Economic and Social Council

Distr.: General
1 July 2022

Original: English

Economic Commission for Europe

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

Eighth joint session
Geneva, 12–16 September 2022
Item 10 (c) 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 2022 and future work: integrated assessment modelling

Integrated assessment modelling

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

Summary

The present report describes the results of the fifty-first 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 (online, 6–8 April 2022).

Based on presentations of scenarios during the meeting, the Task Force concluded that most of the questions raised by the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol) review group[a][b] could be answered, though in some cases only in a preliminary fashion.

The Task Force concluded that current emission reduction obligations would be insufficient to meet long-term targets of the Gothenburg Protocol to protect health and ecosystems in 2030 or 2050. However, there was scope for more improvement of air quality in the United Nations Economic Commission for Europe (ECE) region other than through the emission reduction obligations contained in the amended Gothenburg Protocol. Changes in the energy and agricultural systems played an important role in future emission reductions. It was also suggested that more attention should be paid to the spatial distribution and further reduction of nitrogen oxides (NO_x) emissions from shipping.

The Task Force also:

(a) Recommended making country data available to national experts for further scrutiny and analysis of national abatement options;

(b) Also recommended, in view of the current uncertainties on future developments in energy and agriculture, further work on sensitivity analysis;

(c) Concluded that sensitivity analysis of the health impacts would be recommendable to increase the robustness of policy advice based on model assessments;

(d) Also concluded that a preliminary database of consistent emission factors including condensable particulate matter (PM) and updated fuelwood use was available. Using that database would increase PM exposure in countries that only reported filterable PM emissions. Further analysis of the implications in relation to emission reduction obligations would have to follow;

(e) Further concluded that (in addition to NO_x/non-methane volatile organic compounds control within the ECE region) global methane emission reduction was needed to reduce ground-level ozone in the ECE region.

[a] The Gothenburg Protocol review group is chaired by Ms. Kimber Scavo (United States of America) and was established by the Working Group on Strategies and Review.
[b] See ECE/EB.AIR/2020/3–ECE/EB.AIR/WG.5/2020/3.

I. Introduction

1. This report describes the results of the fifty-first 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 (EMEP) (online, 6–8 April 2022). The presentations made and the reports presented during the meeting are available online.[1]

2. One hundred and forty-four experts registered, and at most ninety-five participated simultaneously, representing the following Parties to the Convention: Austria, Belarus, Belgium, Canada, Croatia, Cyprus, Czechia, Denmark, Estonia, European Union, Finland, France, Georgia, Germany, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Russian Federation, Serbia, Spain, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland and United States of America. Other bodies of the Convention represented were: the EMEP Centre for Integrated Assessment Modelling (CIAM), the Meteorological Synthesizing Centre-West (MSC-W), the Task Force on Techno-economic Issues (TFTEI), the Task Force on Hemispheric Transport of Air Pollution, the Task Force on Emission Inventories and Projections, the Task Force on Reactive Nitrogen, the World Health Organization (WHO)/Executive Body Joint Task Force on the Health Aspects of Air Pollution and the International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops. In addition, a representative of the Republic of Korea participated and the following organizations were represented: the Arctic Monitoring and Assessment Programme, the International Institute for Applied Systems Analysis, the Joint Research Centre of the European Commission, the Netherlands Organization for Applied Scientific Research, the World Meteorological Organization Global Atmospheric Watch Urban Research Meteorology and Environment project, the European Environment Bureau, the World Resource Institute, the International Cryosphere Climate Initiative, 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.

II. Objectives of the meeting

4. Mr. Maas and Mr. Åström summarized the recent activities under the Task Force on Integrated Assessment Modelling and defined the purposes of its fifty-first meeting, i.e., to: assess the current status of integrated assessment models and their projections: learn from national and local assessments: and prepare input for the review of the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol) (see annex I below for current workplan of the Task Force for 2022–2023).

III. Review of the Gothenburg Protocol

5. The Task Force took note of the presentation by Mr. Tiziano Pignatelli and Ms. Nadine Allemand (TFTEI) on their work supporting the review of the technical annexes to the amended Gothenburg Protocol and its associated guidance documents. Amongst other updates, TFTEI observed that the availability of emission factors was informative to a potential technical annex on small (<50 kilowatt rated thermal input (kWth)) combustion sources. The inclusion of condensables in the proposed limit values in the technical annexes, was considered premature, due to the lack of sufficient measurement data.

