PM by moving a significant part of the M-30 ring road underground. Other measures to reduce urban air pollution include the introduction of low emission zones; the renewal of the bus fleet with vehicles using cleaner technology; increasing pedestrian areas; and the promotion of electric vehicles. However, challenges to decreasing NO_x emissions remain as the result of a vehicle fleet that relies mostly on diesel.

The Canton of Geneva approved a plan to improve air quality for 2013–2016. The plan focuses on the reduction of fine particulate matter, specifically from road traffic and heating systems.

37. The Transport, Health and Environment Pan-European Programme (THE PEP), jointly implemented by ECE and WHO/Europe, addresses the existing linkages between the three different Programme sectors, thereby offering a platform for countries to share experiences and lessons learned. Through the Amsterdam and Paris Declarations,¹⁸ countries have committed themselves to build capacity for the integration of transport, health and environmental policies to, inter alia, reduce emissions of transport-related greenhouse gases, air pollutants and noise. The vision of THE PEP is for green and healthy

¹⁸ The texts of the Declarations are available from www.unece.org/transport-health-environment-the-pep/about-us/amsterdam-declaration and www.unece.org/transport-health-environment-the-pep/about-us/paris-declaration.

transport and mobility throughout the region that includes sustainable urban livelihoods for all.

II. Sectors and funding

Questions for discussion: *what sectors contribute the most to air pollution in your country and how successful has your Government been in integrating air pollution reduction measures into financial and development policies, as well as in other sectoral policies? What role can policymakers and financing institutions play in ensuring that projects that reduce air pollution receive funding?*

A. Transport

38. As was outlined above, in spite of tremendous achievements in reducing emissions, the transport sector continues to be one of the key contributors to NO_x, PM_{2.5} and PM₁₀ emissions.

39. Stringent emission limits for air pollutants from road transport have been introduced over the past few decades — with some limits reduced by up to 98 per cent — while at the same time technical innovations and associated improvements in the fuel-efficiency of vehicles have been encouraged.

40. At the same time, some recent findings show that real-world emissions do not always correspond to those measured in test conditions. In particular, it was demonstrated in a report by the International Council on Clean Transportation that on-road NO_x emission levels of modern diesel cars are on average about seven times higher than the limit set by the Euro VI emission standard.

41. Vehicle regulations developed under the ECE Working Party on Pollution and Energy under the World Forum for Harmonization of Vehicle Regulations include test cycles to be performed and reference fuels to be used when measuring engine emissions in the type approval phase. Test cycles are intended to reproduce real driving conditions and are built on real driving data. In this regard, the World-Harmonized Light-Duty Vehicles Test Procedure, to be finalized in 2015, is expected to close the gap between the real-world and test cycle emissions.

42. Market fuel quality¹⁹ influences vehicle emissions particularly when fuel characteristics are not aligned with engine technology. Certain characteristics of the fuel may affect the durability and proper functioning of the vehicle emissions control equipment.

43. Progress in vehicle emission standards, including cleaner diesel and auto fuel economy policy, is lagging in the Eastern part of the region. While the situation with the fuel quality is improving in many countries, in some cases vehicle emission standards — and notably heavy duty diesel standards — have yet to match pace with the improvements on fuel quality.

44. As Europe moves rapidly towards Euro VI and strict fuel economy standards for vehicles, surrounding markets that produce cars for Europe and also import European used

¹⁹ For more information on fuel quality and vehicle emissions standards worldwide see information available from www.unep.org/pcf/.

vehicles will need to keep pace with the region and also benefit from emerging clean vehicle, bus and truck technology for lower conventional and climate-change emissions. However, the large proportion of old vehicles used in many countries may delay the benefits of clean transport technologies by decades if no special steps are undertaken (e.g., wide introduction of low emission zones).

