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**Economic Commission for Europe**

**Executive Body for the Convention on Long-range  
Transboundary Air Pollution**

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Item 6 of the provisional agenda

**Revised long-term strategy for the Convention**

**Draft revised 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 (ECE/EB.AIR/135, annex II). At its thirty-seventh session (Geneva, 11–14 December 2017), the Executive Body adopted decision 2017/4, instructing the policy review group to elaborate a draft revised long-term strategy for the Convention.

The present document contains the proposed revised long-term strategy for the Convention, which reflects the guidance and elements that were provided by the Executive Body at its thirty-seventh session (ECE/EB.AIR/140, annex III) and were further refined in light of the comments and suggestions of the Working Group on Strategies and Review at its fifty-sixth session (ECE/EB.AIR/WG.5/120) and consultations with the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP), the Working Group on Effects (ECE/EB.AIR/GE.1/2018/2–ECE/EB.AIR/WG.1/2018/2, forthcoming) and the Bureau of the Executive Body.

The revised version reflects modifications made by the ad hoc policy review group of experts in response to the edited version after the submission of the document.

## 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 the ad hoc policy review group of experts on the 2016 scientific assessment of the Convention (policy review group) (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 Convention<sup>1</sup> (2016 Assessment Report) and recommendations as to whether and how action should be taken under the Convention in the short and long term based on the findings contained in that Report;

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

(c) Proposing updates and revisions to the long-term strategy based on the findings contained in the 2016 Assessment Report and the policy recommendations developed further to paragraph 1 (a) above, taking into account the report of the ad hoc group of experts on the action plan for implementation of the long-term strategy for the Convention (ECE/EB.AIR/2012/15).

2. At its thirty-seventh session (Geneva, 11–14 December 2017), the Executive Body adopted decision 2017/4 (ECE/EB.AIR/140), instructing 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 (Geneva, 22–25 May 2018), using as guidance the elements agreed by the Executive Body at its thirty-seventh session (ECE/EB.AIR/140, annex III).

3. The present document contains the revised draft long-term strategy for the Convention (ECE/EB.AIR/WG.5/2018/3), which takes into account the comments and suggestions made by the Working Group on Strategies and Review at its fifty-sixth session (ECE/EB.AIR/WG.5/120, forthcoming) and consultations with the Steering Body, the Working Group on Effects (ECE/EB.AIR/GE.1/2018/2–ECE/EB.AIR/WG.1/2018/2, forthcoming) and the Bureau of the Executive Body.

## II. Proposed revised draft long-term strategy for the Convention

### A. Introduction

4. The 2016 Assessment Report clearly shows that the Convention has delivered demonstrable improvements in reducing acidification of the environment and the highest peak levels of ozone and photochemical smog, persistent organic pollutants and heavy

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<sup>1</sup> See Rob Maas and Peringe Grennfelt, eds., *Towards Cleaner Air: Scientific Assessment Report 2016* (Oslo, 2016) and United States Environmental Protection Agency and Environment and Climate Change Canada, *Towards Cleaner Air: Scientific Assessment Report 2016 – North America* (2016), available at [www.unece.org/environmental-policy/conventions/envlrtapwelcome/publications/others/2016/towards-cleaner-air-scientific-assessment-report-2016-north-america.html](http://www.unece.org/environmental-policy/conventions/envlrtapwelcome/publications/others/2016/towards-cleaner-air-scientific-assessment-report-2016-north-america.html).

metals and has begun to reduce particulate matter and atmospheric levels and deposition of nitrogen.

5. It has proved flexible and dynamic in responding to new challenges and problems in the area of transboundary air pollution and has expanded scientific and technical collaboration beyond the United Nations Economic Commission for Europe (ECE) region. It has also given science a prominent role not only in providing information, but in sustaining the policymaking process as seen from the policy response to the scientific assessment of the Convention (ECE/EB.AIR/WG.5/2017/3 and Corr.1).

6. This strategy is an update of the 2010 long-term strategy and sets out a vision for the Convention for the period 2020–2030. This time frame will allow it to contribute to implementation of the 2030 Agenda for Sustainable Development (2030 Agenda) and the Sustainable Development Goals and to consider possible developments over a longer time period – up to 2050.

7. Despite the progress made under the Convention, air pollution in the region still causes significant environmental and health problems and new challenges continue to emerge. As seen from the conclusions of the 2016 Assessment Report, air pollution is increasingly recognized as a global problem and transboundary air pollution from outside the ECE region has a growing impact on air quality within it. The [Parties to the Convention](#) ~~must-should~~ respond to these challenges by building on its strengths and cooperating with international organizations and countries outside the region so that it will continue to play a leading role in efforts to address the air pollution problems of the twenty-first century.

