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

Working Group on Effects

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Progress in activities of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe in 2017 and future work: measurements and modelling

Measurements and modelling

Report of the Task Force on Measurements and Modelling on its eighteenth meeting

Summary

The present document contains the annual report of the Task Force on Measurements and Modelling under the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe, in accordance with the mandate set out in the 2016-2017 workplan for the implementation of the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR/133/Add.1). It summarizes the discussion at and the outcomes of the Task Force's eighteenth meeting, held from 3 to 5 May 2017 in Prague. The report reflects the status of implementation of the work activities of the Task Force as set out in the Convention's workplan (items 1.1.1.2-1.1.1.4, 1.1.1.7, 1.1.1.21, 1.1.2.1, 1.2, 1.3.4), and in the informal document submitted to the Executive Body for the Convention at its thirty-fourth session, "Basic and multi-year activities in the 2016-2017 period" (items 1.1.3, 1.1.5-1.1.8, 1.3.3 and 1.3.5).

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I. Introduction

1. The present report presents the outcomes of the eighteenth meeting of the Task Force on Measurements and Modelling, held from 3 to 5 May 2017 in Prague, including the presentation of activities undertaken since the previous Task Force meeting (Utrecht, the Netherlands, 18-20 May 2016). It describes progress in the implementation of the monitoring strategy of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) (ECE/EB.AIR/2009/16/Rev.1), progress in the development of modelling tools and specific ongoing assessments (modelled trends in air pollution; a heavy metals pilot study; field campaign planning; twin sites activities; and current and potential collaborative activities with other bodies of the Convention on Long-range Transboundary Air Pollution) and development of the workplan for 2018-2019.

2. Seventy experts from the following Parties to the Convention on Long-range Transboundary Air Pollution attended the meeting: Austria, Belarus, Belgium, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Malta, Netherlands, Norway, Poland, Russian Federation, Slovakia, Spain, Sweden, Switzerland and United Kingdom of Great Britain and Northern Ireland. Also present were representatives from three EMEP centres — the Chemical Coordinating Centre (CCC), the Meteorological Synthesizing Centre-East (MSC-E) and the Meteorological Synthesizing Centre-West (MSC-W) — the European Environment Agency, the European Commission Joint Research Centre and the World Meteorological Organization (WMO).

3. Mr. Augustin Colette (France) and Ms. Oksana Tarasova (WMO) chaired the meeting. They presented the agenda, highlighted the achievements since the previous meeting, outlined the ongoing evolution of EMEP processes and drew attention to the Task Force mandate and key elements of the workplan for 2018-2019.

4. The meeting was opened by Mr. Vaclav Dvorak, Director of the Czech Hydrometeorological Institute. An expert from the Institute gave a presentation on the Institute’s activities in the context of the work of the Convention, highlighting its role in the integrated monitoring work under the Working Group on Effects, its contribution to the EMEP monitoring strategy and the work on emissions and source identification and dispersion modelling.

5. The Chair of the Steering Body to EMEP presented an update on EMEP activities, focusing on the outcomes and short- and long-term recommendations of the policy review group. She highlighted potential activities relevant to the Task Force mandate, including: support of emission mitigation strategies for ozone, methane and black carbon; definition of black carbon; work to improve knowledge and accounting of condensables; and efforts to improve the quality of observations, data availability and model applicability at all scales. She further stressed the importance of collaboration with the Working Group on Effects, and cooperation with other bodies within and outside of Convention (e.g., the Aerosols, Clouds, and Trace gases Research InfraStructure Network (ACTRIS), the Arctic Monitoring and Assessment Programme, the Copernicus Atmosphere Monitoring Service and the European Commission). She also highlighted the approach for the development of the 2018-2019 workplan.

