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Update of the long-term strategy for the Convention

Proposed updates and revisions to the long-term strategy for the Convention

Submitted by the Expert Group

Summary

At its thirty-fifth session (Geneva, 2–4 May 2016), the Executive Body for the Convention on Long-range Transboundary Air Pollution established an ad hoc policy review group of experts on the 2016 scientific assessment of the Convention (see ECE/EB.AIR/135, annex II). In line with the request of the Executive Body, the group presented its conclusions and recommendations to the Working Group on Strategies and Review at its fifty-fifth session (ECE/EB.AIR/WG.5/2017/3 and Corr.1). The Working Group provided its recommendations to the Executive Body based on the report of the policy review group (ECE/EB.AIR/WG.5/118). Furthermore, the policy review group presented to the Executive Body the highlights of proposed updates to the long-term strategy (ECE/EB.AIR/2017/4).

At its thirty-seventh session (Geneva, 11–14 December 2017), the Executive Body adopted decision 2017/4, providing a mandate to the policy review group to elaborate a draft revised long-term strategy for the Convention in consultation with the Bureau of the Executive Body. It requested the policy review group to submit the draft strategy for consideration by the Working Group on Strategies and Review at its fifty-sixth session. Most of the short-term recommendations of the policy review group were reflected in the 2018-2019 workplan for the implementation of the Convention (ECE/EB.AIR/140/Add.1).

The present document contains the proposed revised long-term strategy for the Convention elaborated in line with the guidance and elements provided by the Executive Body at its thirty-seventh session (see ECE/EB.AIR/140, annex III).



I. Introduction

1. At its thirty-fifth session (Geneva, 2–4 May 2016), the Executive Body for the Convention on Long-range Transboundary Air Pollution (Air Convention) established an ad hoc policy review group of experts on the 2016 scientific assessment of the Convention (policy review group) (see ECE/EB.AIR/135, annex II). Specifically, the policy review group was tasked with:

(a) Making proposals for a policy response to the 2016 scientific assessment of the Convention¹ (2016 Assessment Report) and recommendations as to whether and how the Convention should take action in the short and long term based on the report's findings;

(b) Reviewing the priorities for work and action in the long-term strategy for the Convention (see ECE/EB.AIR/106/Add.1, decision 2010/18) in the light of the 2016 Assessment Report;

(c) Proposing updates and revisions to the long-term strategy for the Convention based on the findings in the 2016 Assessment Report, the policy recommendations developed further to subparagraph (a) above, and taking into account the report of the ad hoc group of experts on the action plan for the implementation of the long-term strategy for the Convention.

2. At its thirty-seventh session (Geneva, 11–14 December 2017), the Executive Body adopted decision 2017/4, providing a mandate to the policy review group to elaborate a draft revised long-term strategy for the Convention in consultation with the Bureau of the Executive Body. It requested the policy review group to submit the draft strategy for consideration by the Working Group on Strategies and Review at its fifty-sixth session.

3. The present document contains the proposed revised long-term strategy for the Convention elaborated in line with the guidance provided by the Executive Body at its thirty-seventh session (see ECE/EB.AIR/140, annex III).

II. Proposed revised long-term strategy for the Convention

A. Introduction

4. The Convention on Long-range Transboundary Air Pollution has delivered demonstrable improvements in reducing acidification of the environment, in reducing the highest peak levels of ozone and photochemical smog, persistent organic pollutants and heavy metals. It has begun to reduce particulate matter and atmospheric levels and deposition of nitrogen. This is clearly indicated by the 2016 scientific assessment report.

5. The Convention has shown itself to be flexible and dynamic in responding to new challenges and problems in the area of transboundary air pollution and has extended scientific and technical collaboration beyond the United Nations Economic Commission for Europe (ECE) region. The Convention has given a prominent role to science not just in providing underpinning information, but also in sustaining the policy development process itself as demonstrated in the policy response to the scientific assessment of the Convention (ECE/EB.AIR/WG.5/2017/3 and Corr.1).

¹ Rob Maas and Peringe Grennfelt, eds., *Towards Cleaner Air: Scientific Assessment Report 2016* (Oslo, 2016). Available from <http://www.unece.org/environmental-policy/conventions/envlrapwelcome/publications.html>. There is a separate report for North America by the United States Environmental Protection Agency and Environment and Climate Change Canada, *Towards Cleaner Air: Scientific Assessment Report 2016 — North America* (2016, online report).