8. The past years have seen important policymaking on air pollution issues at the international and regional levels:

(a) The Convention takes into consideration the global context of international cooperation ~~in reducing to~~ [reduce](#) air pollution, including through the United Nations Environment Programme (UNEP), the World Health Organization (WHO), 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, the Convention on Biological Diversity, the International Civil Aviation Organization (ICAO), the Climate and Clean Air Coalition (CCAC), the Arctic Council and the Global Methane Initiative. To date, cooperation with these organizations and processes on scientific matters under the Convention has been extremely effective and it is important to build on this cooperation by sharing information and participating in policymaking as appropriate in order to ensure that international efforts are complementary;

(b) The 2030 Agenda and the Sustainable Development Goals were adopted in 2015. Parties' compliance with their obligations under the Convention can contribute to the achievement of Goals 3 (good health and well-being), 11 (sustainable cities and communities), 12 (responsible consumption and production), 14 (life below water) and 15 (life on land);

(c) At the regional level, achievements include the adoption of the European Union's new directive on National Emission Reduction Commitments,<sup>2</sup> cooperation under the Canada-United States Air Quality Agreement and efforts to introduce ~~the~~ best available techniques in Eastern Europe, the Caucasus and Central Asia;

<sup>2</sup> 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).

(d) In 2014, the United Nations Environment Assembly adopted resolution 1/7 on strengthening the role of the United Nations Environment Programme in promoting air quality. In December 2017, building on that resolution, the Assembly adopted resolution 3/8 on preventing and reducing air pollution to improve air quality globally, which calls on member states to take significant action to address air pollution; requests UNEP to create a new platform for cooperation and information-sharing to support countries' efforts to reduce it; and supports enhanced international action to address transboundary air pollution, in particular by enhancing regional cooperation.

9. At the Eighth Environment for Europe Ministerial Conference (Batumi, Georgia, 8–10 June 2016), the ministers endorsed the Batumi Action for Cleaner Air (2016–2021). The initiative provides an opportunity to inspire voluntary national action and promote additional collaboration within and beyond the ECE region.

10. Several protocols with specific obligations designed to reduce the emission of key air pollutants have been developed under the Convention and the three most recent ones have been amended.<sup>3</sup> Now, the Convention should continue to focus on their ratification and implementation while simultaneously considering strategies to address the remaining air pollution issues.

11. The Parties will continue to critically examine work under the Convention, set priorities in light of these broader developments and position the Convention in a leadership role where appropriate.

12. Therefore, the present strategy:

(a) Sets a vision for the period 2020–2030 and beyond, ~~in light of to address~~ the priorities set and in light of the emerging challenges regarding the effects of air pollution and their interaction with climate change, nitrogen pollution, biodiversity loss and other global environmental challenges, through an integrated approach involving agricultural, transport, energy, climate and other policies;

[(a bis) sets forth a clear priority for increasing ratification and implementation of the Convention's protocols;]

(b) Bases this vision on the unique strengths and successes of the Convention, i.e. the close links between science and policy and the ability to deal with multiple effects and pollutants;

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

(d) Allows for assessment of the health and ecosystem impacts at the local and urban levels of air pollution measures taken at the regional level;

(e) Allows for continued cooperation at the global level in assessing the impact of air pollution at the hemispheric scale on regional and local air quality ~~at the hemispheric level;~~

(f) Sets clear priorities for the Convention in order to make best use of the available resources of the Parties and the secretariat.

<sup>3</sup> 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).

13. Section B focuses on the strengths and successes of the Convention, section C describes the remaining environmental and health effect challenges, section D sets out strategic priorities for work under the Convention and section E presents conclusions.

## B. Strengths and successes of the Convention

### The effects-oriented approach

14. The Convention has had considerable success in solving environmental and health problems and has led the way in taking a multi-pollutant, multi-effect approach. The core strengths and expertise of the Convention and its subsidiary bodies include dealing with air pollutants that affect human health, acidification, eutrophication, cultural heritage and other environmental effects that have an adverse impact on environmental services. ~~Work under these instruments focused initially, work on these instruments focused~~ on acidifying pollution and, later, on eutrophying compounds (nitrogen oxides and ammonia) and tropospheric ozone. Work under the Convention has also addressed emissions and effects of particulate matter.

15. In addition, collaboration with other organizations has increased knowledge of the impacts of air pollution, including 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 unique geographical scope; 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 on transboundary air pollution. Cooperation, including with key scientists from outside the ECE region, has been developed in order to assess the ~~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, were used by the European Union in preparing its new National Emission Ceilings (NEC) Directive and enabled its adoption of emission reduction commitments for 2030, in addition to those for 2020 under the Gothenburg Protocol.

### A pioneer role in ~~dealing with~~ addressing heavy metals, persistent organic pollutants and black carbon

18. The Convention ~~also developed~~s protocols ~~that~~ address persistent organic pollutants and heavy metals, including lead, cadmium and mercury. This leadership has paved the way for a global approach to these problems and ~~has~~ inspired the Stockholm and the Minamata Conventions.

19. The expertise acquired, including on best available techniques, emissions inventories and monitoring and modelling under the Air Convention, is relevant to current and future policy work on persistent organic pollutants and heavy metals. Emissions reduction and abatement techniques developed in order to control particulate matter will also deliver reductions in the emission of metals other than mercury ~~and persistent organic pollutants such as polycyclic aromatic hydrocarbons (PAHs)~~.