45. The evolution of regulatory instruments on emissions of local pollutants led to limit values for particulate matter emissions of light vehicles that are today more than 30 times lower than two decades ago. However, there is still potential to reduce emissions of black carbon along with PM_{2.5} with the adoption of Euro VI standards and the introduction of ultra-low-sulphur fuels.

46. Furthermore, the promotion of the use of electric vehicles and the electrification of on-road fleets (including two-wheelers) in the region could provide both important climate benefits and help to reduce local air pollution, thus benefitting health, depending on the primary energy source. These measures are also important in the context of green economy national planning and green growth job creation.

47. Some examples of tools and methods to promote sustainable transport under THE PEP include the WHO-developed Health Economic Assessment Tools (HEATs) for walking and cycling and the step-by-step manual, *Developing national action plans on transport, health and environment*,²⁰ as well as the ECE-developed For Future Inland Transport Systems (ForFITS) tool that evaluates transport activity, energy use and carbon dioxide (CO₂) emissions in a range of possible policy contexts. The use and implementation of such tools at the national and regional levels needs to be supported.

B. Agriculture

48. Agriculture accounts for about 90 per cent of ammonia air emissions in the region. As a precursor to particulate matter, ammonia emissions pose a major threat to human health. Atmospheric ammonia is also a significant source of acidification and excess nutrient loading, causing loss of biodiversity in many of the most vulnerable ecosystems.

49. Coming from manure produced by livestock and from mineral nitrogen fertilizers, a significant share of nitrogen applied through fertilizers is lost from agriculture through leaching and run-off of nitrate to water bodies and gaseous emissions to air.

50. The greening of the agriculture sector is expected to generate a range of benefits, including on agricultural emissions. Better nutrient management should take account of the whole nitrogen cycle. Techniques such as soil-fertility management can also result in lower ammonia emissions. In addition, co-benefits in terms of climate change mitigation, through concerted efforts to reduce ammonia and methane emissions, should also be considered.

Box 6

Examples of nitrogen management in the region

Since 1994, Switzerland has been implementing a direct payments system as part of its agricultural policy, instead of price regulation, with a strong focus on reducing environmental impact and improving animal welfare. Direct payments are specific incentives to remunerate farmers for services of public and common interest. This has

²⁰ Christian Schweizer, Francesca Racioppi and Leda Nemer (Copenhagen, WHO Regional Office for Europe, 2014).

led to a better nutrient balance and efficiency. The use of mineral nitrogen fertilizer has decreased by 25 per cent, which, among others, has led to a reduction in NH₃ by 13 per cent since 1990. In addition, voluntary programmes have been introduced on the cantonal level in 2008. In 2014, this was complemented by federal measures to introduce low-emission manure spreading techniques and payments for manure applications.

In Denmark, action was driven by the need to decrease nitrate pollution of the groundwater. In tackling the problem, the Government introduced regulatory measures for spreading livestock manure (proper timing and techniques for manure application) to reduce ammonia emissions and nitrate leaching. As a result, ammonia emissions were reduced by about 35 per cent between 1990 and 2010.

In the Republic of Moldova, a policy package on organic farming has stimulated farmers to rely on natural farming techniques while limiting the use of synthetic fertilizers, pesticides, etc. The positive effects of this policy have ranged from revitalizing the countryside and the restoration of ecosystem functionality to the development of agro-business opportunities.

C. Industry, including energy

51. The industry and energy production sectors are still the main contributors in the European Union to emissions of many pollutants, such as sulphur dioxide (SO₂), cadmium and mercury.²¹ The resulting economic costs of air pollution from Europe's largest industrial facilities amounted to at least €59 billion in 2012, according to EEA.

Box 7

Membership of Ukraine in the Energy Community

On 1 February 2011, Ukraine became a full member of the Energy Community and assumed the obligation to comply with the conditions of the Treaty establishing the Energy Community and its annexes. In accordance with annex II to the Treaty, all large combustion plants should in a timely manner comply with Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants. In 2015, the Ministry of Energy and Coal Industry developed and submitted the national plan to reduce emissions from large combustion plants to implement the requirements of the Directive.