II. Modelling activities including national contributions

6. A representative of MSC-W presented the development of the EMEP model. The focus was on the transition to a 0.1 x 0.1 longitude-latitude grid. The main stumbling block in the implementation of that transition had been the lack of high-resolution emission inventories — only four countries had produced the required resolution emissions in time for the preliminary simulations presented to the Task Force. There was concern about the production of country and trend reports, which currently could be delivered only on the 50 x 50 square kilometre resolution grid. Adjustment of nitrogen oxides (NO_x) emissions of diesel cars had had an impact on calculated particulate matter (PM) levels and associated mortality. The impact matrices had been calculated for tropospheric ozone using hemispheric transport of air pollution scenarios for the first and second comprehensive assessments (HTAP1 and HTAP2),[1] showing a smaller impact of European emissions in mitigating ozone exposure in Europe in the most recent assessment, presumably attributed to a stronger role of ship emissions than previously thought. MSC-W had initiated collaboration with WMO on measurement-model fusion techniques for calculation of total deposition and on flux estimates with the Working Group on Effects.

7. An expert from Norway presented the work on the use of the EMEP model to assess the contributing of long-range transport on urban scale (uEMEP). Proxy data to redistribute the concentration field within the urban domain were used to achieve estimates of the population exposure. Calculations were done for the local contribution within each EMEP grid, then applying moving window technique and dispersion using proxy data. Comparison with passive sampler measurements for nitrogen dioxide gave a reasonable correlation with the approach for annual averages, while emissions rescaling improved comparison. The same approached had been used for ammonia studies in the Netherlands.

8. An expert from the Netherlands presented the results of an ammonia study comparing high resolution statistical and chemical-transport (EMEP4NL)[2] models. The study demonstrated that EMEP4NL underestimated concentrations of ammonia near the source owing to problems with mixing parameterization within 50 metres of the lowest model layer. Use of statistical models demonstrated better performance in the vicinity of sources, but overall overestimated observations. Future work would include trend analysis of ammonia, implementation of an alternative deposition module within the EMEP model and coupling with the Harmonie[3] model (the national weather model).

9. An expert from Malta presented the evaluation of the volcanic and shipping emissions impact on air quality in the country. Dispersion modelling analysis in combination with aerosol sampling had been used. It had been demonstrated that 71 per cent of emissions reaching the island were coming from heavy fuel ships (i.e., with fuels containing sulphur dioxide).

10. A representative of MSC-E presented the recent developments in heavy metals and persistent organic pollutant modelling, in particular for national-scale case studies, trend assessments and transition to the new spatial grid. Benzo(a)pyrene (BaP) modelling had been performed using the new EMEP grid. BaP levels in Europe were mostly above the

[1] For more info on HTAP1 and HTAP2 emission scenarios, see http://www.htap.org/.
[2] See https://www.aerius.nl/en.
[3] See Hüseyin Toros, Gertie Geertsema and Gerard Cats, “Evaluation of the HIRLAM and HARMONIE Numerical Weather Prediction Models during an Air Pollution Episode over Greater İstanbul Area”, *CLEAN – Soil, Air, Water,* vol. 42, No. 7 (July 2014), pp. 863–870.

European Union target. Residual combustion contributed 80 to 90 per cent of emissions and levels were rising. In the case of Spain, preliminary results indicated a substantial contribution to BaP came from agricultural waste burning (about 70 per cent), though there was a discrepancy between geographical distribution of that contribution between model and observations. Discrepancy in mountain areas was attributed to model limitations in complex orography. The exercise would be repeated with a new emission set for Spain.

11. The representative of MSC-E presented the results of the case study for Poland in collaboration with an expert from Poland. The study had focused on cadmium, and used urban, regional and suburban sites for verification of results. Modelling had been done using the new resolution, so resuspension in the new model set-up had been higher owing to the use of the new land-use and land-cover data. Regional observations were underestimated by the model during the cold season. One of the reasons for underestimation was likely the poor description of planetary boundary layer dynamics. There could be monthly changes in emissions as well, which could lead to underestimation during the cold season. On the urban scale, the picture was more diverse (both underestimation and overestimation).

12. An expert from France presented high resolution simulation of BaP using the CHIMERE[4] model in two resolutions. Simulated concentrations underestimated observations. That discrepancy indicated a potential problem with emissions reported by France to EMEP, especially the ones related to residential wood combustion. Those constituted about 67 per cent of BaP emission in France. BaP followed the same decreasing trend in France as for particles with an aerodynamic diameter equal to or less than 2.5 micrometres ($PM_{2.5}$). Possibly emissions for the country were too low or emissions in the neighbouring countries too high, but the role of BaP heterogeneous degradation with ozone could also be involved.