6. The Task Force took note of the ongoing Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model scenario development work within CIAM. Mr. Zbigniew Klimont (CIAM) reported on progress in development and implementation of emission scenarios and their preliminary impact assessment, in response to the questions for the Gothenburg Protocol review. The current legislation scenario ("CLE") indicated continued reductions of air pollutant emissions for all Parties, with the exception of ammonia (NH_3), emissions of which were estimated to decline only slightly or to continue increasing in the next decades. That had implications for the long-term objectives of the Gothenburg

[1] See www.iiasa.ac.at/web/home/research/researchPrograms/air/policy/past_meetings.html

Protocol, including the widespread exceedance of critical loads for eutrophication and no alignment with the WHO global air quality guidelines for fine particulate matter ($PM_{2.5}$) limit values for the majority of the population in the region. Additional CIAM scenarios (maximum feasible reductions ("MFR") and "Low") identified further mitigation potential, varying across the Parties, which would make it possible to significantly increase the level of ecosystem protection and reduce exposure to $PM_{2.5}$. The analysis of urban pollution levels and contributing sources in the Western Balkans and the countries of Eastern Europe, the Caucasus and Central Asia (EECCA) showed that effective solutions would need to include local and regional policies addressing multiple source sectors.

7. The "CLE" and "MFR" scenarios included current energy and climate policies (with significantly more ambitions in the European Union compared to other regions). In addition, a "Low" scenario had been developed that also included an ambitious climate policy, compatible with Paris Agreement targets, for all regions and a significant transformation in the agricultural sector. That led to a significant reduction in food waste and livestock numbers, especially cattle and pigs, resulting in additional mitigation of NH_3 and methane, i.e. an additional 20–40 per cent reduction compared to "MFR". The number of inhabitants of the ECE region, excluding North America, experiencing annual average $PM_{2.5}$ concentrations above the new WHO guideline (5 micrograms per cubic meter ($\mu g/m^3$)) could decrease from 590 million in the 2050 baseline to 380 million in the "MFR" scenario, and to around 300 million in the 'Low' scenario. Preliminary estimates of the exceedance of critical loads of acidification in the European Union showed a reduction from more than 2 per cent of the nature area in the "CLE" scenario for 2050 to 1 per cent with "MFR" and below 1 per cent in the "Low" scenario. Exceedance of critical loads for eutrophication remained a challenge across large parts of the ecosystems, declining from 65 per cent in "CLE" to 50 per cent in "MFR" in 2050; even in the "Low" scenario, 30 per cent of the nature area remained unprotected in the European Union.

8. The Task Force concluded that there was more scope for improvement of air quality in the United Nations Economic Commission for Europe (ECE) region than with the emission reduction obligations in the amended Gothenburg Protocol. The Task Force recommended making country data available to national experts for further scrutiny and analysis of national abatement options. It was also suggested that more attention should be paid to the spatial distribution and further reduction of nitrogen oxides (NO_x) emissions from shipping. In view of current uncertainties regarding future developments in energy and agriculture, the Task Force also recommended carrying out further work on sensitivity analysis.

9. Mr. David Simpson (MSC-W) introduced the discussion on the condensable fraction of PM, with a short explanation of the issue and its importance in better estimating exposure of humans to $PM_{2.5}$.

10. The Task Force took note of the presentation by Mr. Jeroen Kuenen (Netherlands Organization for Applied Scientific Research), who gave a detailed overview of developments regarding the Ref2 emission inventory, a consistent set of emissions of condensables from residential wood combustion in Europe. The current version of Ref2 also included updates of activity data, installed technology, as well as emission factors for the most relevant emission sources. Work was still ongoing, and results were preliminary, but the current conclusions were that the emission factors found in literature were still variable, and that assumptions regarding "real life" combustion behaviour would have a significant effect on emissions. Comparison with country data showed a diverse picture, relating to differences in activity data as well as emission factors used. Real life use of wood stoves formed a significant source of uncertainty. Although progress had been made, more research was needed.