52. As described below, the industry and energy sectors provide the best avenues for co-benefits between climate change mitigation and air quality management. Adoption of more advanced combustion technologies, fuel switch, increased use of renewable energy sources, and other measures would all produce important climate, environment and health benefits (see box 8).

²¹ *European Union emission inventory report 1990–2013 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)*, EEA Technical report No. 8/2015 (Luxembourg, European Environment Agency, 2015), available from www.eea.europa.eu/publications/lrtap-emission-inventory-report.

Box 8

Emission reduction schemes in the energy sector

In September 2012, the Government of Canada published final regulations to reduce CO₂ emissions from the coal-fired electricity sector. These regulations apply a stringent performance standard to new coal-fired electricity generation units and to coal-fired units that have reached the end of their economic life. As a result of this action, Canada became the first major coal user to ban the construction of traditional coal-fired electricity generation units and to require the phase-out of existing coal-fired units without carbon capture and storage. In the first 21 years, the coal regulations are expected to result in a cumulative reduction in greenhouse gas emissions of about 214 megatons. They are also expected to generate air quality and human health co-benefits through reductions in ambient PM_{2.5} and ozone levels, largely due to reductions in precursor pollutants such as sulphur oxides (SO_x) and NO_x. Cumulative reductions of 4.3 per cent in PM_{2.5}, 22 per cent in SO_x and 10 per cent in NO_x emissions are expected over this time period.

Similarly, the United States Clean Power Plan, finalized in August 2015, aims at reducing CO₂ emissions from the power sector by 32 per cent from 2005 levels by 2030. This also will result in health benefits through the reduction of PM_{2.5}, SO₂ and NO₂.²²

53. Several activities in the mining sector have potentially negative impacts on the environment. Surface mining of copper, iron, coal, and gold, as well as gas drilling, for example, can generate critical levels of air and water pollution and impact biodiversity and ecosystems. Coal extraction has been shown to have negative effects on biodiversity regeneration owing to air pollution and resulting soil degradation. The adoption by the mining sector of the best available technology and environmental management practices, including environmental impact assessments, would provide environmental benefits.

54. The application of the best available techniques (BATs) and the introduction of emission limit values associated with them are effective measures that could inspire the national legislation even for the countries not yet Parties to certain international agreements. Such measures can contribute to the modernization of industrial installations and the adoption of cleaner technologies, thus contributing to greening the economy (see box 9).

Box 9

New law on best available techniques in the Russian Federation

In July 2014, the Russian Federation adopted a new federal law aimed at enhancing environmental protection through the introduction of incentives for gradual application of BATs. The law will cover about 15,000 enterprises in major polluting sectors, addressing about 90 per cent of total pollution. The step-wise implementation of the law includes the final implementation period from 2022 to 2030, during which the transition to BATs and integrated environmental permits for all companies is foreseen.

²² For details see United States Environmental Protection Agency, "Clean Power Plan for Existing Power Plants", 20 November 2015. Available from www2.epa.gov/cleanpowerplan/clean-power-plan-existing-power-plants.

55. In addition to regular industrial emissions, unexpected air pollution caused by industrial accidents can produce significant harm to human health and the environment, including transboundary harm. It is therefore important to work towards environmental risk reduction through the implementation of measures to prevent and reduce hazard exposure and vulnerability to disaster, and to increase preparedness for response and recovery. In this regard, the implementation of the ECE Convention on the Transboundary Effects of Industrial Accidents by countries in the region will support the achievement of the ambitions set globally by the Sendai Framework for Disaster Risk Reduction.²³