6. This strategy is an update of the 2010 long-term strategy and sets out a vision for the Convention until 2030. The timeframe for this updated strategy allows for contribution to the implementation of the 2030 Agenda for Sustainable Development (2030 Agenda) and the Sustainable Development Goals. In doing so, it also considers possible developments over a longer time frame, up to 2050.

7. Despite progress under the Convention, air pollution in the region still causes significant environmental and health problems and new challenges continue to emerge. As underscored by the conclusions of the 2016 scientific assessment report, air pollution is also increasingly recognized as a global problem, with transboundary air pollution from outside the ECE region increasingly impacting the air quality within it. The Parties to the Convention must respond to these challenges, build on its strengths, and cooperate with other international organizations and countries outside the ECE region, thereby demonstrating that it will continue to take a leading role in addressing the air pollution problems of the twenty-first century.

8. There have been important policy developments globally and regionally over the past years relating to air pollution issues, which the Convention needs to take into account. Some of the more important developments include the following:

(a) The Convention takes into consideration the global context of international environmental action on air pollution reduction, which includes work done through the United Nations Environment Programme (UNEP) and the World Health Organization (WHO), the Climate and Clean Air Coalition (CCAC), the World Meteorological Organization (WMO), the United Nations Framework Convention on Climate Change (UNFCCC), the International Maritime Organization (IMO), the Stockholm Convention on Persistent Organic Pollutants, the Minamata Convention on Mercury and the Convention on Biological Diversity. To date, the Convention's cooperation with these organizations has been very effective in the scientific field and it should gain momentum in moving into the policy arena in the future.

(b) The 2030 Agenda for Sustainable Development and its Sustainable Development Goals were adopted in 2015. Parties' compliance with their obligations under the Convention contributes to the implementation of a number of those goals, including specifically Goal 3 (good health and well-being), Goal 11 (sustainable cities and communities) and Goal 12 (responsible consumption and production) and to a number of other Goals, including in particular 14 (life below water) and 15 (life on land).

(c) On a regional level, much action has taken place, including the adoption of the European Union's new directive on National Emission Reduction Commitments², cooperation under the Canada-United States Air Quality Agreement and steps that have been taken to introduce best available techniques in Eastern Europe, the Caucasus and Central Asia.

(d) In 2014, the first UN Environment Assembly adopted resolution 1/7, "Strengthening the role of the United Nations Environment Programme in promoting air quality". In December 2017, the United Nations Environment Assembly adopted resolution 3/8 "Preventing and reducing air pollution to improve air quality globally," which builds on resolution 1/7, calling on member states to undertake significant action and for UNEP to create a new platform for cooperation and information sharing to support countries in addressing air pollution. Resolution 3/8 also supports enhanced international action to address transboundary air pollution, in particular by enhancing regional cooperation.

² Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC, O.J. (L.344), pp.1-31.

9. In addition, at the Eighth Environment for Europe Ministerial Conference (Batumi, Georgia, 8–10 June 2016), ministers endorsed the Batumi Action for Cleaner Air. The initiative provides an opportunity to inspire voluntary national actions and promote additional collaboration within and beyond the ECE region.

10. Moreover, the Convention has developed several protocols with specific obligations designed to reduce emissions of key air pollutants, and amended the three most recent ones³. Now the Convention is focusing on their implementation and ratification, and simultaneously needs to develop strategies to tackle remaining air pollution issues.

11. The Parties to the Convention will continue to critically examine its work and formulate priorities in relation to these wider developments, positioning the Convention in a leadership role where appropriate.

12. The strategy will therefore:

(a) Set a vision for the next 10 years up to 2030 and beyond to address the priorities and to meet emerging challenges regarding the effects of air pollution and their interactions with climate change, nitrogen pollution, and biodiversity loss and other global environmental challenges;

(b) Base the vision on the unique strengths and successes of the Convention — the close links between science and policy and the ability to deal with multiple effects and pollutants;

(c) Respond swiftly to emerging challenges where there is clear benefit to doing so on a regional basis, mindful of existing environmental agreements and opportunities for enhanced cooperation;

(d) Allow for the assessment of health and ecosystem impacts of air pollution measures taken at the regional scale on local and urban air quality;

(e) Allow for continued cooperation at the global level to assess the impacts of air pollution at the hemispheric scale on regional and local air quality;

(f) Set clear priorities for the Convention to ensure the best use is made of scarce resources of the Parties and in the secretariat.

13. Chapter B focuses on the strengths and successes of the Convention. Chapter C describes the remaining environmental and health effect challenges and Chapter D sets out the strategic priorities for the Convention. Finally, Chapter E gives overarching conclusions.