11. The Task Force took note of the presentation by Mr. Klimont (CIAM), who reported on progress in implementation of the condensable PM fraction in the GAINS model. Compared to the current GAINS model estimates of $PM_{2.5}$, the preliminary assessment of the impact of including condensable PM (using the draft "typical" emission factors developed by the Netherlands Organization for Applied Scientific Research/Mr. Kuenen) indicated small to moderate impact on total regional $PM_{2.5}$, but high impact on emissions of some countries, notably those reporting only emission of filterable PM. CIAM also stressed the

importance of simultaneous improvement and harmonization of data on fuelwood use, the structure of combustion installations in the residential sector, and spatial distribution of emissions.

12. The Task Force took note of the presentation by Mr. Simpson (MSC-W) on the use of Ref2 data as input to EMEP emission dispersion modelling. With the EMEP model, three types of data sets had been calculated, covering the uncertainty margins in real life emission factors. He illustrated the potential effect on modelled atmospheric concentrations of $PM_{2.5}$ of including condensables. Calculations based on different Ref2 emission factors were promising, but the model still led to concentrations that were lower than the measurements, and none of the modelled concentration trends were as steep as the trends shown by monitoring stations. Probably other assumptions were needed about the volatility of condensables. Also, further scrutiny of the data on actual residential small-scale combustion installations and their real life use was needed.

13. The Task Force concluded that a preliminary database of consistent emission factors, including condensable PM and updated fuelwood use, was available. Using that database would increase PM exposure in countries that only reported filterable PM emissions. Further analysis of the implications in relation to emission reduction obligations would have to follow.

14. The Task Force took note of the presentation by Mr. Claudio Belis (Joint Research Centre of the European Commission), who showed scenario calculations on the health impacts of $PM_{2.5}$ and ozone exposure in the ECE region, based on global emission developments. The results confirmed the importance of non-ECE emissions of methane for the formation of ozone levels in the ECE region. The emission reductions of ozone precursors within the ECE region as foreseen in the baseline scenario were counteracted by increased methane emissions in the rest of world. The possibility of the ECE region reducing ozone damages on its own was lessening. For the Western Balkans region, the results showed significant improvements within the region and exported therefrom if Western Balkans were to implement ambitious climate and air pollution policies.

15. The Task Force concluded that (in addition to NO_x/non-methane volatile organic compounds control within the ECE region) global methane emission reduction was needed to reduce ground-level ozone in the ECE region.

16. The Task Force took note of the presentation by Mr. Roman Perez Velasco (WHO), who gave an overview of the 2021 WHO global air quality guidelines. There had been numerous updates on air quality guideline values for instance, the recommended annual average $PM_{2.5}$ concentrations in ambient air was reduced from 10 µg/m^3 to 5 µg/m^3 and the nitrogen dioxide (NO_2) guideline level was reduced from 40 µg/m^3 to 10 µg/m^3. The evidence base remained too small to quantify health impacts below those levels, although they could not be excluded. Also, different risk ratios for specific types of particles (e.g., for organic and inorganic aerosols) could not yet be quantified.

17. The Task Force concluded that sensitivity analysis of health impacts would be recommendable to increase the robustness of policy advice based on model assessments.

18. The Task Force took note of the presentation by Mr. Guus Velders (Netherlands) on developments within the Expert Panel on Clean Air in Cities (EPCAC). The Task Force learned about the recent results of the third EPCAC meeting (online, 29 November 2021) (see annex II below). Focus areas included: methods for modelling the source apportionment of local concentrations; experiences with multilevel policymaking; modelling and monitoring requirements for multiscale governance; and lessons drawn from the coronavirus disease (COVID-19) lockdown measures. The fourth EPCAC meeting would be organized in autumn 2022.

19. The Task Force took note of the presentation by Mr. Bruce Denby (Norwegian Meteorological Institute/MSC-W) on the development of the urban EMEP model and its application in support of the revision of the European Union Ambient Air Quality Directive[2] and the review of the Gothenburg Protocol. The model showed a good fit with local

[2] 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.

measurements. The baseline scenario for 2050 showed that, while in the European Union around 50 per cent of the population would be exposed to levels above the WHO guideline level for $PM_{2.5}$, 85 per cent of the population of the Western Balkans and more than 90 per cent of the population of the EECCA region would be exposed to levels higher than the WHO guideline.