20. The 1999 Gothenburg Protocol, ~~as amended in and its 2012 amendments were,~~ is the first international agreements to address ~~tropospheric ozone and black carbon, respectively, both of which are~~ short-lived climate pollutants, ~~in addition to tropospheric ozone~~. The 2016 Assessment Report stresses 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 between Parties in enhancing the skills of national experts and helping countries to perform the tasks required under 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, in implementation of their strategies, have established a robust system of emission inventories and modelling and monitoring activities. This has resulted in a comprehensive database that includes historical data over a 40-year period, allowing for the assessment of long-term trends in transboundary air pollution and its effects. The technical background on emission abatement techniques was developed by the Task Forces on Techno-Economic Issues and Reactive Nitrogen under the Working Group on Strategies and Review.

23. Another of the Convention's strengths is the fact that its science and policy work has traditionally been carried out through a flexible, consensual process. The constructive and unique manner in which science and policy work interact has enabled the Parties to take decisions in response 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 lies not only in setting emissions reduction targets that clearly indicate the desired results, but also in specifying how those reductions should be achieved: by applying uniform minimum technical emission standards based on the best available techniques and energy-efficiency requirements. These technology-based requirements help to ensure a level playing field for the Parties.

25. Another important aspect of work under the Convention is the development of effects-monitoring methodologies that document improvement in air quality in terms not only of concentrations and emissions inventories, but also of decreased impacts.

26. In particular, the flexibility provisions included in the original Protocols on Persistent Organic Pollutants and Heavy Metals and the Gothenburg Protocol (on, among other things, timescales for the application of emission limit values and the opportunity to apply alternative strategies for meeting them) were revised and extended in the amended versions in order to facilitate their ratification and implementation. This work was carried out in close contact with and consultation within the Coordinating Group on the promotion of actions towards implementation of the Convention in Eastern Europe, the Caucasus and Central Asia.

27. The Batumi [Action for Cleaner Air](#) initiative has helped to raise awareness at the political level of the need to improve air quality and the benefits of ratifying the protocols. These efforts are 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 achievements

28. The protocols to the Convention call for reviews<sup>4</sup> to assess their sufficiency and effectiveness in light of the progress made and the latest available scientific and technical knowledge. The Protocol on Persistent Organic Pollutants, the Protocol on Heavy Metals and the Gothenburg Protocol have been amended based on those reviews and now include updated commitments and additional pollutants.

29. Key to tracking these achievements is an effective Implementation Committee, which has established procedures for notifying Parties of non-compliance with the emissions reporting and emission reduction requirements and ensuring that the procedures are followed in such cases. The Implementation Committee and the Convention's subsidiary bodies have developed an excellent partnership in supporting national efforts to achieve and report the emissions reductions required under the protocols.

### C. Remaining challenges

30. While abatement measures under the Convention have significantly reduced the impact of air pollution on health and ecosystems, substantial problems remain. Based on the 2016 Assessment Report, the following air pollutant effects should be addressed through a multi-pollutant, multi-effect approach that includes their potential interaction with climate change, the nitrogen cycle and biodiversity.

#### Ozone and its precursors

31. Although peak ozone concentrations have been reduced, there is evidence of widespread damage to human health, natural vegetation, crops and forests, and some materials in the ECE region. Even with full implementation of the Gothenburg Protocol and its 2012 amendments (e.g. reducing emissions of nitrogen oxides and non-methane volatile organic compounds, both of which are ozone precursors), wide-scale problems will remain. Model simulations indicate that background levels of tropospheric ozone will begin to increase again after 2020–2030,<sup>5</sup> driven progressively by methane emissions outside the ECE region. Therefore, further reduction in precursors, including methane, will be required [to fully address the adverse impacts of ozone](#).

32. The WHO air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide<sup>6</sup> are currently under review.

[32bis](#). For vegetation, including crops, more [data is available on](#) biologically-relevant flux-based critical levels for ozone ~~have been set~~. However, integrated assessment models should be further developed to better understand the impact of emission reductions in terms of ozone damage to vegetation.

33. Since tropospheric ozone is both [an air pollutant and contributes to climate change](#) ~~short-lived climate pollutant and a potent greenhouse gas~~, the reduction of elevated concentrations helps to mitigate both air pollution and climate change.

<sup>4</sup> Pursuant to article 10 of the Gothenburg Protocol, article 10 (3) of the Protocol on Persistent Organic Pollutants and article 10 of the Protocol on Heavy Metals.

<sup>5</sup> Scientific Assessment Report (see note 1), p. 27.

