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

Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe

Working Group on Effects

Fifth joint session
Geneva, 9–13 September 2019
Item 3 (d) of the provisional agenda
Progress in activities of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe in 2019 and future work: integrated assessment modelling

Integrated assessment modelling

Report by the Co-Chairs of the Task Force on Integrated Assessment Modelling

Summary and recommendations

The present report describes the results of the forty-eighth meeting of the Task Force on Integrated Assessment Modelling under the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (Berlin,
23 and 24 April 2019). It includes the main findings from the meeting and recommendations for future work.

During the reporting period, the Task Force carried out the activities assigned to it in the 2018–2019 workplan for implementation of the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR/140/Add.1, items 1.1.3.2, 1.1.3.3, 1.1.4.3 and 2.3.9–2.3.10) and those set out in informal document 3, entitled "Draft revised mandates for scientific task forces and centres under the Convention", submitted to the Executive Body for the Convention at its thirty-seventh session (Geneva, Switzerland, 11–14 December 2017).

In accordance with the workplan, the Task Force is requested to present an annual report on its work to the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe. The present report details the progress made by the Task Force since its previous report and provides an overview of upcoming activities through 2019.

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I. Introduction

1. The present report describes the results of the forty-eighth meeting of the Task Force on Integrated Assessment Modelling under the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (Berlin, 23 and 24 April 2019). It includes the main findings from the meeting and recommendations for future work. The full report on the meeting and its presentations is available online.[1]

2. The meeting was attended by 42 experts, representing the following Parties to the Convention: Cyprus, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom of Great Britain and Northern Ireland. Other bodies represented were the Centre for Integrated Assessment Modelling, the Task Force on Techno-economic Issues, the Task Force on Hemispheric Transport of Air Pollution, the Joint Research Centre of the European Commission, the Meteorological Synthesizing Centre-West, the Coordination Centre for Effects, the European Environment Agency, the World Meteorological Organization (WMO) Global Atmosphere Watch Urban Research Meteorology and Environment, the European Environmental Bureau, AirClim, Environmental Action Germany and the Oil Companies' European Association for Environment, Health and Safety in Refining and Distribution.

3. Mr. Rob Maas (Netherlands) and Mr. Stefan Åström (Sweden) chaired the meeting.

4. Dr. Lilian Busse, the Head of the Division for Environmental Health and Protection of Ecosystems at the German Environment Agency, welcomed the Task Force on Integrated Assessment Modelling to Berlin and opened the meeting.

II. News from other bodies

5. Mr. Maas and Mr. Åström summarized the latest developments within the Convention and other air pollution policy arenas, including the Task Force-related recommendations from the Saltsjöbaden VI workshop[2] and the long-term strategy of the Convention,[3] as well as the revised mandate of the Task Force.

6. The Saltsjöbaden VI workshop, held in Gothenburg, Sweden, in 2018, had led to four recommendations of special relevance for the Task Force. Those recommendations were: to include local population exposure in the long-term strategy of the Convention; to set up an expert panel on clean air in cities; to better align international policies with national and local policies; and to develop user-friendly guidance documents for local-level assessments of air quality, abatement options and their effects.

7. The long-term strategy of the Convention, which had been adopted in December 2018, building upon recommendations of the 2016 Scientific Assessment Report[4] and the Saltsjöbaden VI workshop, included the ambition to assess health and ecosystem impacts at the local scale and compare the effectiveness of international measures with local air pollution measures. Moreover, the long-term strategy called for the assessment of the potential benefits of global cooperation for regional and local air quality.