20. The Task Force took note of the presentation by Mr. Gregor Kiesewetter (International Institute for Applied Systems Analysis/CIAM) on recent developments in modelling contributions to city-level pollution with the GAINS model. That was done in the context of the general update of atmospheric transfer coefficients and extension of the domain in GAINS. For around 300 cities (including 175 non-European Union cities), preliminary results for sector- and source-specific contributions to ambient $PM_{2.5}$ had been derived. For the Western Balkans cities, the significant contribution of local residential heating and of remote (often transboundary) power plants was shown. Current legislation would improve the situation, but high concentrations (of sometimes more than 20 $\mu g/m^3$ $PM_{2.5}$) were expected to remain.

21. The Task Force took note of the presentation by Ms. Rita van Dingenen (Joint Research Centre of the European Commission) on recent work on nitrogen pollution, air quality and health. A study had found that NH_3 abatement in most regions of the world had a higher benefit/cost ratio than NO_x abatement. A study on long-term NH_3 emission trends consistent with the Intergovernmental Panel on Climate Change Shared Socioeconomic Pathways-Representative Concentration Pathways scenario narratives used in climate research showed a large NH_3 emission reduction potential remaining in several of the above-mentioned scenarios, with corresponding improvements in $PM_{2.5}$ exposure in Eastern Asia, Europe and North America.

22. The Task Force concluded that most of the questions of the Gothenburg Protocol review group could be answered, though in some cases only preliminarily.

IV. Other elements of the Task Force workplan 2022–2023

23. The Task Force noted the presentation by Mr. Åström on current work supporting the development of a guidance document on non-technical and structural measures, to be finalized in 2023. Several participants expressed their interest in contributing to an inventory of good practices to stimulate behavioural change.

24. The Task Force took note of the presentation by Ms. Alison Davies (Task Force on International Cooperation on Air Pollution (TFICAP)). The first in-person meeting of TFICAP was planned for October 2022 (more information to follow). The Global Forum for International Cooperation on Air Pollution would meet in Gothenburg, Sweden, on 16 March 2023, back-to-back with the Saltsjöbaden VII workshop. Several participants expressed an interest in further cooperation with TFICAP.

25. The Task Force on Integrated Assessment Modelling took note on the overview by Mr. Åström of the Task Force 2022–2023 workplan items and their status, as well as current thinking on the update of the integrated assessment modelling/economic research strategy as part of the updated strategy for EMEP and the Working Group on Effects for 2020–2030 and beyond, in line with the Long-term strategy for the Convention (Executive Body decision 2018/5).[3] Given that the workplan period had just started, none of the items had yet been finalized. The Task Force meeting participants were invited to brief the Co-Chairs on their activities in relation to the workplan and their suggestions for research strategies for the coming years.

V. Other results of assessment modelling

26. The Task Force took note of the presentation by Mr. Andrew Kelly (EnvCon, Ireland) on effects on emissions from early introduction of electric vehicles and on effects on

[3] Available at https://unece.org/decisions.

emissions from work-from-anywhere practices. The results showed that early introduction of electric vehicles would have significant effects on cumulative carbon dioxide (CO_2) emissions by 2030. Also, work-from-anywhere would have air quality effects, although not major, and it was important to recognize that, at least in Ireland, commuting only represented some 25 per cent of total personal vehicle transport demand.

27. The Task Force also took note of the presentation by Mr. Carlo Trozzi (Techne Consulting, Rome) on the regional air quality plan of the Campania Region in Italy. The region currently often had PM_{10} and ozone concentrations higher than air quality limit values, which required the development of an air quality plan. Based on emission inventories, air quality modelling and emission and emission abatement scenarios, future emissions and concentrations had been analysed. The strategic environmental assessment had been completed and the plan adopted by the Regional Council.

28. The Task Force further took note of the presentation by Mr. Stefan Reis (Centre for Ecology & Hydrology, United Kingdom of Great Britain and Northern Ireland) of the Assessing Mitigation Pathways to Realize Public Health Benefits of Air Pollutant Emission Reductions from Agriculture project.[4] Through a range of agricultural management and dietary scenarios – developed with stakeholder engagement – the analysis included the impacts of NH_3 emission changes on $PM_{2.5}$ concentrations, population exposure, costs and benefits due to reduced air pollution, and changed diets.