B. Strengths and successes of the Convention

Effects-oriented approach

14. The Convention has achieved considerable success in solving environmental and health problems. In particular, it has led the way in taking a multi-pollutant, multi-effect approach. The Convention and its subsidiary bodies established the core strengths and expertise, namely, dealing with air pollutants affecting human health, acidification, eutrophication, cultural heritage and other environmental effects which lead to adverse impacts on environmental services. It was concentrated first on acidifying pollution, then on eutrophying compounds (namely nitrogen oxides and ammonia) and tropospheric

³ That is: The Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol); the Protocol on Heavy Metals; and the Protocol on Persistent Organic Pollutants (Aarhus Protocols).

ozone. The Convention has also been addressing emissions and effects of particulate matter.

15. In addition, collaboration with other organizations has allowed the Convention to gain additional knowledge of the impacts of air pollution, in particular, by establishing the ECE/WHO Joint Task Force on the Health Aspects of Air Pollution. This has facilitated the consideration of health impacts, including in integrated assessment modelling.

16. Another major strength of the Convention is its geographical coverage. The Convention is unique in that it covers most of the northern hemisphere from the United States of America and Canada across Europe and the Russian Federation to Central Asia and is the only multilateral legally binding instrument to address transboundary air pollution. Furthermore, cooperation, including with key scientists from regions outside of ECE, has been established to assess hemispheric transport of air pollution in the entire Northern Hemisphere.

17. It is worth noting that the Convention's scientific tools, including integrated assessment modelling and effects monitoring, are also used by the European Union for the development of the new National Emission Ceilings (NEC) Directive. These tools enabled the adoption by the European Union of emission reduction commitments for 2030 in addition to the those for 2020 in the Gothenburg Protocol.

Pioneer role on heavy metals, persistent organic pollutants, and black carbon

18. The Convention also developed protocols which address persistent organic pollutants and heavy metals, including lead, cadmium and mercury. Moreover, this leadership paved the way for a global approach to these problems and inspired the Stockholm Convention on Persistent Organic Pollutants and the Minamata Convention on Mercury.

19. The acquired technical expertise, including on best available techniques, emissions inventories, monitoring and modelling under the Air Convention is pertinent for current and future policy work on persistent organic pollutants and heavy metals. It is noted that emission reductions and abatement techniques developed to control particulate matter will also deliver reductions in emissions of metals other than mercury.

20. The Gothenburg Protocol, amended in 2012, is now the first international agreement to address black carbon, a short-lived climate pollutant, in addition to tropospheric ozone. The 2016 Assessment Report stressed that many air pollution abatement measures have clear co-benefits for reducing greenhouse gases and short-lived climate pollutant emissions, and thus address climate change while improving air quality.

The Convention as a flexible and adaptable mechanism

21. Another highlight of the Convention is the promotion of partnerships to enhance skills' development of national experts and to support countries in the achievement of tasks required by the protocols.

22. The Working Group on Effects and the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP), in the implementation of their strategies, have established a robust system of emission inventories, modelling and monitoring activities. This has resulted in a comprehensive database including historical data spanning a 40-year period, allowing for the assessment of long-term trends of transboundary air pollution and its effects. The technical background related to emission abatement techniques was developed under the Working Group on Strategies and Review by the both Task Forces on Techno-Economic Issues and Reactive Nitrogen.

23. One further strength of the Convention is that its work has traditionally been carried out in a flexible, consensual process. The procedures and activities are less rigid than in many multilateral environmental agreements, particularly in the way the science

and policy work interact, and the way in which decisions are taken. This has enabled the Parties to the Convention to respond to new developments and problems, such as updating emissions factors to better reflect real-world emissions, e.g., of nitrogen oxides (diesel cars) and particulate matter (small wood combustion installations) in emission inventories.

24. The success of the Protocols was not only in setting emission reduction targets but also in specifying how to achieve those reductions through the implementation of emission standards based on best available techniques and energy-efficiency requirements. Another important development was to establish methods for the monitoring of the various effects in a way to document the improvement of air quality, not only as concentrations and emissions inventories, but also at the level of the decreased impacts.

25. In particular, the provisions for flexibility for timescales in the application of emission limit values and for the opportunity to apply alternative strategies to meet the emission limit values requirements were included in the amended Protocols on Persistent Organic Pollutants, Heavy Metals and the Gothenburg Protocol as a way to facilitate ratification and implementation of the protocols. This work was developed in close contact and consultation within the Coordinating Group on the promotion of actions towards implementation of the Convention in Eastern Europe, the Caucasus and Central Asia.