8. The forty-seventh Task Force meeting had proposed a revision of the Task Force mandate, which had been accepted by the Executive Body in December 2018. The revised

[1] See www.iiasa.ac.at/web/home/research/researchPrograms/air/policy/past_meetings.html.
[2] See http://saltsjobaden6.ivl.se/.
[3] Executive Body decision 2018/5: Long-term strategy for the Convention on Long-range Transboundary Air Pollution for 2020−2030 and beyond.
[4] United Nations Economic Commission for Europe (ECE), *Towards Cleaner Air: Scientific Assessment Report 2016*. Available at www.unece.org/index.php?id=42861; and ECE, *Towards Cleaner Air. Scientific Assessment Report 2016: North America.* Available at www.unece.org/index.php?id=42947.

version currently gave the Task Force the mandate to work on multi-scale and multi-objective assessment modelling aimed at analysing cost-effective policy strategies that combined international, national and local actions, and to consider the links between air quality policies and other policy processes.

9. It was expected that the amended Protocol to the 1979 Convention on Long-range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol) would enter into force in 2019, and, if so, it was likely that a process of review of the Protocol would be initiated. Such a review could require efforts by the Task Force and the Centre for Integrated Assessment Modelling, among other things, to clarify which sectors contributed to emission reductions, which measures were most effective and which cost-effective measures had not yet been taken.

III. Objectives of the meeting

10. The 2018–2019 mandate of the Task Force was to guide and review the further development and application of integrated assessment models, facilitate the exchange of experience among national integrated assessment modellers, produce the deliverables defined in the 2018–2019 workplan and suggest items for inclusion in the 2020–2021 workplan.

11. Accordingly, the purposes of the meeting were to:

(a) Assess the status of models and available scenarios;

(b) Learn from national, regional and sectoral analyses;

(c) Assess progress of the Task Force workplan items;

(d) Assess the effectiveness of global sectoral strategies, together with Task Force on Hemispheric Transport of Air Pollution experts;

(e) Propose items for inclusion in the 2020–2021 workplan.

IV. Updates on European scientific assessments

12. The Task Force took note of the presentation by Mr. Markus Amann (Centre for Integrated Assessment Modelling) on the latest research carried out for the European Commission on the assessment of different instruments to control emissions from international shipping in the Mediterranean Sea. The Sulphur Emission Control Area and the Nitrous Oxide Emission Control Area, as well as climate policies and economic growth effects, had been analysed. In general, the effectiveness of the instruments depended on scope, and doubled if the European Union and non-European Union stakeholders acted together. The Sulphur Emission Control Area and the Nitrous Oxide Emission Control Area could, by 2050, deliver reductions of fine particulate matter ($PM_{2.5}$) concentrations of up to 3 $\mu g/m^3$ in coastal areas around the Mediterranean Sea. Benefits would outweigh costs by a factor of ~7 by 2030 and of ~12 by 2050.

13. The Task Force suggested further studying the benefits of the measures in the Mediterranean Sea for adjacent seas, including the trade route towards the North Sea. Moreover, the issue of effectiveness of policy instruments regarding the retrofitting of existing ships on sea and inland waterways required attention.

14. The importance of integrated local-regional-international air quality policies was demonstrated, with examples taken from a recent study carried out for India. The results showed that local air quality standards for $PM_{2.5}$ in most Indian megacities were unattainable with local measures alone.

15. Key areas of the Greenhouse Gas – Air Pollution Interactions and Synergies model-improvements for any Gothenburg Protocol review should be the stabilization of emission inventory data for historical years, updated data for activity levels and emission projections for countries in Eastern Europe, the Caucasus and Central Asia and consensus on the contribution of transcontinental fluxes. Such a review should clarify what the remaining

distance would be from the long-term health and ecosystem objectives of the Protocol once all technical annexes had been fully implemented. The Task Force took note of the Centre for Integrated Assessment Modelling presentation on the latest International Institute for Applied Systems Analysis research for the European Commission. It was confirmed that several (~10–25 per cent) European Union countries had changed their base year emission reporting by >±10 per cent for the years 2005 and 2010 and that a few others had done so by +200 per cent and -40 per cent, particularly for $PM_{2.5}$.