<sup>6</sup> <http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/pre2009/air-quality-guidelines-global-update-2005-particulate-matter-ozone-nitrogen-dioxide-and-sulfur-dioxide>; <http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/activities/update-of-who-global-air-quality-guidelines>

### Particulate matter and its precursors

34. High particulate matter concentrations, including from long-range transport of emitted particulate matter and precursors of secondary particulate matter, have significant health effects in terms of morbidity and mortality. The WHO guidelines for particulate matter are substantially exceeded in many parts of the ECE region, especially in urban areas. The ongoing review is based on evidence of the deleterious health effects of particulate matter observed at lower levels than previously reported.<sup>7</sup>

35. In addition to health effects, particulate matter causes soiling and corrosion of materials and cultural heritage and contributes to visibility degradation. The reduction of black carbon as part of particulate matter is important owing to its toxicological effects and its contribution to both air pollution and climate change.

### Nitrogen and sulfur

36. Reductions in the emission of acidifying pollutants, particularly sulfur, 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 the remaining acidification. Sulfur and nitrogen compounds still contribute significantly to corrosion of and damage to the cultural heritage with acceptable levels exceeded 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 atmospheric nitrogen compounds continues to threaten sensitive ecosystems and species in large areas of the ECE region. This conclusion is supported by the observation of nutrient imbalances, high nitrogen saturation and biodiversity loss in terrestrial and aquatic ecosystems. Current and future exceedances of critical nitrogen loads as an indicator of biodiversity loss over large areas are dominated by ammonia emissions from agriculture; nitrogen-related secondary particulate matter also contributes significantly to particulate matter exposure. In addition to these effects, atmospheric inputs of nitrogen compounds are closely linked to climate change owing to the coupled carbon and nitrogen cycles.

### Persistent organic pollutants and heavy metals

38. Despite the rapid decrease in the emission of heavy metals and persistent organic pollutants in recent decades, long-term risks persist: critical loads of lead and mercury are widely exceeded and the levels of unintentionally released persistent organic pollutants (uPOPs) such as polycyclic aromatic hydrocarbons (PAHs) and hexachlorobenzene are still a concern. While the relevant global Conventions (Minamata and Stockholm) address ~~many important – the full life cycle approach to mercury and POPs (from manufacture to waste) aspects of air pollution,~~ it is expected that the Air Convention will continue to ~~play an important role [pursuant to the Executive Body decision 2013/22] provide added value,~~ particularly with regard to the determination and assessment of emissions; atmospheric transport and the effects of heavy metals and persistent organic pollutants, including on health; and the ~~technologies for~~ abatement of heavy metal and uPOP emissions.

### From the long-range transboundary to the 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

<sup>7</sup> The revised guidelines are expected to be published in 2020.



organic pollutants and mercury, which are covered by global conventions, but also to tropospheric ozone, particulate matter and other pollutants. ~~Therefore, –e~~Emission reductions, ~~especially~~ of methane as an ozone precursor, will be needed on a hemispheric scale in order to reduce ozone and its impact in the ECE region. The Convention will continue to play a vital role in assessing and addressing hemispheric air pollution.]

[39. Intercontinental long-range transboundary air pollution is significant for persistent organic pollutants and mercury, which are covered by global conventions, but also for tropospheric ozone and particulate matter. Therefore, emission reductions, especially of methane as an ozone precursor, will be needed on a hemispheric scale in order to most effectively reduce ozone and its impact in the ECE region. The Convention will continue to play a vital role in assessing, facilitating cooperation, and addressing hemispheric air pollution in conjunction with local and regional controls.]

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

#### **Monitoring challenges**

41. Air quality and effects monitoring is essential in order to verify models, detect recovery from past impacts or identify new ones, and assess the efficiency and sufficiency of further abatement. Among other things, models and assessment methods facilitate the analysis and use of monitoring results by policymakers. The Convention's monitoring, modelling and assessment system is unique worldwide and the Parties should work to facilitate need to ensure the provision of adequate resources for its long-term operation.

#### **Links between air pollution, ecosystems and climate change**

42. The links and feedbacks between air pollution, ecosystem biogeochemistry and biodiversity, land-use management and climate change are complex. Examples include synergies between increasing ozone and nitrogen pollution, biological effects and climate change; the mobilization of mercury previously deposited as a result of changes in acidification and climate; and increased emissions of volatile organic compounds and ammonia owing to rising temperature. In light of these interactions and given that air pollution is the central link, this is an important science-policy issue for outreach under the Convention. Further work on these interactions by the Convention's scientific bodies is a high priority.

#### **Flexibilities**

43. In order to facilitate further ratifications, the amended Protocols provide more flexible arrangements, on a transitional basis, for applying emission limit values, more limited reporting requirements and additional flexibility in assessing compliance with emission reduction commitments (adjustment procedure). Although some undeniable progress has been made, these flexibility provisions have not produced the expected results to date.

#### **Need for communication on the need for further action**

44. Communication on work under the Convention, achievements and remaining challenges needs to be improved in order to raise awareness among policymakers and the public.

45. The strong available scientific evidence of the negative impact of air pollution on health, materials and ecosystems highlights the need for further action in order to improve

air quality and public health, including by increasing cooperation with non-ECE regions (see below).