13. An expert from the Russian Federation presented a comparison of model results with measurements at four sites for heavy metals (bromine and lead). Difficulty in modelling was related to lacking emission data. There could be local emissions sources that impacted the results of the comparison, hence individual locations had to be analysed differently.

14. An expert from the United Kingdom presented the results of the application of the EMEP4UK[5] model for the analysis of the annual averages and episodes. The focus of the study had been on ammonia and ammonium. The emission data used had been compiled using different sources. Comparison with the measurement in London demonstrated that 80 per cent of emissions were lacking in inventory. The results confirmed that emissions largely drove models, with meteorology and chemistry playing a role in defining final concentrations.

15. The presentations were followed by a general discussion on recent developments in the models and the major challenges, including implementation of the new grid, links between regional and global models and the impact of the temporal variations in emissions. Parties expressed their disappointment with the fact that, despite advances in modelling which could potentially be used to improve emissions estimates, those modelling developments were not used by the emission inventory community. Important work was ongoing in the modelling community to account for semi-volatile organic compounds in the

[4] See http://www.lmd.polytechnique.fr/chimere/.

[5] See Centre for Ecology and Hydrology, “EMEP4UK model description”. Available from http://www.emep4uk.ceh.ac.uk/description (accessed on 14 June 2017).

formation of secondary organic aerosols, in particular in relation to residential wood burning, and that work should also be coordinated with the work on condensables handled by the emission inventory community. Parties agreed that use of proxy data and numerous medium quality observations could be helpful for downscaling, while care should be taken about formation of secondary pollutants and double counting of emissions. Sharing land-use data in all models should be considered to improve consistency.

III. Modelling: trend analyses and Eurodelta

16. An expert from France gave an overview of Eurodelta-trends[6] exercise. Eight models had participated in the exercise, which had covered the period 1990-2010. The exercise had been implemented though a three-tier approach, with models evaluated against observations their applicability for drawing policy-relevant conclusions and for estimating impacts. Five models had performed the full 21 years running under a harmonized set-up. The exercise had largely confirmed trend conclusions drawn from observations: ozone peak value had decreased and the modelled trends followed the observed ones. Both approaches showed that ozone peak values had decreased, and that trends of PM were larger in the 1990s than in the 2000s and were driven by emission reductions. The attribution of trends to different processes was done by means of sensitivity runs where the individual drivers (emissions, boundary conditions and meteorology) changed. The trend of ozone annual average in the 1990s was small, with multiple factors working in different directions (emissions had driven levels down, while meteorology and intercontinental transport had driven levels up), with peak levels driven largely by emissions. Further plans included data dissemination and connection with impact studies.

17. An expert from Germany looked at the meteorological drivers of surface ozone, using the outcomes of sensitivity simulations from Eurodelta-trends. The focus was on “ozone persistent” regions of Europe where models were compared with observations. The correlation was better in summer than in spring, and exhibited temporal variability. The best correlation had been found between ozone and maximum temperature, though it was likely that the role of temperature was overestimated in the models and the effect of relative humidity underestimated.

18. A representative of MSC-W reported on the Eurodelta-trends multi-model simulations of PM with a special emphasis on particles with an aerodynamic diameter equal to or less than 10 micrometres (PM_{10}) and $PM_{2.5}$. From five to eight models were used in different set-ups. A difficulty was reported in model verification for the 1990s owing to a lack of observations. The ensemble trend was smaller than in the observations, but the models agreed on the spatial distribution of trends. The interannual correlation between model and observational trends was above 0.8 for most models and the ensemble of models captured well the average change of PM_{10}, with an estimated 2.0 per cent per year decrease, whereas observations indicated a 2.3 per cent per year decrease. Winter trends were smaller than summer trends. The difference between trends in winter and summer was smaller in the models than in the observations. The natural aerosols had different signals (both could increase in some regions and could decrease in the other). Meteorological variability impacted up to 10 per cent of variability, but it could mask variability related to emissions. In the 1990s, PM trends had been more pronounced.