16. The Task Force expressed appreciation for the European Environment Agency presentation on the 2018 follow-up to the 2013 Air Implementation Pilot project, which had focused on 10 European Union cities that had difficulty meeting air quality limit values. As a part of the follow-up, several examples of good practice had been identified. For example, in Milan, Italy, car traffic had reduced by 30 per cent and bicycle-sharing opportunities had increased in the past eight years. The follow-up also showed that local administrative capacity was one of the most important challenges and that improved local-national cooperation was crucial. In general, local measures were not easily transferable to other cities due to city heterogeneity. Health was becoming an important driver for air pollution policies. Public acceptance of air quality measures required citizen involvement, both regarding measurements and policy design.

17. The Task Force acknowledged the presentation by a representative of Ecometrics Research and Consulting on recent developments in benefit assessments, including work on the health impacts of nitrogen dioxide (NO_2) and the revised damage cost estimates. A recent research review in the United Kingdom of Great Britain and Northern Ireland (Committee on the Medical Effects of Air Pollutants) had focused on NO_2 and health, and discussion was ongoing on how to consider health impacts of NO_2 in health impact assessments. The Committee's study gave case-specific values for the response functions to be used when estimating health impacts from NO_2 emission changes; however, users should employ caution.

18. Recent damage cost estimates (i.e. the monetized damage from 1 kg of emission) had been produced in the United Kingdom of Great Britain and Northern Ireland. Revised cost estimates included the addition of a number of new health endpoints not previously considered. That breakdown showed how the "cost profile" of NO_2 was different from the corresponding profile of primary $PM_{2.5}$ emissions. The damage costs used in the United Kingdom of Great Britain and Northern Ireland did not include the damage that occurred outside the country due to its emissions. Participants reported that a number of other countries (Denmark, Finland, Sweden) were following a similar approach, which implied only a partial recognition of the "polluter pays" principle. An update by the European Environment Agency of the damage costs (from industrial emissions) was ongoing and was expected during 2020 but would include analysis of effects of each country on all other countries in the modelled domain.

V. Progress on national integrated assessments

19. The Task Force noted the presentation by Mr. Jeroen Kuenen (Netherlands) on source apportionment of $PM_{2.5}$ concentrations in Europe. The analysis focused on modelling daily PM_{10} and $PM_{2.5}$ concentrations, among others due to small-scale wood combustion, including subfractions such as elemental carbon and organic carbon, taking into account total primary particles (including condensables) in a consistent way across Europe. The work was available online in the Netherlands Organization for Applied Scientific Research Operational Pollution Apportionment Service model.[5] The model provided access to daily source apportionments per sector or per country with respect to local air quality in cities.

[5] See https://topas.tno.nl.

20. The Task Force noted that further discussion was needed on how to communicate the source apportionment for secondary particles (which could be a product of emissions from different countries and sectors).

21. The Task Force also noted the presentation by Ms. Simone Schucht (France) of a French study on control of emissions from international shipping in the Mediterranean Sea. The study looked at both the daily and the annual impacts on $PM_{2.5}$ and NO_2 concentrations of a potential Nitrous Oxide Emission Control Area and Sulphur Emission Control Area in the Mediterranean Sea. The study also included impacts on ground-level ozone. The cost-benefit analysis showed benefit-costs ratios that were slightly higher than the results of the Mediterranean study presented by the Centre for Integrated Assessment Modelling.