#### D. Strategic priorities of the Convention

46. Bearing in mind the challenges highlighted in section C, the key priorities for action and policymaking until 2030 are set out below. These priorities should guide future work and facilitate the prioritization of tasks and the use of resources, including those allocated to the subsidiary bodies and the secretariat. The specific tasks listed for each priority should not be viewed as exhaustive. Going forward, the Convention should also maintain its flexible response to new scientific developments and policymaking.

##### Maximizing the impact of the Convention

47. The highest priority for work under the Convention is to maximize its impact ~~in~~ ~~order to~~ ~~by~~ meeting the objectives of the three most recent protocols as amended, in particular, in terms of emissions reductions, and to realize the associated environmental and health benefits. Increasing ratification and implementation of these protocols, including through effective enforcement of compliance, and ensuring that they are kept under review and that appropriate action is taken are key elements of this effort.

48. Increased ratification and implementation of the three most recent protocols, as amended, are of central importance in the countries of Eastern Europe, the Caucasus and Central Asia. [Existing policy and institutional gaps between countries of the region and other Parties to the Convention in the field of air quality management and pollution abatement matters require continuous attention, bridging these gaps should become one of the long-term tasks of the Convention.] Continued awareness-raising, particularly at the political level, of the need to improve air quality and the benefits of ratifying the protocols is vital to the success of the Convention.

49. Capacity-building in order to enhance skills; increase understanding of the provisions of the protocols; improve the use of existing capacity; share lessons learned; and transfer knowledge related to air quality monitoring, emission inventories and projections and abatement strategies will remain a key focus so that countries, particularly in Eastern Europe, the Caucasus and Central Asia, can adopt the best available techniques and implement emission reduction commitments. Financial support will continue to be required and pursued.

50. The protocols' effectiveness requires that the Parties meet all of their obligations under those instruments. Parties should continue to: improve emissions inventories; ensure regular reporting, including of gridded data for Parties within the geographical scope of EMEP; and implement technical measures. As emissions inventories improve, the Parties will have a greater awareness of appropriate strategies, policies and technical measures for addressing emissions and meeting the objectives of and obligations under the Protocols. The Implementation Committee should maintain its approach to compliance review with a focus on long-standing cases of non-compliance and should continue to support countries' efforts to meet their emission reduction and reporting obligations.

[51. Pursuant to article 10 of the Gothenburg Protocol, the Parties are expected to review the amended Protocol and update it if necessary after its entry into force. This review, the outcome of which will determine whether an update is necessary, should take into account the sufficiency and effectiveness of current obligations and the Parties' success in achieving the Protocol's objectives. An update could include, inter alia, the consideration of the introduction of mandatory emissions reporting; emission reduction commitments; further measures to reduce black carbon emissions; further emissions requirements for fine

particulate matter, acid rain and ozone precursors already included in the Protocol, in particular strengthened ammonia abatement measures; and the treatment of ozone precursors not yet addressed, such as methane. It could also consider strengthened emission standards based on the best available techniques and energy-efficiency requirements for residential and small-scale solid fuel burning; shipping emissions (with due consideration for IMO policies and measures); further requirements for hemispheric air pollution; and barriers to implementation, including for existing sources. This review should also include a reflection on the flexibility provisions and their effectiveness.]

[51. The Parties should review the amended Gothenburg Protocol, taking into account the provisions of Article 10. This review, the outcome of which will determine whether an update is necessary, should include an evaluation of mitigation measures for black carbon and ammonia emissions and should also take into account the sufficiency and effectiveness of current obligations and the Parties' success in achieving the Protocol's objectives. An update could consider the introduction of mandatory emissions reporting, emission reduction commitments and further measures to reduce black carbon emissions; further emission reduction measures for fine particulate matter, acid rain and ozone precursors already included in the Protocol, in particular strengthened ammonia abatement measures; and the treatment of ozone precursors not yet addressed, such as methane. It could also consider emission reduction measures for residential and small-scale solid fuel burning and shipping emissions (with due consideration for IMO policies and measures); further requirements for hemispheric air pollution; and barriers to implementation, including for existing sources. The review should also include a reflection on the flexibility provisions and their effectiveness.]

[51. Pursuant to article 10 of the Gothenburg Protocol, the Parties are expected to review the amended Protocol and update it if necessary after its entry into force. This review, based on which Parties will determine whether an update is necessary, should take into account the sufficiency and effectiveness of current obligations and the Parties' success in achieving the Protocol's objectives. The review should consider the priorities identified in the present strategy, as well as the findings of the 2016 scientific assessment report.]

52. In the short term, the Parties to the Convention will continue to focus on implementation and ratification of the Protocol on Heavy Metals and the Protocol on Persistent Organic Pollutants. Future work under those instruments should continue to follow the principled approach set out in decision 2013/22 of the Executive Body (ECE/EB.AIR/122/Add.1) and, in the latter case, should focus on ~~uPOPs~~<sup>combustion-related</sup> ~~persistent organic pollutants~~. Work on uPOPs could include continued scientific and technical research with a focus on additional efforts to strengthen the best available techniques, more specific measures on ~~unintentionally released POPs~~<sup>uPOPs</sup> such as PAHs and specific measures for countries in Eastern Europe, the Caucasus and Central Asia, especially for new installations.