[6] See Meteorologisk Institutt, EMEP wiki, EURODELTA/TFMM trend modelling. Available from https://wiki.met.no/emep/emep-experts/tfmmtrendeurodelta (accessed 14 June 2017).

19. An expert from Spain presented the results of deposition trends estimated in a Eurodelta-trends exercise. Modelling results had been compared with observations (total deposition and wet deposition). The largest differences had been found for sulphur oxides wet deposition (strong underestimation). The EMEP model had had the results the closest to observations (averaged of all stations). Most models had underestimated wet deposition trends, while the EMEP model overestimated it in the beginning of the period. The differences between models were significant and the role of dry deposition could be different, but could not be challenged against observations. Most of the models overestimated air concentration.

20. An expert from Sweden presented an analysis of the long-term deposition in Europe (1850-2100). A standard set-up of MATCH[7] and EMEP models had been used for evaluation. Gridded emissions had been combined from EMEP, and historical emissions and projections had been from the Evaluating the CLimate and Air Quality ImPacts of Short-livEd Pollutants (ECLIPSE) project.[8] The MATCH model was consistently higher than EMEP for deposition, though the two models had the same input. Calculations demonstrated that deposition had peaked in 1970 and had substantially decreased for oxidized nitrogen and sulphur — returning to the levels of the early twentieth century — but the trend was very weak for reduced nitrogen. Model concentrations had been compared with the data from ice core for the annual mean. The wet deposition in rain was five times higher than in snow, so comparison had focused on a tendency. Comparison had been made with the European Air Chemistry Network observation data from 1955 to early 1980. About 100 stations for nitrogen deposition had been used in Europe (bulk samplers with monthly resolution). The MATCH model mostly overestimated and EMEP underestimated those observations. Potentially all the data sets could be normalized against reference periods. For relative trends, there was a good comparison between observations and models from 1980. Projected deposition was driven by projected emission, but there was a difference in scenario. Nitrogen deposition was way too high in the ecosystem (for projected emission levels).

IV. Implementation of the monitoring strategy and national activities

21. A representative of CCC gave a presentation on collaboration with the European Earth Observation Programme, Copernicus. Copernicus had three components: a space component (satellite observations); an in situ component (onsite observations); and a service component (processing and analysis of data). Copernicus would provide funding to the Norwegian Institute for Air Research to streamline delivery of EMEP near-real-time data. Increased use of data would improve visibility of EMEP, but EMEP had to move towards automated methods of observation, which should be reflected in the revision of the EMEP monitoring strategy. There was no expectation that near-real-time data were validated. Currently the progress with delivery of such data was only reached for super-sites (e.g., through ACTRIS) or sites delivering data through the European Environment Agency e-reporting air quality database, but EMEP observations should be clearly

[7] See Swedish Meteorological and Hydrological Institute, “MATCH – transport and chemistry model”. Available, 3 March 2017. Available from https://www.smhi.se/en/research/research-departments/air-quality/match-transport-and-chemistry-model-1.6831.

[8] See http://eclipse.nilu.no/.

identified in the reporting. Provision of support to individual automated instruments was not a very efficient use of resources. Rather, the work should be focused on improving tools to set up data exchange, monitoring and troubleshooting and also on organizing a workshop for near-real-time data exchange, building upon the existing data submission protocols. There should also be a focus on comprehensive sites and attempts to close geographical gaps. CCC stressed that the contract with Copernicus would mostly focus on services provided by the Norwegian Institute for Air Research. Parties expressed concerns about the need for consultation with their Copernicus national focal points. Early fall the new services would be initiated, potential contributors assessed and then the national systems would be connected to Copernicus through the Norwegian Institute.