D. Residential heating

56. Residential heating with wood and coal is an important source of ambient (outdoor) air pollution; it can also cause substantial indoor air pollution through either direct exposure or infiltration from outside. Across Europe and North America, Central Europe is the region with the highest proportion of outdoor PM_{2.5} that can be traced to residential heating with solid fuels (21 per cent in 2010). Evidence links emissions from wood and coal heating to serious health effects such as respiratory and cardiovascular mortality and morbidity. Wood and coal burning also emit carcinogenic compounds, besides PM. It will be difficult to tackle outdoor air pollution problems in many parts of the world without addressing this source sector. A better understanding of the role of wood biomass heating as a major source of globally harmful outdoor air pollutants (especially fine particles) is needed among national, regional and local administrations, politicians and the public at large.²⁴

57. Promoting the use of residential wood burning as a measure to combat climate change has the potential to produce negative results, as residential wood burning can impact both indoor and outdoor air quality. Emissions of particulate matter and persistent organic pollutants such as PAHs increase as a result of wood burning. Specifically, under the Air Convention Protocol on POPs, some Parties that promoted the combustion of wood for residential heating are experiencing difficulties in meeting their emission reduction targets.

58. Economic measures to decrease emissions from residential heating may include the provision of subsidies to replace old boilers with modern, more efficient devices (see box 10).

Box 10

Measures addressing the residential heating sector

Small-scale combustion in the Czech Republic is responsible for up to 95 per cent of PAHs emissions and 76 per cent of primary PM_{2.5}. To reduce emissions from households, of which 17.5 per cent are still burning solid fuels for heating, the Czech Republic introduced a “common programme for replacement of solid-fuel boilers” in 2012. The subsidy scheme was financed by the State Environmental Fund and regional authorities.

The United States Environment Protection Agency (EPA) residential wood smoke initiative features both voluntary and regulatory components. They include cash rebates for homeowners to change out their woodstoves in certain communities and a labelling

²³ See General Assembly resolution 69/283.

²⁴ See World Health Organization Regional Office for Europe, *Residential heating with wood and coal: health impacts and policy options in Europe and North America* (Geneva, 2015). Available from www.euro.who.int/en/publications/abstracts/residential-heating-with-wood-and-coal-health-impacts-and-policy-options-in-europe-and-north-america.

scheme for EPA-certified appliances. In addition, the “Burn Wise” education campaign, aimed at the reduction of residential wood smoke in the United States, includes information, videos and materials on a dedicated website.

E. Funding

59. Approaches to funding measures to improve air quality may differ according to target sectors. The funding mechanisms therefore have to be part of a policy mix (e.g., as part of development policies), and measures taken at different levels and in different areas have to complement each other.

60. Air pollution impacts could also be considered in the broader context of an environmental tax reform, when taxation is shifted from “goods” to “bads”. In this regard, the removal of environmentally harmful subsidies (e.g., for fossil fuels) and/or additional taxation of fossil fuels could serve as good examples of tools to reach effective emission reductions.

61. Funding may be available from different sources. This may include in-country funding (public and private), as well as budgetary and concessional support (from domestic and international sources). Financing of national air quality management networks, as a rule, requires fewer resources than the implementation of technical measures and can be financed from the national budget. Specific investments taken at the level of power plants and other industrial installations are normally expected to be financed by the private sector.

III. Public awareness and participation

Questions for discussion: *are the prevailing problems with air pollution and its transboundary character generally known in your country? How can communication be improved? Which channels, messages and means work best in your country? How could enabling public participation in relevant processes (e.g., policy development) improve air quality and what measures work best in your country?*

A. Access to information

62. Access to information on air quality is of primary importance for the public as it directly concerns the health and well-being of citizens. In addition to receiving rapid information in cases of exceptional high-pollution episodes, the public should also be able to get regular access to information on concentrations of pollutants and their potential health impacts, major sources of emissions, measures taken by authorities to address air pollution and actions to be taken by citizens to reduce exposure. The availability of such information will contribute to improving public awareness and potentially provide additional incentives for industry to introduce further abatement techniques. Different obligations covering access to information exist on the national and international levels. Some of them are listed below along with some examples of practices adopted by countries.