53. Heavy metal mitigation activities should be pursued in the ECE region, provided that these activities are complementary to work undertaken by the Minamata Convention on Mercury and the UN Environment Programme (UNEP). With this in mind, and the Convention should consider acting as a centre of expertise for UNEP with a focus on sharing technical knowledge in terms of the best available techniques, emission inventories, modelling and monitoring.

[54. When considering updates to the Protocols, the Parties should consider opportunities for an integrated approach to environmental policy that can achieve multiple goals and benefits, as well as potential unintended consequences of proposed actions for other environmental problems. They should also consider whether additional flexibilities could be incorporated and whether new approaches such as commitments of a different nature and

a step-wise approach to ratification, could be adopted in order to facilitate ratification and implementation by countries in Eastern Europe, the Caucasus and Central Asia. ]

[54. When considering updates to the Protocols, the Parties should consider opportunities for an integrated approach to environmental policy that can achieve multiple goals and benefits, as well as potential unintended consequences of proposed actions for other environmental problems. They should also consider whether additional flexibilities could be incorporated and whether new approaches could be adopted in order to facilitate ratification and implementation by countries in Eastern Europe, the Caucasus and Central Asia.]

#### **Improving the scientific and technical basis for work under the Convention**

55. Science-based decision-making and effects-oriented approaches as a foundation for sound policy will remain essential components of work under the Convention. This strength will be maintained and, where possible, improved, including with regard to cooperation between Convention bodies. Cooperation with strategic partners like the World Meteorological Organisation (IMO) and the World Health Organization (WHO) is essential for the scientific work of the Convention and will be maintained.

56. In order to ensure maximum relevance of the Convention, its scientific activities should include broad participation throughout the ECE region, including North America and, in particular, Eastern Europe, the Caucasus and Central Asia where increased involvement would support, among other things, the effort to obtain reliable emissions data and to develop monitoring and modelling networks throughout the region.

57. Improving the scientific and technical basis of the Convention by better assessing progress in improving air quality and reducing human health ~~impacts and~~ materials and ecosystem effects will help to ensure that policymaking remains evidence-based and effective. Air quality monitoring and modelling activities should be closely coordinated with health and ecosystem impact assessments with a view to a clearer understanding of the progress made and the remaining issues to be addressed.

58. The Parties should maintain or extend their monitoring networks, including ecosystem and material monitoring. Parties should develop their monitoring networks for air pollution (EMEP network) and its effects in accordance with the relevant Monitoring Strategy and every opportunity should be taken to make monitoring networks serve multiple clients (national and international) and help them to address other problems, such as climate, biodiversity and land-use management, ~~should be taken~~. Priority should be given to expanding effects-based monitoring to include additional types of ecosystems, including grasslands, heathlands, bogs and dunes. Cooperation with other networks such as the Long-Term Ecosystem Research Network and LifeWatch will also be important. Consideration of expanding work on an urban, hemispheric or global scale should bear in mind the consequences for modelling and monitoring, including the potential diversion of resources from core activities related to scale modelling and background monitoring.

59. Work under the Convention will also include continuing efforts to make the monitoring data gathered by all relevant International Cooperative Programmes accessible through web-based common entry points. Air quality and effects monitoring should be adapted to scientific requirements on an ongoing basis. Data from other earth observation programs such as Group on Earth Observations, Global Atmosphere Watch and Copernicus, ~~particularly earth observations~~, should also be considered.

60. Sound scientific findings are dependent on the quality and completeness of the data available. Solid emissions inventories and projections, which are crucial in setting

meaningful (effects-based) emission reduction commitments, are also important in promoting ratification and for use by the scientific community as a whole. The completeness and accuracy of emissions inventories and projections needs to be improved, particularly in Eastern Europe, the Caucasus and Central Asia. Work under the Convention and EMEP will take specific steps to improve the inventory review process, to support Parties' efforts to improve emissions reporting and further develop the methodologies that underpin emissions estimates, including for some specific pollutants. Verification needs to be strengthened, including by taking measurements and confirming that real-world emissions are accurately and consistently represented in emissions inventories. Improving the definition of black carbon for emissions reporting and ambient air and effects monitoring is a high priority. EMEP should also work closely with ~~the~~ relevant organizations in establishing current, reliable non-ECE emissions inventories for all pollutants in order to assess their transport to and from either the ECE regions. Continued efforts to make reported emissions data and projections accessible are also needed.

61. The Task Force on Health should further assess the health effects of particulate matter, giving due consideration to its components, and the health effects of NO<sub>2</sub> and long-term exposure to ground-level ozone; review and harmonize methodologies for health impact assessments; and continue to analyse and prioritize the airborne effects of heavy metals and POPs for policymaking purposes.

62. The EMEP Steering Body and the Working Group on Effects should further improve the implementation of their respective strategies for cooperation on monitoring, modelling and mapping between their centres, task forces and programmes. The presentation of modelling results should more clearly specify the scale of the assessment, e.g. continental, regional or local.