26. The Batumi Action on Cleaner Air, an initiative of the Convention, which was launched at the Eighth Environment for Europe Ministerial Conference, has helped to raise awareness at the political level of the need to improve air quality and the benefits of ratifying the protocols. These awareness-raising efforts are also acknowledged in the resolution on preventing and reducing air pollution to improve air quality globally (UNEP/EA.3/Res.8) adopted by the United Nations Environment Assembly at its third session (Nairobi, 4-6 December 2017) as inspiration for action in other regions.

Regular review of the achievements

27. The protocols to the Convention call for timed reviews⁴ to assess their sufficiency and effectiveness taking into consideration the progress achieved and the latest available scientific and technical knowledge. On the basis of such reviews, the Protocols on Persistent Organic Pollutants, Heavy Metals and Gothenburg Protocol were amended and now include updated commitments and additional pollutants.

28. A key success in tracking these achievements is an effective Implementation Committee which established procedures for notifying Parties of non-compliance and emissions reporting and the subsequent steps to address Parties' non-compliance were effectively implemented. The Implementation Committee and the Convention's subsidiary bodies have developed an excellent partnership to support countries in the achievement and reporting of emissions reductions required by the protocols.

C. Remaining challenges for human health and ecosystems

29. While abatement measures under the Convention have achieved significantly reduced impacts of air pollution on health and ecosystems, substantial problems remain. Based on the 2016 Scientific Assessment Report, the following air pollutant effects have to be addressed in the context of a multi-pollutant/multi-effects approach, including their potential interaction with climate change, the nitrogen cycle and biodiversity:

⁴ As per article 3 (12) of the Gothenburg Protocol, as per article 10 (3) of the Protocol on Persistent Organic Pollutants, and as per article 10 of the Protocol on Heavy Metals.

Ozone and its precursors

30. Although peak ozone concentrations have been reduced, there is evidence of widespread ozone pollution damage to human health, natural vegetation, crops and forests, and some materials in the ECE region. Large-scale problems will remain even with full implementation of the Gothenburg Protocol and its 2012 amendments reducing the emissions of nitrogen oxides and non-methane volatile organic compounds, both are ozone precursors. Model simulations indicate that background levels of tropospheric ozone will start increasing again after 2020-2030⁵, progressively driven by methane emissions outside the ECE region. Therefore, further reductions in precursors, including methane, will be required.

31. WHO ambient air quality guidelines for ozone and nitrogen dioxide are under revision, so the projected health effects could be different than currently assumed. Current research indicates that non-exceedance of the present WHO ambient ozone guidelines will not be sufficient to protect vegetation, including crops. Models to describe and assess ozone damage to vegetation have been successfully developed; however, the modelling of the consequences of emission reductions has to be further developed in integrated assessment models.

32. Since tropospheric ozone is a greenhouse gas, the reduction of elevated concentrations also contributes to the mitigation of climate change.

33. For all the reasons mentioned, addressing tropospheric ozone is a key challenge for the Convention.

Particulate matter and its precursors

34. High particulate matter concentrations, including the contributions from long-range transport of emitted particulate matter and precursors of secondary particulate matter, have significant health effects in terms of morbidity and mortality. WHO ambient air quality guidelines for particulate matter are substantially exceeded in many areas of the ECE region, especially in urban areas. Based on evidence of the deleterious health effects of particulate matter that has been observed at lower levels than previously reported, WHO ambient air quality guidelines for particulate matter are also under revision.

35. Besides health effects, particulate matter causes soiling and corrosion of materials. The reduction of black carbon, as part of particulate matter, is important owing to its toxicological effects, its soiling effects and its contribution to climate change.

Nitrogen and sulphur

36. Reductions in emissions of acidifying pollutants, particularly of sulphur, have significantly reduced the threat of acidification for sensitive terrestrial and aquatic ecosystems. However, biological recovery shows a substantial delay compared with recovery of critical chemical parameters. The input of nitrogen compounds, especially ammonia/ammonium, increasingly dominates remaining acidification. Sulphur and nitrogen compounds are still contributing significantly to corrosion, causing exceedance of acceptable levels in some areas.