22. The Task Force noted the presentation by Mr. Maas (Netherlands) on ongoing work by the Netherlands on the national air quality plan. Current trends showed declining exposure to particulate matter and NO_2. The possibility to use national options to reduce exposure was different for the pollutants. Exposure to $PM_{2.5}$ in the Netherlands stood at 75 per cent due to foreign sources, whilst exposure to NO_2 concentrations stood at 50 per cent due to foreign sources. Local-scale air quality was even more influenced by non-local sources. That meant that local measures would have a small impact on average population exposure. At the national level, on average, across the entire population, 3 additional life-months per person could be gained between 2016 and 2030 if all current national and international policy measures were implemented as planned. Additional national air quality measures would add 0.5–1 month. National climate measures could contribute to some degree, but would be minimal if a strong increase in the use of biomass were to be included. Climate policies did more to reduce NO_2 than to reduce $PM_{2.5}$ concentrations. Cooperation with surrounding countries was still needed. The Netherlands could not achieve a 50 per cent improvement in air pollution-related health without international cooperation (short of a far-reaching decrease in macroeconomic activity).

23. The Task Force also took note of the presentation by Ms. Johanna Appelhans (Germany) on the German air pollution control programme. Draft results showed that challenges remained regarding the fulfilment of the 2030 emission reduction commitments for most Gothenburg protocol pollutants, except for non-methane volatile organic compounds, based on current emission projections. However, the outcome of a German Commission on Growth, Structural Change and Employment was currently being analysed and preliminary results indicated that the Commission's suggested phase-out of coal-fired power generation in Germany would have a substantial impact on emissions of sulphur dioxide (SO_2) and nitrogen oxides (NO_x) and might enable the 2030 reduction commitments of the amended National Emission Ceilings Directive[6] for SO_2, non-methane volatile organic compounds and $PM_{2.5}$ to be met without additional measures. However, the outcome of the Commission increased the risk of "regret investments" in new air pollution control (if made in coal power plants). Additional emission reduction measures would result in a substantial reduction of PM, NO_2 and ammonia (NH_3) concentrations, but could increase annual mean ozone concentrations in agglomeration areas.

24. The Task Force expressed appreciation for the presentation by Mr. Antonio Piersanti (Italy) on the development of the Italian air quality plan. Italy was on track to fulfil its emission reductions obligations for the year 2020. However, in order to fulfil the National Emission Ceilings Directive commitments for 2030, Italy needed to implement additional measures for all polluants except SO_2. Nevertheless, even those measures would not ensure that Italy was in full compliance with the European Union Air Quality Directive.[7] Italian integrated assessment modelling work was focused on selecting priority actions on the basis of sectoral source apportionment and updates of the Greehouse Gas – Air Pollution Interactions and Synergies model for Italy were planned.

[6] 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, *Official Journal of the European Union*, L 344, 2016, pp. 1–31.

[7] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, *Official Journal of the European Union*, L 152, 2008, pp. 1–44.

25. The Task Force recommended further analysis of the implications for ammonia projections of an increased use of biofuels and biogas as part of climate policy strategy. For example, in Germany, the increased growth of corn for biogas production had led to a 10 per cent rise in German ammonia emissions during a 10-year period.

26. The Task Force noted the presentation by Mr. Åström (Sweden) on the new Swedish national air quality plan and results from recent integrated assessment modelling-related studies. To meet the requirements of the National Emission Ceilings Directive, Sweden must make further efforts to reduce NH_3 and NO_x emissions by 2030. With regard to achieving further emission reductions of NH_3, increased use of bandspreading of manure, instead of broadcasting, had been identified as being the most important measure. As for the further reduction of NO_x emissions, improved flue gas cleaning in existing industrial combustion plants and the achievement of Swedish transport sector climate objectives (among other things, electrification) were considered to be of the utmost importance.

27. A recent Swedish ex-post evaluation study indicated that the requirements for SO_2 end-of-pipe technologies in the Gothenburg Protocol had been an important driver for Swedish SO_2 emission reductions between 1990 and 2012. Another study showed that the use of different climate metrics (Global Warming Potential, Global Temperature change Potential, etc.) did not affect the cost-effectiveness ranking of options to reduce emissions of short-lived climate pollutants. However, the cost-effectiveness ranking of emission control options could be sensitive to the chosen economic perspective in the analysis. There were also indications that the consideration of emission reductions from international shipping would increase the cost-effectiveness of reducing damage to health and ecosystems.