22. Another representative of CCC gave an update on the outcome and follow ups from the Task Force workshop on quality assurance and data reporting, held at CCC in October 2016. The data quality objectives for inorganic ions had been updated in line with the guidelines of the Global Atmospheric Watch (GAW) Programme, to 5 per cent for sulphate and nitrate, and to 7 per cent for ammonium. The data reporting templates includes measurement uncertainty as well as quality measures (e.g. audit or intercomparison), but how to report measurement uncertainty is somewhat unclear for several species. For elemental carbon/organic carbon, the template for calculating uncertainty is not used by everyone. It was proposed to include at least analytical uncertainty for most species. Templates and guidelines for how to calculate this would be updated accordingly. It was noted that regular update of the whole EMEP manual for sampling and analysis is impractical, and EMEP/CCC will rather publish individual guidelines, which is developed by the Task Force or other communities on the submission web page, and clearly state which guidelines and standard operating procedures are recommended for the EMEP network. It was noted that mercury measurement needed to be improved, and it was suggested to possibly facilitate a field campaign in the near future. And new metadata information for persistent organic pollutants had been added in the reporting templates.

23. An expert from Czechia reported on implementation of the EMEP monitoring strategy in the country. The strategy was to concentrate different activities at the Kosetice site, where a visit had been organized during the Task Force meeting. That site was recognized as National ACTRIS Research Infrastructure and was supported by three other institutes (the Centre for Toxic Compounds in the Environment (RECETOX),[9] the Institute of Chemical Analysis and the Research and the Academy of Science). The station provided transnational access to the observational platform.

24. An expert from the Russian Federation described activities of the Acid Deposition Monitoring Network in East Asia (EANET), which focused on observations and operated as an intergovernmental initiative. Network data were now available online to improve dissemination. The Acid Deposition Network produced a report that included sections on quality assurance and impact assessment, and could now include long-term trends.

25. An expert from Germany presented results of observations with an advanced Monitor for AeRosols and Gases in Ambient air (MARGA) instrument that allowed for gas and aerosol measurements. Results were compared with the standard gas analysers. Higher aerosol concentrations were measured with filter-based instruments in comparison with MARGA. Some other advantages and limitations of the instrument were presented.

[9] See http://www.recetox.muni.cz/index-en.php.

Observational data were analysed using the HYSPLIT trajectory model[10] for source attribution. For chloride, the main source in summer and spring was from the North Sea, in winter there was a source in Eastern Europe (either coal combustion or steel production).

26. A representative of WMO outlined the outcomes of the Global Atmosphere Watch 2017 Symposium (Geneva, 10-13 April 2017). Participants had expressed a need to develop more services for the public rather than merely providing raw observations (e.g., inverse modelling for emission estimates). In accordance with a new implementation plan, a more user-oriented approach would now be implemented. A partnership discussion at the Symposium had also identified that many organizations ran similar projects in a number of countries without coordination of efforts. Participants had further stressed the need for improved emission estimates, a more defined role of citizen science and better synergies in addressing air pollution and climate change. WMO had initiated development of a statement on low-cost sensors and invited EMEP to contribute with expertise.

27. An expert from the United Kingdom provided details of a comparison of ethane and propane observations at two rural EMEP sites in the United Kingdom. Observations had demonstrated a decrease of nearly 20 per cent per year (since 1993) of n-butane, and the same had been observed for ethylene thanks to a three-way catalyst introduced in the country. Levels of ethane and propane had been more or less constant, though the evolution was substantially different from the one used in the emission inventory. The inventory showed a negative trend in natural gas leakage (3 to 5 per cent per year) while six sites showed an increase rather than a decrease in leakage emissions. There was no difference in the diurnal cycle of ethane between weekdays and weekends. Rural sites in Harwell and Auchencoth had started seeing the intercontinental influence of fracking on ethane levels; however, the ration of ethane or propane had not been checked.

28. An expert from Spain presented a phenomenology of high ozone and ultrafine particles episodes. Recirculation played a substantial role in forming high ozone levels in the Mediterranean. Comparison of observations at different pollution levels had demonstrated the formation of an “ozone belt” around Madrid. There was a change in the trend of ozone in 2013 from positive to negative, presumably owing to an increased number of cars and an associated increase of ozone titration. Episodes of high ozone concentrations correlated well with high temperatures. There had been a regional increase in the levels of ultrafine particles during three days of advective episodes. Policy responses to control ozone levels should be adapted for either advective or accumulating episodes. Satellite observations showed nitrogen dioxide had decreased at the regional scale. Aerosol was dominated by ultrafine particles, which differed for different regions of Spain. Black carbon was proposed as the best proxy for ultrafine particles.