37. The disruption of global and regional nitrogen cycles is one of the most important challenges for environmental policy. The eutrophying input of nitrogen compounds from the atmosphere continues to threaten sensitive ecosystems in large areas of the ECE region. This is supported by observations of nutrient imbalances, a high degree of nitrogen saturation and biodiversity loss in terrestrial and aquatic ecosystems. The current and future exceedances of critical loads of nitrogen as an indicator for biodiversity losses

⁵ Reference 1 above (Scientific Assessment Report), p. 27.

over large areas are dominated by ammonia emissions from agriculture. Nitrogen-related secondary particulate matter also contributes significantly to particulate matter exposure. Besides these effects, atmospheric inputs of nitrogen compounds are strongly linked to climate change due to the coupled carbon and nitrogen cycles.

Persistent organic pollutants and heavy metals

38. Despite a rapid decrease of emissions of heavy metals and persistent organic pollutants in the past decades, long-term risks continue to exist. For instance, critical loads of lead and mercury are widely exceeded, and pollution levels of unintentionally released persistent organic pollutants (uPOPs), such as polycyclic aromatic hydrocarbons and hexachlorobenzene, are still a concern. While the global Conventions on mercury (Minamata) and persistent organic pollutants (Stockholm) deal with many relevant air pollution aspects, this Convention can be expected to provide added value particularly regarding the determination and assessment of emissions, atmospheric transport and effects of heavy metals and persistent organic pollutants, and the abatement of heavy metals and uPOPs emissions.

From long-range transboundary to urban scale

39. There are strong indications that transcontinental long-range transboundary air pollution is of significant and increasing importance. This applies not only to persistent organic pollutants and mercury which are covered by global conventions, but also to tropospheric ozone, particulate matter and other pollutants. Therefore, emission reductions especially of methane as an ozone precursor will be needed on a hemispheric scale to reduce ozone and its impacts in the ECE region. The Convention will continue to play a vital role in assessing and addressing hemispheric air pollution.

40. At the same time, it is increasingly evident that local air pollution, including in cities, is strongly influenced by long-range and transboundary transport of pollutants. Improved multi-scale models and increased cooperation between different governance levels are needed to solve local and urban air pollution problems.

Air pollution links to ecosystems and climate change

41. Links and feedbacks between air pollution, the ecosystems' biogeochemistry and biodiversity, and climate change are complex. Examples include synergies between increasing ozone and nitrogen pollution, biological effects and climate change; the mobilization of previously deposited mercury by changes in acidification and climate; or increasing emissions of volatile organic compounds and ammonia with rising temperature. These interactions are an important science-policy item for this Convention and its outreach since air pollution is the central link.

Monitoring challenges

42. Air quality and effects monitoring is essential to verify models, to detect recovery from past impacts or determine new impacts, and to assess efficiency and sufficiency of further abatement. The Convention's monitoring, modelling and assessment system is unique worldwide and Parties need to ensure the Convention has adequate resources to maintain its long-term operations.

Need for communication on necessity for further action

43. Communication on the work under the Convention, on the successes and the remaining challenges needs to be improved to raise awareness to the public and to policy makers.

44. The strong available scientific evidence of the negative impacts of air pollution on health and the ecosystems highlights the need for further action to improve air quality and

public health. This includes the need to increase cooperation with non-ECE regions, which is further elucidated below.

D. Strategic priorities of the Convention

45. Bearing in mind the challenges highlighted in section III, key priorities for action and policy development out to 2030 are set out below. These priorities should guide the direction of future work as well as facilitate the prioritization of work and associated use of resources, including managing the workload of the subsidiary bodies and the secretariat. Specific tasks listed for each priority should not be read as exhaustive. In line with its flexible approach, the Convention should also continue to be agile in responding to new science and policy developments going forward.

Maximizing the Impact of the Convention

46. The highest priority of the Convention is to maximize its impact and that of its protocols, in order to meet the objectives of the three most recent, amended protocols (the Gothenburg Protocol, the Protocol on Heavy Metals; and the Protocol on Persistent Organic Pollutants) in particular, in terms of emissions reductions, and to realize the associated environmental and health benefits. Increased ratification and implementation of these protocols, including through effective enforcement of obligations, as well as ensuring the protocols are kept under review and amended as appropriate are key elements of this effort.

47. Increased ratification and implementation of the three most recent amended protocols are of central importance, in the countries of Eastern Europe, the Caucasus and Central Asia. Continued awareness-raising in those areas particularly at the political level of the need to improve air quality and the benefits of ratifying the protocols is vital for the success of the Convention.