63. In light of the remaining challenges, scientific work with respect to POPs and heavy metals should continue with a focus on improving understanding of their long-term trends in emissions, transport, fate and accumulation in the environment and their adverse effects on human health and ecosystems. Informed by this work, the Working Group on Strategies and Review should hold a policy conversation on the hemispheric transport of mercury and POPs, especially PAHs from burning wood.

64. The Bureau of the Executive Body and the subsidiary bodies should continue their discussions of new options for financing activities not covered by the Protocol to the Convention on Long-range Transboundary Air Pollution on the Financing of the Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe and make recommendations to the Executive Body.

65. The Convention should continue to play a vital role in assessing the hemispheric transport of air pollution and EMEP should provide analyses 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 scale beyond the ECE region. Reports should include the most relevant available information on the relative contributions of air pollution in and outside the ECE region to air pollution in the region, including the contribution of international shipping emissions to background ozone and particulate concentrations; the contribution of fires and smoke; the potential for emissions reductions; the relative contribution of each pollutant, including precursors, to the pollution problem in the region; the impact of climate change on that contribution; and the ecosystem and health impacts of hemispheric air pollution.

66. Given that urban air quality is influenced by local, national and transboundary pollution and regional air quality by urban emissions abatement, the Task Force on Integrated Assessment Modelling should assess the health, materials and ecosystem impacts of measures taken on various geographical scales in order to identify appropriate multi-

scale abatement strategies. The impact of air pollution on a hemispheric scale should be further assessed by the Task Force on Hemispheric Transport of Air Pollution with due consideration for regional actions.

#### Enabling Sound Policy

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

68. Work under the Convention will continue to focus on the pollutants best controlled at the regional level and will consider the need for further action to address the remaining and emerging issues identified in section C, including particulate matter and its precursors, black carbon as a component of particulate matter, tropospheric ozone and its precursors, eutrophying pollution with a focus on ammonia and, where still needed, acidifying pollution. With respect to tropospheric ozone, consideration will be given to how the Convention can best add value to the treatment of ozone precursors not yet addressed (such as methane). ~~Wand, with the agreement of the Parties, work on other pollutants under the Convention could also be considered of other pollutants if the scientific evidence is sufficiently strong. For example, scientific and technical efforts to determine whether additional uPOPs should be covered by the Convention pursuant to Executive Body decision 2013/22 should continue.~~

69. The importance of an integrated approach to environmental policymaking is becoming increasingly recognized and greater efforts to examine and communicate these interactions under the Convention, and specifically under the Gothenburg Protocol, are needed. In that regard, the multi-pollutant, multi-effect approach should continue to be used and further developed through, in particular, an integrated approach to environmental policymaking in three areas:

(a) First, both science and policymaking must consider the fact that air pollution is the central link in the interaction between ozone, nitrogen, climate change and ecosystems. For example, climate change could increase ozone concentrations and ammonia emissions and trigger ecosystem response, further increasing concentrations and their effects and necessitating further reduction of ozone precursor and ammonia emissions;

(b) Second, the disruption of global and regional nitrogen cycles is one of the most important challenges for environmental policy and can only be properly addressed through an integrated approach involving agricultural, transport, energy and other policies. Air pollution abatement plays a key role in managing reactive nitrogen and preventing its effects;

(c) Lastly, while efforts to understand the rationale for an integrated approach in addressing air quality and climate change have recently expanded, actual integrated policymaking that explicitly targets multiple objectives and considers all impacts is still emerging. Interactions between air pollution and climate change mitigation measures – including the impact of climate measures on air quality and the impact of air pollution measures on climate – should be further analysed in order to identify “win-win” abatement strategies and policies that leverage synergies between measures aimed at reducing air pollutants and greenhouse gases.

70. Analyses of the economic costs of the impacts of air pollution and the cost-effectiveness of policies for controlling it are essential to the design of effective control strategies and provide a rationale for policymaking. The Task Force on Techno-Economic Issues and the Task Force on Integrated Assessment Modelling should continue to improve

their estimates of the cost of air pollution's impact on human health and ecosystems, the cost data and the cost-effectiveness of abatement measures and the costs of inaction. They should also compare additional local and regional measures with those taken at the continental level, considering the relative importance of various sources, and should analyse the cost-effectiveness of Northern Hemispheric emission reduction strategies for ozone precursors as compared with a European or North American approach aimed solely at reducing ozone damage to health and crops.

#### Communication, outreach and cooperation

71. It remains urgent to continue to better communicate the Convention's work and successes in addressing transboundary air pollution, including at the political level, and to increase awareness of the importance of addressing air pollution for health and environmental reasons and the availability of cost-effective tools for doing so. This will help to 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 and the benefits of ratifying the Convention's protocols, including the potential economic and competitiveness benefits of implementing emission reduction measures.