63. The Air Convention and its protocols contain obligations for Parties to report the emission data for the pollutants addressed, as well as provisions for the exchange of information and reporting on the strategies, policies and measures that Parties have taken to implement their obligations under the respective protocols. In order to report on national emissions of agreed pollutants, Parties submit data to the Centre on Emission Inventories

and Projections (CEIP) under EMEP. The public is able to access and make use of all the data submitted.

64. Parties also exchange experience on strategies, policies and measures at annual sessions of the Working Group on Strategies and Review under the Air Convention, including on their efforts to raise awareness on issues relevant to air quality and its impacts on human health and ecosystems.

Box 11

Awareness-raising on air pollution

In Austria, information on how to burn wood properly was developed in cooperation with chimney sweepers' and medical associations and presented in brochures and on a dedicated website, which also features an emissions calculator.

The Canadian Air Quality Health Index (AQHI) is a forecast and real-time tool designed to help the public make decisions on a daily basis to protect their health by limiting short-term exposure to air pollution and adjusting their activities during periods when health risks are elevated. A health-based formula is used to combine NO₂, PM_{2.5} and O₃ levels and to present the associated health risk on a 1–10+ scale. Daily forecasts provide risk reduction guidance (e.g., “Reduce or reschedule strenuous activities outdoors”) to people who are particularly sensitive to air pollution, such as those with cardiovascular or respiratory illness, as well as to the general public. The index is communicated along with advice on actions that can be taken to reduce air pollution. The AQHI is delivered online and through social media applications through partnerships with Canadian provinces, territories and municipalities.

65. Access to environmental information is the first fundamental pillar of the Aarhus Convention. Parties to the Convention are obliged to ensure public access to environmental information upon request as well as to proactively collect and publicly disseminate environmental information. The scope of “environmental information” covers a wide range of issues, such as information regarding air quality, noise levels and economic analyses used in environmental decision-making.

Box 12

Access to information

The website of the National Environmental Protection Agency of Romania regularly publishes information on air quality and on emissions of air pollutants.²⁵ In Serbia, the National Metaregister for Environmental Information is a useful portal, which provides quick and easy public access to existing environmental information, including on biodiversity, air quality and climate change.²⁶ The former Yugoslav Republic of Macedonia has developed an air quality web portal, which provides information on the current air quality in the country, as well as background information about air pollutants, health effects and legislation.²⁷

²⁵ See www.anpm.ro.

²⁶ See www.ekoregistar.sepa.gov.rs/en.

²⁷ See airquality.moepp.gov.mk/?lang=en.

BreezoMeter

At the first-ever start-up award event, held on the margins of the sixty-sixth session of ECE, BreezoMeter, a mobile phone application providing location-specific air quality data, was selected as one of the six finalists. Breezometer's mission is to improve the health and quality of life for people worldwide by providing air quality data for consumers and businesses in a format as simple, intuitive and actionable as weather data. Using big data analytics that makes it possible to gather air quality and weather data from thousands of sources together using unique algorithms, Breezometer tracks and interprets the level of air quality, right down to street level.

66. The Aarhus Convention's Protocol on PRTRs is the first legally binding international instrument on pollutant release and transfer registers (PRTRs). Its objective is to enhance public access to information through the establishment of coherent, nationwide PRTRs. Parties to the Protocol are obliged to provide access to information on local, regional or national pollution. PRTRs are publicly accessible, free-of-charge online databases (registers) providing periodic and reliable data on emissions (releases) and transfers of pollutants, including greenhouse gases, heavy metals and toxic chemical compounds.