29. The Task Force took note of the presentation by Mr. Paul Ruyssenaars (National Institute for Public Health and the Environment of the Netherlands) on the possibility for the Netherlands to comply with the 2021 WHO air quality guidelines or interim targets. For NO_2, the scenario calculations showed promising results for 2030, but for $PM_{2.5}$ the situation would be more difficult. The WHO interim target 4 was within reach by 2030. Analysis of more options was ongoing to see if climate policies and nitrogen policies could help the Netherlands to achieve the air quality guidelines.

30. The Task Force also took note of the presentation by Mr. Mark Barrett (University College London Energy Institute, United Kingdom of Great Britain and Northern Ireland) on a zero-greenhouse gas emission scenario for the United Kingdom of Great Britain and Northern Ireland. Even for the islands constituting that country, extended electricity grids to continental Europe were expected to be more cost efficient than a storage solution. Also interesting was the seasonal shift in energy demand for households from heating demands in winter to cooling demands in summer.

31. The Task Force further took note of the work by Mr. Matteo Paolo Costa (RSE – Research on Energy Systems, Italy) on developments regarding a new air quality integrated assessment model for Italy. The predicted effect of a reduction in road traffic emissions had been compared to a brute force chemical transport model simulation model. Relative biases appeared over port cities, suggesting that the simplified model lacked accuracy in reproducing the large NO_x emissions released in coastal regions and ports. The Task Force concluded that the spatial distribution of shipping emissions required further attention and that further mitigation options for shipping existed.

32. The Task Force took note of the United Kingdom Integrated Assessment Modelling of a range of scenarios up to 2050 presented by Ms. Helen ApSimon (Imperial College London, United Kingdom), which had been used to inform the setting of targets for reducing $PM_{2.5}$ in England both to reduce population exposure and to set an upper limit on concentrations. Scenarios modelled incorporated electrification of road transport and covered different levels of ambition for abatement and effects of “net zero” energy projections, plus sensitivity studies to various uncertainties (e.g., with respect to domestic wood burning). Targets had been produced for public consultation, such as a 35 per cent reduction in population exposure and a limit value of 10 $\mu g/m^3$, both to be achieved by 2040. The monetized benefits were substantial, and there was convergence between average exposure in more deprived and less deprived areas.

33. The Task Force also took note of the presentation by Mr. José-Luis Santiago (CIEMAT, Research Centre for Energy, Environment and Technology, Spain) on multiscale

[4] See https://amphora-project.org.uk/.

modelling for analysis of measures to reduce NO_2 concentrations. Based on the Spanish National Air Pollution Control Programme, the modelling compared the year 2016 situation with future years. In 2030, for larger regions, there was no expected exceedance of annual average NO_2 concentrations, nor was there for 10*10 km regions. However, to ensure compliance, the modelling of the same scenarios had been carried out at street-level resolution to confirm the coarser resolution results. The results for the three street-level sites modelled showed that, for two of the three cases, hot spots (4 per cent and 12 per cent of the area) should be experiencing NO_2 concentrations above 40 $\mu g/m^3$. However, on average, each area analysed should have annual concentrations below 40 $\mu g/m^3$.

Annex I

Workplan items 2022–2023

Approved at the forty-first session of the Executive Body (see ECE/EB.AIR/148/Add.1)

Workplan item	*Activity*	*Outcome*	*Lead body(ies)*	*Resources*
1.1.1.27	Consolidate existing evidence on health outcomes of exposure to air pollution	A report on methods for health risk/impact assessment of air pollution and cost-benefit analysis (update to HRAPIE project)	Task Force on Health in collaboration with other groups, for example, TFIAM	Expected to be covered by recommended contribution; further funding needed
		An overview on air pollution and COVID-19 (optional, pending resources)	Task Force on Health	
1.1.3.1	Scenario assessment relevant for the Gothenburg Protocol review and potential revision using multiscale GAINS and EMEP/uEMEP and including an extension of the GAINS domain (EECCA/Western Balkans/Türkiye)	Data and scenario analyses (2022−2023)	CIAM, TFIAM and MSC-W	Covered by the EMEP budget
1.1.3.2	Scenario development for the (potential) revision of the Gothenburg Protocol, including cost-effectiveness analysis of specific measures and assessment of the implication of improved modelling, among others, inclusion of condensables and marine deposition targets	Scenario analyses (2023)	TFIAM and CIAM	Covered by the EMEP budget