28. The Task Force expressed appreciation for the presentation by Ms. Helen ApSimon (United Kingdom) on the effects of national and international shipping on the air quality of the United Kingdom of Great Britain and Northern Ireland. Ex-post analysis confirmed the significant role of European agreements in the improvement of air quality in the country. The study showed that, within the near future, NO_x emissions from international shipping were likely to be 1.5 times higher than land-based anthropogenic NO_x emissions, implying a significant contribution to population exposure. In the United Kingdom of Great Britain and Northern Ireland, work was ongoing to assess risk maps for ecosystem effects, with a focus on areas of special interest and Natura 2000 areas. Current plans were related to future road transport emissions (for example, electric vehicles and non-exhaust emissions) and embedded modelling down to the street scale, as well as locally specific modelling of agriculture and ecosystems.

29. The Task Force also expressed appreciation for the presentation by Mr. Andrew Kelly (Ireland), who showcased recent work on the development of the National Air Pollution Control Plan, which focused mainly on NH_3 challenges and which was part of a process that reconfirmed that climate and air pollution policies and scenarios needed to be better integrated. He also talked about the development of the National Clean Air Strategy,[8] which contained a large number of ambient air pollution measures, as well as actions to replace fossil fuels with cleaner alternatives. Outcomes from recent research on the conflicts between air pollution and climate change policies in Ireland were also presented. The Conflicts with Air project[9] delivered high-resolution air pollution concentration maps for Ireland, and explored a plausible problematic air pollution scenario, as well as a solution scenario that identified actions to make air and climate policies more robust.

30. The Task Force took note of the presentation by Mr. Stefan Reis (United Kingdom) on an ex-post evaluation of the drivers of emission reduction and reduced health damage over the past 40 years. The key messages were that mortality attributable to NO_x and $PM_{2.5}$-exposure had decreased by some 50 per cent, while mortality attributable to ozone had increased for the period 1970–2010. However, between 1990 and 2010, ozone-attributable

[8] See www.dccae.gov.ie/en-ie/environment/topics/air-quality/national-clean-air-strategy/Pages/default.aspx.

[9] See http://conair.envecon.eu/.

mortality had decreased. General conclusions from the study were that it was important to convey positive messages and to estimate past effects of emission control policies. Future work would include a higher spatial-temporal resolution, as well as calculations on the morbidity effects of air pollution.

VI. Progress of the Task Force workplan

A. Progress on Greenhouse Gas – Air Pollution Interactions and Synergies control costs and assessment of the costs of inaction (items 2.3.9. and 2.3.10 of the workplan)

31. Mr. Åström, speaking in his capacity as Co-Chair, presented the activities related to the envisaged report on the costs of inaction. Scoping and coordination efforts had been made together with the Task Force on Techno-economic Issues, and all Parties with relevant information or activities were invited to provide input.

32. With respect to the update of Greenhouse Gas – Air Pollution Interactions and Synergies control cost data, the Task Force on Techno-economic Issues continued to regularly update cost data and was currently focusing on the costs to reduce emissions from the cement industry, which would be available for presentation by the end of 2019.

33. The Task Force noted that several national assessment studies ignored transboundary health and ecosystem impacts. Moreover, national cost-benefit guidelines often contained values on the damage costs per emitted kg that omitted the damage abroad. That practice was not in keeping with the spirit of the Convention and the principles of environmental economic theory, which implied that all external effects should be included when assessing the costs and benefits of projects or policy measures. Looking only at local or national damage costs would mean that less priority would be given to policy measures to abate transboundary air pollution. If all Parties to the Convention were to use such damage cost estimates as the basis for policy, they would also receive fewer benefits from measures in other countries and the total cost-effectiveness of air pollution policy would be reduced.