Box 13

Pollutant release and transfer registers

There are a number of examples of national, publicly accessible PRTRs, such as the Croatian National Portal of the Environmental Pollution Register and PRTR-Espana, which aim to provide access to information on the release and transfer of pollutants and waste in order to allow informed public participation in decision-making on environmental issues. There are also regional registers, such as the European Pollutant Release and Transfer Register (E-PRTR), which was established to provide easily accessible key environmental data from industrial facilities in European Union member States and several other non-European Union States.

67. Education at all levels is also an important component of raising awareness. In this regard, the UNECE Strategy on Education for Sustainable Development presents a practical instrument to integrate knowledge on sustainable development into all forms of education systems and support the implementation of the communication, education, public participation and awareness-raising provisions of multilateral environmental and other relevant agreements.

B. Public participation for improving air quality

68. The Aarhus Convention recognizes effective public participation as an essential part of the decision-making procedure. It therefore requires Parties to provide for early and effective public participation, when all options are still open, on decisions to permit certain types of activities and during the preparation of plans, programmes, legislation and policies related to the environment, including on air-related matters. Authorities must take the outcomes of the public participation into due account in their final decisions.

69. The effectiveness of the Aarhus Convention's public participation pillar is closely linked with the Convention's other two pillars (i.e., access to information and access to justice): to participate in a meaningful way the public must have access to all the

information relevant to the decision-making and, should the right to participate be denied, access to review procedures should be ensured.

IV. Cooperation

Questions for discussion: *has international cooperation led to an improvement in air quality? How can international cooperation strengthen the national work? Which international instruments are the most effective in your experience? Which activities should be further strengthened to promote ratification, implementation and further development of the Air Convention and its protocols?*

70. The implementation of measures to address air pollution should start with improving cooperation among relevant agencies at the national level on such issues as the exchange of monitoring data and emission inventories. Provisions for such cooperation should also be reflected in the national legislation.

71. In addition, the availability of monitoring and inventory data is also a prerequisite for effective international cooperation. Joint work among countries is imperative in addressing air quality, as some pollutants can be transported over thousands of kilometres across national borders. International agreements do not just set emission reduction commitments; they also provide forums for scientific collaboration and policy negotiation. They also produce specific recommendations for Parties on the introduction and application of abatement techniques, which could be considered by a country even before its accession to an international instrument, thus contributing to the transfer of knowledge and technology.

72. The Air Convention, signed in 1979 in Geneva, was the first example of an international effort to address air pollution, and was initially aimed at reducing the effects of acid rain through the control of the emissions of sulphur across the ECE region. Later the scope of the Convention was widened to include other key pollutants. Since then, the Convention has been providing a framework for the implementation of eight protocols, which set national emission targets and identify specific measures for cutting emissions across a wide range of sectors, through which some of the region's major environmental problems have been successfully addressed.

73. However, the progress is uneven across the ECE region: it has been less marked in countries with economies in transition, in particular in Eastern Europe, the Caucasus and Central Asia. The active involvement of all countries of the region is crucial for regional cohesiveness and the effectiveness of the Convention as an instrument for protection of human health and environment. For this reason, the recently amended protocols to the Convention, including the Gothenburg Protocol, now include specific provisions on flexibilities to implement emission standards for new Parties in order to facilitate the possibility for more countries to ratify and implement them.

74. In this regard, assistance activities launched under various platforms and by different organizations in response to the most urgent needs of the target countries in Eastern Europe, the Caucasus and Central Asia are specifically important to close the gap in air quality management across the region.

Box 14

Examples of technical cooperation, advisory and capacity-building activities

In November 2014, ECE organized a workshop on emission inventory development in Azerbaijan. As a result of the workshop, for the first time, Azerbaijan submitted its Informative Inventory Report and emission calculation tables in the 2015 reporting round under the Air Convention, including the information on large point sources.