48. Capacity-building to enhance skills' development and understanding of protocol provisions, as well as improve the use of existing capacity, share lessons learned, and transfer knowledge related to air quality monitoring, emission inventories and projections and abatement strategies in order for countries, particularly those in the Eastern Europe, the Caucasus and Central Asia, to implement best available techniques, will continue to be a key focus. Financial support will continue to be required and pursued.

49. Full compliance by all Parties with their obligations under the protocols is required for them to be effective. The Implementation Committee should continue its approach to compliance review with a focus on enduring cases of non-compliance and should continue to support countries in their efforts toward compliance with their emission reduction and reporting obligations.

50. In line with its commitment to keep its protocols under review, the Parties to the Convention will review the amended Gothenburg Protocol and update it as necessary after its entry into force. The next review of the Gothenburg Protocol should consider *inter alia*, emissions reductions commitments and mandatory emissions reporting for black carbon, further requirements for fine particulate matter, acid rain and ozone precursors already included in the Protocol, including strengthened ammonia abatement measures, and steps to address ozone precursors not yet addressed such as methane. It should also consider how to address shipping emissions.

51. Parties to the Convention will continue to focus in the near-term on implementation of the Heavy Metals Protocol and the Protocol on Persistent Organic Pollutants, following the principled approach of the Long-term strategy for the Convention (ECE/EB.AIR/106/Add.1). Any future action under the Protocol on Persistent Organic Pollutants should focus on combustion-related persistent organic pollutants. Such action could include additional measures that strengthen best available techniques, more specific measures on combustion-related persistent organic pollutants such as polycyclic

aromatic hydrocarbons and specific measures for countries in Eastern Europe, the Caucasus and Central Asia, especially for new installations. The Convention should also pursue mitigation activities on heavy metals within the ECE region and consider acting as a centre of expertise for UNEP on reducing heavy metals, focusing on sharing its technical knowledge in terms of best available techniques, emission inventories, modeling and monitoring.

52. When considering updates to the Protocols, Parties should consider opportunities for incorporating an integrated approach to environmental policy that can achieve multiple goals and benefits, as well as potential unintended consequences of proposed actions on other environmental problems. They should also consider whether additional flexibilities could be incorporated that could facilitate ratification and implementation by countries in Eastern Europe, the Caucasus and Central Asia, such as different types of commitments and provisions for step-wise ratification.

Improving the Scientific and Technical Basis

53. The Convention's science-based decision-making and effects-oriented approach will remain essential components of the Convention, providing the foundation for sound policy. This strength will be maintained, and improved where possible, including in terms of cooperation between Convention bodies.

54. To be of most relevance, the Convention's scientific activities should include broad participation within the entire ECE region, including North America, and in particular the countries of Eastern Europe, the Caucasus and Central Asia, whose increased involvement would *inter alia* support the effort to obtain reliable emissions data and develop monitoring and modelling networks throughout the region.

55. Improvements to the scientific and technical basis of the Convention, by better assessing progress in improving air quality and reducing human health and ecosystem effects, will help ensure that policy remains evidence-based and effective. Monitoring and modeling activities on air quality should be closely coordinated with those for assessing impacts on health and ecosystems in order to prove a clearer understanding of the progress made and issues remaining to be addressed.

56. Parties to the Convention should maintain or extend their monitoring networks and the Convention should take every opportunity to make monitoring networks serve multiple clients (national and international) and other problems such as climate, biodiversity and land-use management. Consideration of extending the geographical scope to high resolution (i.e., cities) and hemispheric or global work should keep in mind the consequences for monitoring. EMEP should consider how to further develop high resolution modeling without diverting resources from core activities related to ECE scale modeling and background monitoring.

57. The provision of sound scientific findings is dependent on the quality and completeness of the data available. Solid emissions inventories and projections are important for ratification. The completeness and accuracy of emissions inventories and projections needs to be improved, in particular, in Eastern Europe, the Caucasus and Central Asia. The Convention/EMEP will take specific steps to implement improvements, including for some specific pollutants and to improve the inventory review process. Verification needs to be strengthened, including by measurements and by confirming that real-world emissions are accurately and consistently represented in emissions inventories. Improved definitions of black carbon for emissions reporting and for ambient air and effects monitoring purposes is a key priority. EMEP should also closely cooperate with relevant non-ECE organizations to provide relevant expertise for establishing reliable and current non-ECE emissions inventories for all pollutants to underpin the assessment of transport to and from other regions.

58. The Task Force on Health should further assess the health effects of particulate matter with due consideration of its components.