Workplan item	*Activity*	*Outcome*	*Lead body(ies)*	*Resources*
1.1.3.3	Assessing observed trends in air pollution at the various scales Linkages between global and regional air pollution	Contribution to the review of the Gothenburg Protocol (2022)	TFMM, TFHTAP, TFIAM and MSC-W	Covered by the EMEP budget
1.1.3.5	Perform an evaluation of the impact of potential methane mitigation measures on regional ozone	Report and workshop organized in 2023	TFMM, TFHTAP, MSC-W, TFIAM and CIAM	Covered by the EMEP budget
1.1.4.1	EPCAC activities	Activity report (2022) Two annual meetings of EPCAC (2022 and 2023)	TFIAM with nominated experts	Covered by in-kind contributions from participating countries
1.1.4.2	Development and design of global emission scenarios with a regional and sectoral breakdown to explore the mitigation potential in comparison to the baseline with a data set for use in Convention modelling tools	Report (2022–2023)	TFIAM and TFHTAP	
1.3.1	Cooperation with HELCOM and OSPAR; marine environment protection	Evaluation of atmospheric load of heavy metals and POPs to the Baltic and North Seas Reports (2022–2023) Evaluation of the impact of air pollution on marine environment Evaluation of the impact of chemicals of emerging concern in the Baltic Sea Developments to include marine ecosystem protection in future emission reduction strategies	MSC-E, WGE, MSC-W, TFIAM, AMP (Ad hoc Group on Marine Protection including CCE and ICP Waters)	Covered by HELCOM and OSPAR funding Further funding needed

Workplan item	*Activity*	*Outcome*	*Lead body(ies)*	*Resources*
2.1.2	Review of the sufficiency and effectiveness of the Gothenburg Protocol as amended	(a) Input provided to support the review; (b) Consideration of the main findings and conclusions of the review of the amended Gothenburg Protocol; final report on the review submitted to the Executive Body; (c) Session on barriers to ratification and implementation[a]	WGSR, TFIAM, TFTEI, TFRN and scientific bodies WGSR WGSR, EECCA Coordinating Group	
2.1.5	Demonstrate the costs of inaction on air pollution to encourage ratification of the key Protocols to the Convention, in particular the Gothenburg Protocol	Report for policymakers on the costs of inaction on air pollution submitted to the Executive Body	TFIAM, TFTEI	Funding provided by Norway
2.1.6	Promotion of multiscale modelling for formulating effective measures and policies	Policy brief on multilevel governance	TFIAM	Funding needed
2.1.7	Discuss the implications of future global and regional emissions scenarios	(a) Based on scientific work in point 1.1.4.2, identify priority emission sectors and regions outside the Convention that have a significant potential to have an impact on the achievement of the Convention's goals; (b) Make recommendations to the Executive Body	WGSR, TFHTAP, TFIAM, CIAM WGSR	
2.2.3	Development of a Guidance document on non-technical and structural measures	Draft guidance document submitted for adoption by the	TFIAM, TFRN, TFTEI	In-kind contributions by participating countries

[a] In case it is feasible to organize an in-person event in 2022.

Workplan item	*Activity*	*Outcome*	*Lead body(ies)*	*Resources*
		Executive Body at its forty-third session		
2.2.4	Promotion of guidance documents, including those recently adopted	Explore opportunities to promote guidance documents, including those recently adopted within and outside ECE	TFRN, TFTEI, TFIAM	

Abbreviations: CCE, Coordination Centre for Effects; CIAM, Centre for Integrated Assessment Modelling; COVID-19, coronavirus disease; ECE, United Nations Economic Commission for Europe; EECCA, Eastern Europe, the Caucasus and Central Asia; EMEP, Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe; EPCAC, Expert Panel on Clean Air in Cities; GAINS, Greenhouse Gas and Air Pollution Interactions and Synergies; HELCOM, Baltic Marine Environment Protection Commission; HRAPIE, Health risks of air pollution in Europe; ICP Waters, International Cooperative Programme for Assessment and Monitoring of the Effects of Air Pollution on Rivers and Lakes; MSC-W, Meteorological Synthesizing Centre-West; OSPAR, Commission for the Protection of the Marine Environment of the North-East Atlantic; POPs, persistent organic pollutants; TFEIP, Task Force on Emission Inventories and Projections; TFHTAP, Task Force on Hemispheric Transport of Air Pollution; TFIAM, Task Force on Integrated Assessment Modelling; TFMM, Task Force on Measurement and Modelling; TFRN, Task Force on Reactive Nitrogen; TFTEI, Task Force on Techno-economic Issues; uEMEP, urban EMEP; WGSR, Working Group on Strategies and Review.