29. An expert from Belarus presented the results of analysis of formaldehyde concentration fields. Higher spatial resolution of emissions was needed for modelling hourly air quality forecast. AERMOD dispersion modelling[11] had been used to assess the impact of individual facilities on pollution levels and on the population in the vicinity of individual facilities. Formaldehyde was measured using the electrochemical method for

[10] See United States National Oceanic and Atmospheric Administration, Air Resources Laboratory, Hysplit Model, 21 April 2017. Available from http://ready.arl.noaa.gov/HYSPLIT.php.

[11] See United States Environmental Protection Agency, Support Center for Regulatory Atmospheric Modeling, “Air Quality Dispersion Modeling – Preferred and Recommended Models”, 5 June 2017. Available from https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod.

verification purposes. For impact calculation, population density had been compared with calculated concentrations. A similar assessment was planned for other volatile organic compounds and ammonia.

30. Another expert from the United Kingdom described the challenges associated with addressing nitrogen pollution. Among other factors, exchange processes with soil were uncertain (e.g., nitrous acid). Understanding of nitrogen cycling between components in the atmosphere was also limited. Linkages between air quality, ecosystems and climate were not well studied. Several nitrogen substances had been measured using different techniques and a number of interferences had been detected. Chemiluminescent and photolytic techniques would be compared within ACTRIS. For fluxes measurement, eddy-covariance technique had been used and compared with results of direct measurement at different altitudes (within five inlets at 5-metre tower). It was recommended to consider daily precipitation and nitrate to evaluate nitrogen deposition. It was also noted that, for ammonia measurements, the molecular-specific method had to be chosen (online and off-line available). The set-up of the system had been found to be essential. For passive samples, temperature impacted the specific rate of uptake. The expert proposed several levels of data quality objectives for ammonia measurements depending on the temporal resolution and uncertainty.

31. An expert from Switzerland presented an analysis of elemental carbon/organic carbon in aerosol from the observations at 7 to 11 sites in the Unites States of America utilizing collocated samples of $PM_{2.5}$ on Teflon and quartz filters. The Fourier Transform infrared spectroscopy (FTIR) technique had been used for measuring the filters. Interferences in spectroscopy had been detected. Elemental carbon could be predicted from FTIR spectra on Teflon filters (the individual shape of molecules could be distinguished) using three spectral components.

32. An expert from Czechia reported on implementing integrated monitoring in the country. There was an overlap between EMEP monitoring and monitoring for effects in the field of precipitation. There were only six co-located stations for international cooperative programme impact monitoring and EMEP monitoring, though there was a requirement for the effects study to have a catchment area. Effects monitoring used the EMEP air chemistry manual, but stored only monthly data. The quality of those data and their availability for comparison with the models was to be studied.

V. Urban increment and twin sites

33. An expert from Spain presented an initiative on pollution sources attribution using pairs of urban, suburban and background sites. Three countries were currently taking part in the initiative. The approach was based on chemical speciation measurements of aerosol and positive matrix factorization. In Spain, three separate stations under different conditions were used to assess pollution sources in the larger Barcelona area. Long-range transport was important in summer, while in winter local contribution was more important. The approach allowed identification of eight aerosol pollution sources for Barcelona, but had some limitation with attribution of secondary aerosol production. High episodes of secondary sulphate in Barcelona were associated with shipping. The approach had limitations with regard to attribution of biomass burning-related aerosol and would be updated to better account for it. Apportionment could be supported by trajectory analysis. In Switzerland, the approach had been applied to the pair Zurich-Payern. No difference between speciation had been detected between summer and winter. The output had been compared with the Greenhouse Gas Air Pollution Interactions and Synergies (GAINS)

model output for 2009 and was in a good agreement with it. For northern France, three sites were used (traffic, urban and background). An interesting source of particulate matter was artificial (polluted) soil. Sources of marine aerosols had been underestimated in the city because the background site was further from the sea.

34. A representative from the Centre for Integrated Assessment Modelling presented source attribution of particulate matter using the GAINS model. Through source apportionment it was possible to separate regional background (through spatial interpolation of the rural background sites) and residual components (natural, regional and local). Transboundary versus national pollution had also been estimated. The results were aggregated over a large number of stations. GAINS had provided sectoral-spatial source apportionment of PM at the monitoring site, identifying the contribution from transboundary, national and local origin, and different source sectors and pollutants.