The Air Quality Governance project, funded by the European Union under the European Neighbourhood and Partnership Instrument and implemented between 2011 and 2014, provided support at the policy and strategic levels to build the capacities in target countries²⁸ on air quality and air pollution issues. The activities included the elaboration of comprehensive overviews and gap analyses of the existing legislative and institutional frameworks, the drawing up of optimum accession scenarios to the amended Gothenburg Protocol and pilot projects in each country. The National Pilot Project in the Republic of Moldova resulted in the submission for the first time by the country of an Informative Inventory Report in line with the Air Convention requirements, covering a long period: from the base year of 1990 until 2012.

The third ECE Environmental Performance Reviews of Belarus and Georgia, adopted by the Committee on Environmental Policy at its twenty-first session in October 2015, contain specific recommendations on air quality.

75. Some implementation gaps also remain in Western Europe, mainly in relation to the further abatement of ammonia and nitrogen oxides emissions. One way to address the issue could be through fostering intersectoral cooperation, as many different sectors contribute to national emissions of air pollutants including industry, housing, transport and agriculture. One potential example for such cooperation could be the need to address the nitrogen cycle in a more coherent way by studying how emissions of different nitrogen compounds in different sectors could be jointly addressed.

76. The activities under the Air Convention are complemented by a number of other important agreements and processes to tackle air pollution at the regional and global levels. For example, UNEP hosts the Climate and Clean Air Coalition (CCAC) to reduce short-lived climate pollutants, an important initiative at the intersection of climate change and air pollution. This underlines the importance of cooperation among United Nations system organizations such as ECE, UNEP and WHO in supporting countries' efforts to reduce air pollution. In this context, it would be useful to identify possible synergies between the implementation of the Paris Agreement on Climate Change and the abatement measures to improve air quality.

77. The recently adopted key international commitments, such as resolution 1/7 of the United Nations Environment Assembly on strengthening the role of UNEP in promoting air quality and World Health Assembly resolution 68.8 on "Health and the environment: addressing the health impact of air pollution", provide further incentives to enhance regional and global or cross-regional cooperation. In this connection, the European Environment and Health Process provides a good example of intersectoral and inter-agency cooperation to address, among others, air quality and health challenges in the pan-European region. As explained in relevant sections above, additional cooperation

²⁸ Armenia, Azerbaijan, Belarus, Georgia, Republic of Moldova, Russian Federation and Ukraine.

opportunities exist between regional and global agreements dedicated to managing similar polluting substances.

78. Enhanced cooperation among all stakeholders is particularly relevant now, following the adoption of the Sustainable Development Goals by the international community in September 2015.²⁹

V. Conclusions and way forward

79. Successful implementation of air pollutant emission reduction targets in line with national regulations and international agreements, such as the Air Convention's protocols, has contributed to a significant reduction in the environment- and health-related impacts of air pollution in the ECE region over the past few decades. However, about 700,000 people still die prematurely each year in the pan-European region as a result of air pollution exposure (see para. 9 above). Additional measures must therefore be undertaken in the region to protect public health and the environment. The three recently amended Protocols to the Air Convention — the Protocol on POPs, the Protocol on Heavy Metals and the Gothenburg Protocol — once they enter into force,³⁰ will contribute significantly to improving this situation.

80. Substances such as NO_x, ammonia, O₃, heavy metals, POPs and PM_{2.5} continue to be the main air pollutants in the region. Some pollutants, like NO_x, ammonia and volatile organic compounds, in addition to their individual negative effects also contribute to the formation of PM_{2.5}, which is the main air pollutant of concern for human health. Cities continue to be hotspots of air pollution and the air quality management policies need to prioritize actions to improve air quality in urban areas. Transboundary cooperation is indispensable in reaching targets in many of the urban areas due to the potential of most of the air pollutants to travel long distances. As demonstrated in the present document, many countries, even if all sources of local pollution were eliminated, would not be able to reduce pollution to acceptable levels due to the transboundary component of air pollution.