72. The bodies under the Convention should also enhance efforts in their communication activities to raise awareness of the compelling environmental, health and economic rationale for action on air pollution and to increase the visibility of the Convention, building on the successes of multilateral cooperation within the Convention system in dealing with increasingly complex science-policy issues. Where possible, an updated approach should include new tools and mechanisms and innovative approaches better able to reach the desired audiences – the public, environmental NGOs, policymakers and those at the political level. NGOs can play an important role by disseminating information to the public, advocating for cleaner air and promoting the adoption and implementation of air pollution abatement strategies. Where possible, the Parties should contribute to efforts to improve the effectiveness of the Convention's communications activities. In this context, NGOs can play an important role by disseminating information to the public, advocating for cleaner air and promoting the adoption and implementation of air pollution abatement strategies.

73. The Parties should promote the Batumi Action for Cleaner Air initiative wherever possible as a tool for raising awareness of the availability of solutions and inspiring national action within and outside the ECE region.

74. The significant scientific and political outreach and capacity-building under the Convention in recent years should be enhanced. It is important to build on the successful mutual outreach to and information-sharing with organizations such as UNEP, the Climate and Clean Air Coalition, the Arctic Council, the Global Methane Initiative, UNEP and other United Nations organizations, including WHO and WMO, by continuing to leverage synergies between their work and the work of the Convention. Scientific cooperation with countries outside the ECE region, including under the Task Force on Hemispheric Transport of Air Pollution, has also taken place and should be enhanced. Consideration should be given to initiating a dialogue with institutions such as the Organisation for Economic Co-operation and Development, the World Bank, the Asian Development Bank, the African Development Bank Group, the European Bank for Reconstruction and Development, the European Investment Bank and the Inter-American Development Bank.

75. Hemispheric and intercontinental transport of air pollutants, especially ozone and particulate matter, has been established as an important factor in air quality management. Hemispheric influence on air quality in the ECE region remains a challenge and transcontinental and hemispheric cooperation in reducing emissions is needed. While the

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Convention and its protocols should remain open only to ECE member countries, addressing the remaining pollution problems will require cooperation at the policy level, including with other countries and regions. The Parties have begun to seriously explore ways to promote broader geographic cooperation and to consider seriously the role of the Convention in broader geographic efforts to reduce transboundary air pollution and the potential nature and approach of such cooperation.

76. At the third ~~meeting of the~~ United Nations Environment Assembly (Nairobi, 4–6 December 2017), ~~the participants~~ Member States adopted resolution 3/8 that urges Member States to take a series of actions to reduce air pollution. It encourages them to pursue synergies and co-benefits between national clean air policies and policies in key areas that are also covered or impacted by the Gothenburg Protocol, such as transport, urbanization, climate change, energy ~~access~~, agriculture and nitrogen management, and ~~to work towards~~ ~~calls on them to pursue~~ a shared response ~~and to identify solutions to addressing~~ air pollution. The resolution ~~also~~ calls for action by UNEP ~~member States by and by~~ UNEP itself, including the development of a platform for information-sharing and cooperation among countries and organizations ~~in order to facilitate a shared response to addressing air pollution~~. It also calls for UNEP to enhance regional cooperation on air pollution in close cooperation with the Convention and other relevant ~~[initiatives] [fora or organizations] instruments~~ and stresses the need for further knowledge-sharing between ~~existing~~ regional cooperation forums, including the Convention, ~~and any future ones~~.

77. The Convention will share experience and scientific expertise, strive to play a key role in the development and operation of the platform and organize informal discussions on policy cooperation between regions.

78. Lastly, the Parties should intensify their efforts to ~~ensure the Convention is be~~ nimble in responding to emerging scientific information and policy priorities and should take into account relevant work and policy discussions within other frameworks. In considering its policy responses and priorities, it should strive to be open-minded and ambitious, ~~but also pragmatic~~, in order to reap the maximum benefits with regard to air quality and human and ecosystem health.

## E. Overarching conclusions

79. Much remains to be done in addressing transboundary air pollution ~~with~~ ~~anthat~~ impacts ~~on~~ the ECE region. The Parties will need to support the efforts to meet their current obligations, encourage additional ratifications of the three latest protocols and move forward in addressing the challenges of the twenty-first century.

80. Model simulations indicate that global cooperation in addressing air quality in the ECE region is also essential. Continued improvements to the technical and scientific basis of the Convention will maintain its leadership ~~in addressing air pollution issues~~ and position the Convention to cooperate with other organizations and regions, serving as a model for addressing air quality. This will include:

- (a) Continuing to use the best available science and to further develop the multi-pollutant, multi-effect approach;
- (b) Advancing efforts to address air pollution on a broader geographic scale;
- (c) Promoting the exchange of experience ~~with~~ ~~on~~ the effectiveness of measures taken at the national level in order to encourage mutual learning;
- (d) Striving for an integrated approach to environmental policymaking that includes ground-level ozone-nitrogen-climate-biodiversity interaction; integrated nitrogen



management, including its impact on health; the climate change co-benefits of air pollution policies and measures; and the impact of climate policies on air pollution.

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