35. A representative of MSC-W described the involvement of Met Norway in the Copernicus Atmospheric Monitoring Service (CAMS)[12] city allocation policy service, which was focused on forecasts for PM_{10} and ozone. Definition of the city was important for assessment of internal and external contributions to urban pollution. MSC-W had offered to rerun the model for selected twin sites and to assess seasonal differences and contributions from different sectors.

36. A representative of the Joint Research Centre of the European Commission presented the SHERPA[13] tool, which had been developed to support local and regional authorities in the design of their air quality plans. SHERPA was based on source-reception relations and had a resolution of 7 kilometres. Results were within 5–10 per cent uncertainty of the full model. The air quality model to support the tool was CHIMERE and emissions data were from the European consortium for Modelling Air pollution and Climate Strategies (EC4MACS).[14] SHERPA had been applied to segregate pollution sources in Paris for annual average $PM_{2.5}$. To deliver comparable results with the other approaches in the context of the Task Force Twin Site exercise, there was a need for clear definition of city borders and urban increments.

37. The presentations were followed by a general discussion on definition and attribution of urban increment using different approaches. The observational twin site coupling aerosol chemical speciation with source apportionment offered an interesting perspective to compare with integrated assessment models used to quantify the contribution of long-range transport to urban air pollution. Parties appreciated the twin site approach and it was recommended to scale up that initiative to the other geographical regions. There was a need to compare in more detail the approaches of the Copernicus Atmospheric Monitoring Service, SHERPA and GAINS, and to define the advantages and limitations of the different approaches for policymaking. Eurodelta analysis could also be one of the tools to contribute to source attribution assessment. It was stressed that models could be used to introduce predictive capabilities, while observations provided evidence for policy support.

[12] See https://atmosphere.copernicus.eu/cams71-products-support-policy-users.

[13] See European Commission, "SHERPA: a computational model for better air quality in urban areas". Available from https://ec.europa.eu/jrc/en/news/sherpa-computational-model-better-air-quality-urban-areas (accessed on 19 June 2017).

[14] See http://www.ec4macs.eu/.

VI. Conclusions and way forward

38. A Co-Chair of the Task Force detailed the potential role of the Task Force in strengthening the links between EMEP and the Working Group on Effects, as pointed out in the Convention workplan. The contact group within the Task Force proposed to have joint workshops and discuss shared databases. The atmospheric community was invited to collaborate with the community performing observations for effects studies to investigate if some sites could contribute to EMEP monitoring as well, as exemplified by national experts from Czechia, the Russian Federation and the United Kingdom.

39. As a part of the workplan implementation, a discussion was organized to plan the next intensive measurement period. That campaign could be carried out jointly with ACTRIS. It was proposed to focus the campaign on the tracking of residential combustion using two different methods: continuous aethalometer measurement at several wavelengths for equivalent black carbon originated from fossil fuel or wood burning; and analysis of filters for levoglucosan. CCC had worked on the preparation of a detailed campaign description and requirements. The Joint Research Centre had proposed to combine the campaign with the ongoing filter analysis at the Centre.

40. A Co-Chair of the Task Force described a proposed updated mandate for the Task Force and its relation to the workplan. Parties were invited to submit final comments on the proposal before the mandate was submitted to the EMEP Steering Body.

41. The Task Force Co-Chairs concluded the workshop highlighting current and potential future activities. The proposed workplan would include: (a) continued work on better characterization of urban increment (“twin sites”) and the assessment of the contribution of long-range transboundary air pollution to urban air pollution for the main pollutants, heavy metals and persistent organic pollutants; (b) planning and implementation of the intensive measurement period; (c) contribution to the assessment of microsensors; (d) better definition of black carbon; (e) national heavy metal and persistent organic pollutants case studies; (f) collaboration with the Working Group on Effects; (g) characterization of condensables; and (h) ammonia observations. In 2017/18, special attention would be paid to the development of the new EMEP monitoring strategy.