B. Progress on the ammonia assessment report (item 1.1.3.2)

34. Mr. Maas, speaking in his capacity as Co-Chair, presented the activities related to the ammonia assessment report. A first draft was expected to be circulated during the summer and interested expert from several bodies under the Convention would be invited to react and make contributions thereto.

C. Progress on the expert panel on clean air in cities (item 1.1.3.3)

35. Mr. Maas introduced the current activities under the workplan. In November 2018, a scoping session involving several networks had identified the potential role of an expert panel on clean air in cities. The Executive Body had approved its mandate in December 2018.
The Parties to the Convention could still nominate experts or policymakers for the panel, whose first formal workshop would be organized in autumn 2019.

36. The Task Force expressed appreciation for the presentation by Mr. Mike Holland (United Kingdom) on efforts to assess the cost-effectiveness of local air quality measures. The lack of (ex-post) data had proved to be a serious limitation. Multiple rationales for policies, as well as other policy measures (acting as confounders), affected the cost-effectiveness of local air quality measures. Regional variability in costs of measures, as well as analytical biases, complicated the development of a harmonized database, while at the same time greatly increasing the importance of such work in the interests of providing guidance and learning from experience.

37. The Task Force noted that a focus on achieving air quality limit values, or on achieving maximum improvement of human health, would lead to different policy measures and different outcomes in terms of the costs per life year gained. Both approaches had merits and together they could show the trade-off between effectiveness and equity of air pollution policy. Therefore, the Task Force recommended also looking at highly exposed groups when designing a policy based on maximizing health improvement by reducing the average exposure of the population in a city, as well as assessing the health benefits (in terms of life years gained) from measures that were focused on reducing exposure in local "hot spots".

38. The Task Force acknowledged the presentation by Mr. Martin Lutz (Germany) on managing air quality at the city level. Source appointment analysis showed that the local share of the contribution to Berlin's $PM_{2.5}$ concentration levels was decreasing over time, and that currently 60 per cent of the problem was from non-local sources. For NO_2, the situation was the opposite, with a high contribution from local sources. Analysis of the local ban on cars with diesel engines showed that some reallocation of traffic could be expected, with an increase in air pollution in other streets. No net positive health effects were to be expected. City-wide measures would be more effective, but the key problems were the conflicting interests of city and national governments with respect to, for example, the implementation of low-emission zones. The focus on air quality limit values had led to a lack of assessments of the health impacts of local policy proposals. The city was looking for indicators that better represented the health improvements to be achieved.

39. The Task Force expressed appreciation for the presentation by Mr. Ranjeet Sokhi (WMO) on understanding and forecasting local air quality on the basis of linked global and regional atmospheric models, as applied in the Global Atmosphere Watch Urban Research Meteorological and Environment project. Results from source appointment confirmed the importance of non-local sources for local air quality. Other results showed the combined effect of climate change and air pollutant emission changes on ozone and $PM_{2.5}$ concentration levels. The project illustrated the importance of linking geographical scales for air quality projections, including proper accounting of local circumstances.

D. Progress on global sectoral strategies (item 1.1.4.3)

40. The Task Force took note of the Task Force on Hemispheric Transport of Air Pollution research presented by Mr. Jan Eiof Jonson (Meteorological Synthesizing Centre-West).
The results showed that different ozone metrics showed different regional shares to total ozone concentration in a specific region. Regional shares were higher for the sum of ozone means over 35 parts per billion (ppb)[10] and phytotoxic ozone dose indicators, and the rest of the world was more important for annual mean ozone. The results also showed that international shipping contributed substantially to $PM_{2.5}$ and ozone concentrations in European countries, but with a large variation dependent on sea region and country. Malta was an outlier, with shipping contributing some 60 per cent of total $PM_{2.5}$ concentrations.