81. In this regard, actions in sectors such as transport could have important health benefits. This could include promotion of cleaner vehicles and fuels, introduction of low emission zones and incentives for using public transport. At the same time, measures to address climate change should not have negative impacts on air quality, as was the case with the promotion of the use of diesel-fuelled cars due to their assumed contribution to the reduction of greenhouse gas emissions. For several sectors, such as energy and industry, there are important opportunities for co-benefits between climate change mitigation and the reduction of air pollution. Agriculture is also an example of a sector where measures taken at the farm level can benefit the environment in a multitude of ways. A proper nitrogen cycle management reduces air and water pollution, improves biodiversity and produces climate benefits while increasing economic performance. Thus, measures targeting air pollution in different sectors have the potential to contribute significantly to greening the economy.

82. Securing funding for implementing measures to reduce air pollution continues to be a challenge. However, as was demonstrated with examples from the European Union and the United States, investing in air pollution reduction pays. One dollar spent on air quality

²⁹ See General Assembly resolution 70/1.

³⁰ For the Gothenburg Protocol, two thirds of the Parties to the original Protocol need to ratify the amendments for them to enter into force; the list of Parties to the original Protocol is available here: https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtmsg_no=XXVII-1-h&chapter=27&lang=en.

improvement produces up to 40 dollars in expected public health, environment and climate benefits. Recent studies³¹ show that the economic costs of the health impact of air pollution can be significant.

83. The public has to become more aware of the negative consequences of air pollution for human health and ecosystems, the sources of air pollution and the role it can play in improving the situation. Authorities have to put in place notification mechanisms to alert citizens, and specifically vulnerable groups, of high-pollution episodes and to provide guidance on the ways to limit the negative impacts on the population in such situations.

84. Public participation in all the steps of designing and implementing projects with potential negative impacts on air quality, in accordance with the provisions of the Aarhus Convention, can play an important role in limiting such potential negative impacts or eliminating them. PRTRs have proved to be an effective tool for providing reliable data on emissions and transfers of pollutants. Accession to the Protocol on PRTRs by more countries will contribute substantially to improving air quality — in the region and beyond.

85. Cooperation at the national and international levels continues to be key to the success of air management policies. Proper coordination and exchange of data between all relevant agencies at the national level should be clearly established by the national legislation. International cooperation can be successful only if it relies on comparable and reliable data. In addition, it is important to maintain the science-policy bridge to make sure that decisions taken at the national and international levels correspond to scientific evidence, and that the measures to tackle air pollution are designed in the most cost-effective way. Regional and global actions and targets should complement and reinforce each other as well as the activities of different organizations and stakeholders, including those in the United Nations system.

86. The Batumi Action for Cleaner Air to be presented for endorsement at the Eighth Environment for Europe Ministerial Conference contains a number of possible actions for improving air quality in the region with a view to encouraging and supporting Governments and other stakeholders in their work to improve air quality during the period 2016–2021. Thus, the initiative can act as one of the instruments to implement the outcomes of the Conference related to the air quality theme, through commitments to be announced by Governments and other stakeholders comprising appropriate actions in accordance with the country-specific needs.

87. The continued improvement of scientific knowledge and evidence is a prerequisite for successful policymaking in the field of air pollution management. In this regard, the upcoming assessment report under the Air Convention, to be published in 2016, will present an important scientific overview of the state of air pollution in the ECE region. A summary for decision makers of this assessment will be presented at the Conference.

88. It is therefore very important to continue to assess the situation and to take both timely and effective measures to tackle the existing and emerging negative impacts of air pollution in order to improve air quality in the pan-European region for a better environment and human health.

³¹ See World Health Organization Regional Office for Europe and the Organization for Economic Cooperation and Development, *Economic cost of the health impact of air pollution in Europe: Clean air, health and wealth* (Copenhagen, 2015). Available from www.euro.who.int/en/media-centre/events/events/2015/04/ehp-mid-term-review/publications/economic-cost-of-the-health-impact-of-air-pollution-in-europe.