59. The EMEP Steering Body and the Working Group on Effects should further improve the implementation of their respective strategies with respect to cooperation on monitoring, modelling and mapping, improve the analysis of long-term trends in emissions and the capacity for quantifying intercontinental transport through multi-compartment modeling. The Bureau of the Executive Body and subsidiary bodies should continue discussions on new options for financing activities not covered by the EMEP Protocol and make recommendations to the Executive Body.

60. The Convention should continue to play its vital role in assessing hemispheric transport of air pollution and EMEP should provide analysis and reports that support policy conversations on the need to address ozone and its precursors, particulate matter, heavy metals and persistent organic pollutants on a broad geographic basis beyond the ECE. Reports should include the most relevant available information on the relative contributions within and outside the ECE region to air pollution within the region, the potential for emissions reductions, and the relative contribution of each pollutant, including precursors, to the pollution problem in the ECE region.

61. Given that urban air quality is influenced by both national and transboundary pollution, the Task Force on Integrated Assessment Modelling should assess the health and ecosystem impacts of measures taken at the regional and international scales on local and urban air quality to help determine the appropriate complementary abatement strategies. The impacts of air pollution at the hemispheric scale should be further assessed by the Task Force on Hemispheric Transport of Air Pollution with due consideration of regional actions.

Enabling Sound Policy

62. It is key to maintain and strengthen the close two-way linkages between science and policy. On the one hand, scientific activities need to respond to policy needs and questions. On the other hand, new scientific developments should also influence policy priorities and guide policy decisions, both in terms of what the policy should address and how the policy should be developed.

63. The Convention will continue to concentrate on pollutants best controlled at a regional level and address the remaining and emerging air pollution issues. This means in particular a focus on PM, including black carbon, tropospheric ozone, including methane, eutrophying pollution with a focus on ammonia, and, where still needed, on acidifying pollution. The Convention will address other pollutants if the scientific evidence is sufficiently strong and Parties agree they are appropriate to address. For example, further scientific and technical work should continue to determine whether additional uPOPs should be added to the Protocol on Persistent Organic Pollutants.

64. The importance of taking an integrated approach to developing environmental policy is becoming increasingly recognized and more work to examine and communicate these interactions should be carried out under the Convention. The Convention should continue to use and further develop the multi-sector, multi-pollutant approach, and should in particular strive to take an integrated approach to developing environmental policy in three areas:

(a) First, science as well as policy development have to take into account that air pollution is the central link for interactions between ozone, nitrogen, climate change and ecosystems. For instance, climate change may induce increased ozone concentrations and ammonia emissions and trigger ecosystem responses further increasing concentrations and their effects. These feedbacks would necessitate further emission reductions of ozone precursors and ammonia.

(b) Second, the disruption of global and regional nitrogen cycles is one of the most important challenges for environmental policy that can only be properly addressed with an integrated approach involving agricultural, transport, energy and other policies.

Air pollution abatement plays a central role in managing reactive nitrogen and prevents effects.

(c) Finally, while work on understanding the rationale for an integrated approach to addressing air quality and climate change has expanded recently, actual integrated policy development explicitly targeting multiple objectives and considering all impacts is still emerging. Interactions between air pollution and climate change mitigation measures should be further analyzed and studied. The analysis should examine impacts on air quality of climate measures, and impacts on climate from air pollutant measures, with the goal of pointing to abatement strategies and policies that leverage synergies between measures targeting reductions of air pollutants and greenhouse gases – so-called win-win policies.

65. Analyses of the economic costs of the impacts of air pollution and the cost-effectiveness of policies to control it are essential to the design of effective control strategies and provide the rationale for decision-making to policymakers. The Task Force on Techno-economic Issues and the Task Force on Integrated Assessment Modelling will produce a report that sets out the costs of control versus the costs of inaction. The two Task Forces will also work to improve the analyses from the Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model, by comparing cost estimates from different models and to improve the cost estimates of the impacts of air pollution on human health and ecosystems. Additional local and regional measures should be compared with additional continental measures, considering the relative importance of various sources. The Task Force on Techno-economic Issues and the Task Force on Integrated Assessment Modelling should also analyze the cost-effectiveness of Northern Hemispheric emission reduction strategies to reduce ozone precursors as compared with a European or North American approach alone to reduce ozone damage to health and crops.