41. The Task Force acknowledged the information about European Union action on black carbon in the Arctic provided by Mr. Åström. The action was a three-year effort to: improve knowledge of black carbon emissions; increase awareness and share knowledge of the problem; provide advice, documents and scenario analysis; and develop a road map for international cooperation on black carbon. The aim of the action was to provide input to, and collaborate with, the Convention working bodies. It was foreseen that the future work would be coordinated with the Convention and would provide input to Working Group on Strategies and Review deliberations and joint outreach and communication efforts.

[10] The sum of ozone means over 35 parts per billion (ppb) is the indicator for health impact assessment recommended by the World Health Organization. It is defined as the yearly sum of the daily maximum of 8-hour running average over 35 ppb. For each day, the maximum of the running 8-hours average for ozone is selected and the values over 35 ppb are summed over the whole year.

42. The Task Force noted the presentation by Ms. Rita Van Dingenen (Joint Research Centre) on trends in global methane emissions and impacts on ozone concentrations. The observed global methane emissions had been increasing, especially since 2002, but they had decreased at the European Union-28 level. Ozone formation was largely independent from the regional location of methane emissions, but local peaks depended on local emissions of NO_x and non-methane volatile organic compounds. On the basis of the scenarios analysed, there was reason to expect a further increase in background ozone concentrations should no additional action be taken on methane emissions.

43. The Task Force took note of the presentation by Mr. Toon Vandyck (Joint Research Centre) on air pollution co-benefits of climate policies. The 2°C target scenario would imply more co-benefits for air pollution than the nationally determined contributions scenario.
Co-benefits entailed reduced health impacts from $PM_{2.5}$ and ozone exposure.

VII. Preparation of the 2020–2021 workplan and for the review of the amended Gothenburg Protocol

44. Mr. Maas presented experiences from a report on the review of the Gothenburg Protocol in 2007.[11] Such a review might require efforts by the Task Force and the Centre for Integrated Assessment Modelling, among other things, to clarify which sectors contributed to emission reductions, which measures were most effective and which cost-effective measures had not yet been taken. An important question would be to what extent full implementation of the technical annexes would be able to achieve the long-term objectives of the Protocol regarding the protection of health and ecosystems.

45. The Task Force participants raised items that could be included in a review of the amended Gothenburg Protocol. Harmonization and stabilization of the emission database would be an important precondition. Attention should be paid to measures to reduce black carbon, methane, ammonia and shipping, as well as to the linkages with climate change and the impacts on morbidity and biodiversity. It would also be good to show the benefits of international coordinated action for the various stakeholders.

46. A Task Force on Reactive Nitrogen workshop was expected to be held on 30 September and 1 October 2019, back-to-back with a meeting of the International Nitrogen Management System on 2 October 2019, with both events taking place in Brussels. The workshop and the meeting could provide a suitable opportunity for a discussion on the envisaged ammonia assessment report.

47. The forty-ninth meeting of the Task Force on Integrated Assessment Modelling would take place in Edinburgh, United Kingdom of Great Britain and Northern Ireland, in the week beginning Monday, 20 April 2020.

VIII. General conclusions and recommendations

48. The Task Force noted that the Greenhouse Gas – Air Pollution Interactions and Synergies model was ready to be used for a review of the amended Gothenburg Protocol and its technical annexes. However, officially submitted emission data for 2005 and beyond were still being adjusted by the Parties, and consistency in emission reporting among Parties could not yet be fully guaranteed. In particular, equal or compatible treatment of condensables (particulates from, among other things, residential wood burning that were formed due to the cooling of emitted gasses) required the attention of the Parties. Potential abatement measures for shipping in European seas had been added to the Greenhouse Gas – Air Pollution Interactions and Synergies model.

[11] Review of the Gothenburg Protocol, Report of the Task Force on Integrated Assessment Modelling and the Centre for Integrated Assessment Modelling, report 1/2007. Available at www.pbl.nl/sites/default/files/cms/publicaties/500090002.pdf.