Annex II

Expert Panel on Clean Air in Cities

Report of the Expert Panel on Clean Air in Cities on its third meeting (29 November 2021)

1. Around 95 participants from national Governments, cities, the scientific community, non-governmental organizations and industry, the World Health Organization (WHO) and the European Commission participated in an online workshop on 29 November 2021. Mr. Roald Wolters (Netherlands) and Mr. Guus Velders (Netherlands) chaired the meeting.

2. A representative of WHO presented the new WHO air quality guidelines (published in 2021). The new air quality guidelines levels for particulate matter $(PM)_{2.5}$, PM_{10}, ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and carbon monoxide (CO) were significantly lower than previous levels and also significantly lower than the European Union air quality limit values. WHO had also defined interim targets for those compounds, emphasizing that any improvement in air quality reduced the health impacts of air pollution. The new guidelines indicated that air pollution was still a leading cause of health damage in Europe and around the world. Although air quality in Europe had improved since the 1980s and the European Union air quality limit values had been met in many countries, meeting the new WHO guideline levels required large additional reductions in emissions of most air pollutants.

3. Representatives of the European Commission presented the ongoing process of the revision of the European Union Ambient Air Quality Directive,[1] for which the new WHO guidelines were a major source of input. In the process, the European Commission had performed a fitness check of the current Ambient Air Quality Directive and identified shortcomings related to:

(a) Health outcomes: European Union limit values were not fully aligned with scientific advice;

(b) Enforcement: exceedances were not always addressed sufficiently and/or on time;

(c) Governance: air quality plans did not always address all sources effectively;

(d) Assessment/Monitoring: flexibilities might sometimes have an impact on the comparability of data;

(e) Information: public felt underinformed about poor air quality and its impacts; a revised air quality directive was planned to be adopted by 2023.

4. Several research groups presented results from modelling studies. Atmospheric models were improving taking into account chemical and meteorological processes from street to European level. Those models were used to quantify contributions from the various sectors to air pollution in cities in Europe. That provided the necessary information for local and national authorities to choose priority sectors, identify important transboundary sources and analyse how air quality management could be aligned with other policies, such as spatial planning, energy and climate policies.

5. The modelling studies showed that a range of different source sectors contributed to air pollution, such as traffic, industry, residential heating and agriculture. Those sectors contributed differently to air pollution in cities. Local urban sources from traffic and residential heating contributed most to (local peaks in) NO_2 air pollution in large cities, while sources from outside cities contributed most to (background levels of) PM_{10} and $PM_{2.5}$ air pollution in cities.

[1] 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.

6. A representative of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe/Meteorological Synthesizing Centre-West (EMEP/MSC-W) presented the results of recent applications of the urban EMEP (uEMEP) fine scale model for Europe. That model used the EMEP/MSC-W model for the large-scale background and a Gaussian dispersion model to downscale concentrations to city level at 100 m resolution. The uEMEP model provided information on the source contributions for cities in Europe.

7. A representative of the Joint Research Centre of the European Commission pointed to the *Urban $PM_{2.5}$ Atlas: Air Quality in European Cities – 2021 Report*,[2] with contributions of local, national and European emissions to concentrations in many European cities. For larger cities, local activities were responsible for a significant fraction of local $PM_{2.5}$ air pollution. Abating agricultural emissions outside of cities was identified as an effective way to improve urban air quality.

8. Positive actions to improve air quality had been demonstrated for several cities and could serve as examples for other cities and regions. It was demonstrated that attention to communication and raising awareness of local air quality was important. There were several initiatives in cities to engage citizens. Through “citizen science”, citizens contributed to measuring local air quality and got more involved in decisions related to their local environment.

9. Experts from Poland and the Netherlands illustrated the benefit of a multilevel policy approach, where local, regional and national authorities jointly developed a policy plan.

10. The coronavirus disease (COVID-19) lockdown in many countries had proven that a reduction in traffic had a significant positive effect on NO_2 air quality. Sustained reductions in emissions at least as large as during the lockdown would be needed to meet the WHO guideline levels for NO_2.

---

[2] Philippe Thunis and others (Luxembourg, Publications Office of the European Union, 2021).