Communication, Outreach and Cooperation

66. There is a pressing need to continue to better communicate the Convention's work and successes in addressing transboundary air pollution, including at the political level as well as to increase awareness of the importance of addressing air pollution for health and environmental reasons and the availability of cost-effective tools for doing so. This will help address one of the key barriers to ratification in Eastern Europe, the Caucasus and Central Asia which is a lack of awareness, including at the political level, of the risks associated with air pollution as well as the benefits of ratifying the Convention's protocols, including economic and competitiveness benefits that can be realized by implementing their emission reduction measures.

67. The bodies under the Convention should actively contribute to the enhancement of its communication efforts to further increase their effectiveness. The Convention's communication activities should both raise awareness of the issue of air pollution, including the compelling environmental, health and economic rationale for taking action, and increase the visibility of the work of the Convention. An updated approach should include where possible fresh tools and mechanisms, and innovative approaches that will reach the desired audiences – at the public, policymaker and political levels. Parties should also input into the effort to improve the effectiveness of the Convention's communications activities where possible.

68. The Batumi Action for Cleaner Air initiative is a tool for raising awareness of the availability of solutions, and for inspiring more national action within and outside the ECE region, and Parties to the Convention should promote this initiative where possible.

69. The considerable amount of scientific and political outreach activities undertaken under the Convention over the past few years with success should be enhanced. Successful mutual outreach to and information-sharing with other organizations such as UNEP, the Climate and Clean Air Coalition, the Arctic Council and other United Nations organizations, including the WHO and WMO, has taken place and will be built on in order to continue to leverage synergies between the work of these organizations.

Scientific cooperation with countries outside of the ECE region, including under the Task Force on Hemispheric Transport of Air Pollution, has also taken place and the Convention should continue to look for opportunities to enhance this cooperation. The Convention should consider initiating a dialogue with institutions such as the International Monetary Fund, the World Bank, the Asian Development Bank, the African Development Bank Group, the European Bank for Reconstruction and Development and the Inter-American Development Bank.

70. Hemispheric and intercontinental transport of air pollutants, especially ozone and particulate matter has been established as an important factor in air quality management. Transcontinental and hemispheric cooperation in reducing emissions is called for because hemispheric influence on air quality within the ECE region remains a challenge. While the Convention and its protocols should remain open to countries in the ECE region only, tackling the remaining pollution problems within the ECE region will require cooperation at the policy level including with countries and regions outside of the ECE region. The Convention has begun to seriously explore how to take forward broader geographic cooperation and needs to consider seriously its role in the development of any broader geographic effort to reduce transboundary air pollution, as well as the nature and approach such cooperation should take.

71. Most recently, a number of ECE member States collaborated on a resolution at the third meeting of the United Nations Environment Assembly that specifically calls for all Member States to take a series of actions to reduce emissions of air pollutants from key sources that are also covered by the Gothenburg Protocol such as transport, urbanization, climate change, energy, agriculture and nitrogen management, and to work toward a shared response to addressing air pollution. The resolution calls for action by all UNEP member states and UNEP itself, including the creation of a platform for information-sharing and cooperation amongst countries and organizations, to *inter alia* help facilitate a shared response to addressing air pollution.

72. The Convention will share its experience and scientific expertise, and will strive to play a key role in the development and operation of the platform, as well as the launch of an informal dialogue to discuss policy cooperation amongst regions.

73. Finally, the Convention should continue to be nimble in responding to emerging scientific information and policy priorities, and take into account relevant work and policy discussions that take place outside of the Convention. In considering its policy responses and priorities, it should strive to be open-minded, progressive and ambitious in order to reap maximum benefits for air quality, and human and ecosystem health.

E. Overarching conclusions

74. There is still much work to be done to address transboundary air pollution that impacts in the ECE region. To be successful, the Convention will need to work closely with Parties to implement current obligations, encourage additional ratifications of the latest three protocols and move forward to address the challenges of the twenty-first century.

75. Model simulations indicate that global cooperation to address air quality in the ECE is also essential. Continued improvements to the technical and scientific basis will maintain the Convention's leadership role as well as position the Convention to cooperate with other organizations and regions, including serving as a model for other regions in addressing air quality. This leadership role will include:

- (a) continuing to use the best available science and further develop the multi-effect multi-pollutant framework;
- (b) advancing efforts to address air pollution at a broader geographic scale;

(c) promoting exchange experiences of the effectiveness of measures taken at the national scale to encourage mutual learning;

(d) striving for an integrated approach for environmental policy that includes ground-level ozone-nitrogen-climate-biodiversity interactions, integrated nitrogen management including its impacts for health, and climate change co-benefits of air pollution policies and measures and effects of climate policies on air pollution.