49. Several participants presented assessments in support of the development of local and national air quality plans. Most of the assessments tended to look only at domestic health and ecosystem benefits and did not include transboundary effects (while often assuming that they would profit from further actions in surrounding regions or countries). The Task Force recommended that assessment of the cost-effectiveness and benefits of local and national policies should include transboundary impacts on health and ecosystems, as transboundary fluxes still constituted a major part of air pollution. Moreover, the damage cost data used in cost-benefit analysis of investment projects or policy measures should include transboundary damage.

50. Several national experts presented ex-post assessments of air quality policies, showing that internationally agreed environmental legislation had had a significant influence on the improvement of air quality in their countries. The Task Force recommended other Parties to carry out such ex-post assessments, as they could be an important input for any upcoming review of the amended Gothenburg Protocol and in showing the success and benefits of international cooperation.

51. Even in major cities, such as Berlin and London, there was a large regional and transboundary contribution to the concentration of particulate matter at traffic stations. The Task Force emphasized that long-range transport of fine particulate matter, nitrogen compounds and ozone contributed significantly to local air quality and related impacts on health and ecosystems. The meeting called for the development of a multi-scale air quality management strategy. Integrated assessment modelling could support that aim and could also reveal the benefits of coordinated action. The Task Force reconfirmed that it would establish an expert panel on clean air in cities that could provide the necessary input to air quality managers at all levels of governance.

52. The Task Force noted that the focus on local measures to comply with air quality limit values along busy roads sometimes led to measures that were not cost-effective, or that were even counterproductive from a health perspective. The Task Force recommended assessing the health impacts of such measures and comparing the costs per life year gained with those of measures that aimed to reduce the average exposure of the population in a city or neighbourhood, in order to inform policymakers about the price of achieving greater equality in population exposure.

53. New studies reconfirmed the potential co-benefits for air quality of reaching the 2°C climate target. The Task Force noted that those co-benefits would not be sufficient to achieve the long-term objectives of the Convention. Remaining nitrogen problems would require additional action. An integrated design of climate and air quality policy was needed to deal with policy trade-offs: fuel switch for climate reasons should not worsen (local or regional) air quality, and air pollution strategies should aim to be at least climate neutral.

Annex

Work plan items 2018–2019

Item	*Activity*	*Deliverable*	*Who*
1.1.3.2	Ammonia: Improve understanding of the cost effectiveness of local versus regional agricultural emission control for the protection of human health and ecosystems in Europe	Presentation of Task Force on Integrated Assessment Modelling at Task Force on Measurements and Modelling meeting in 2018 Synthesis report focusing on agriculture in 2019	Task Force on Integrated Assessment Modelling with support from Task Force on Measurements and Modelling and countries experts (France, Netherlands, among others)
1.1.3.3	Local assessment modelling of measures to reduce population exposure	Workshop in 2018	Task Force on Integrated Assessment Modelling with support from local and national experts
1.1.4.3	Sectoral opportunities to mitigate intercontinental transport	Workshop in 2018 and synthesis report in 2019	Task Force on Hemispheric Transport of Air Pollution with support from Task Force on Integrated Assessment Modelling/Centre for Integrated Assessment Modelling
2.3.4/2.3.9	Collect and provide data for inclusion in the Greenhouse Gas – Air Pollution Interactions and Synergies model, in cooperation with the Centre for Integrated Assessment Modelling and other institutions and organizations. Review of the control costs currently used with a view to improving, on an ongoing basis, the cost-effectiveness analyses produced by the Greenhouse Gas – Air Pollution Interactions and Synergies model	Updated data for selected sectors provided to the Centre for Integrated Assessment Modelling for inclusion in Greenhouse Gas – Air Pollution Interactions and Synergies	Task Force on Techno-economic Issues, with support from national experts and the Centre for Integrated Assessment Modelling
2.3.10	Assessment of the cost of inaction		Task Force on Techno-economic Issues with support from Task Force on Integrated Assessment Modelling