

# AIR CONVENTION

(CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION)

Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)

## TASK FORCE ON INTEGRATED ASSESSMENT MODELLING (TFIAM)

50<sup>th</sup> session, 21 - 23 April 2021

Online meeting

*chairs report*

### I. INTRODUCTION

1. This report describes the results of the 50<sup>th</sup> session of TFIAM, held online from the 21<sup>st</sup> to the 23<sup>rd</sup> of April 2021. The presentations made during the meeting and the reports presented are available at:  
[http://www.iiasa.ac.at/web/home/research/researchPrograms/air/policy/past\\_meetings.html](http://www.iiasa.ac.at/web/home/research/researchPrograms/air/policy/past_meetings.html).
2. Around 125 experts registered, and at most 100 participated simultaneously, representing the following Parties to the Convention: Austria, Belarus, Belgium, Canada, Croatia, Denmark, Finland, France, Georgia, Germany, Hungary, Ireland, Italy, Kazakhstan, Moldova, the Netherlands, Norway, Poland, Portugal, Russia, Serbia, Slovak Republic, Spain, Sweden, Switzerland, Ukraine, the United Kingdom of Great Britain and Northern Ireland, Uzbekistan, and the European Union. Other bodies of the Convention represented were the EMEP Centre for Integrated Assessment Modelling (CIAM), the Task Force on Techno-Economic Issues (TFTEI), the Task Force on Hemispheric Transport of Air Pollution (TFHTAP), the Task Force on Emission Inventories and Projections (TFEIP), the Task Force on Reactive Nitrogen (TFRN), the World Health Organization/Task Force on Health (TF-Health), the Integrative Collaborative Program (ICP) on Vegetation, and the Meteorological Synthesizing Centre-West (MSC-West). In addition, a representative from South Korea participated and the organisations Joint Research Centre of the European Commission (JRC), the European Environment Agency (EEA), WMO Global Atmospheric Watch Urban Research Meteorology and Environment (WMO/GURME), the European Environment Bureau (EEB), World Resource Institute (WRI), Clean Air Task Force (CATF), ICCI, IUAPPA, and CONCAWE were represented.
3. Mr. R. Maas (Netherlands) and Mr. S. Åström (Sweden) chaired the meeting.

### II. OBJECTIVES OF THE MEETING

4. Mr. Maas summarized the recent activities under the Task Force and defined the purposes of the 50<sup>th</sup> TFIAM meeting: to assess the current status of integrated assessment models, to learn from national and local assessments and to prepare for the

review of the Gothenburg Protocol. The current work plan of the Task Force for 2020-2021 is included in Annex 1.

### **III. UPDATES ON EUROPEAN SCIENTIFIC ASSESSMENTS**

5. TFIAM took note of the presentation by Zbigniew Klimont, the head of CIAM, on the GAINS analysis of European air quality futures. He presented scenarios for the EU's Clean Air Outlook-2 (CAO-2). Several countries have difficulties with meeting the 2005-2020 ammonia reduction obligation. The scenarios also showed the co-benefits from climate and energy policies (including methane reduction from agriculture). Scenario's including the 55% greenhouse gas reduction target in 2030 will be published in June 2021. The CAO-2 analyses showed the importance of measures in surrounding countries for air quality improvement. Analyses for large cities in Asia also showed a significant contribution from abatement measures in the wider region. According to recent model calculations by EMEP/MSC-W, the much larger NO<sub>x</sub> and SO<sub>2</sub> emission reductions compared to NH<sub>3</sub> emission reductions have led to less efficient formation of NH<sub>4</sub> aerosols and a shorter lifetime of reduced nitrogen (NH<sub>3</sub>+NH<sub>4</sub>) in air. Assuming emission projections consistent with the National Emissions Ceilings Directive until 2030, reduction of NH<sub>3</sub> emissions became a factor 2.6 less effective to reduce secondary inorganic aerosol concentrations compared to 2005. In winter, the reduction of ammonia may still be efficient to reduce PM<sub>2.5</sub>. This effect has been considered, to some extent, in CAO-2 since the GAINS model source receptor relationships, developed jointly with EMEP, anticipated future reduction of SO<sub>2</sub> and NO<sub>x</sub> emissions.

6. TFIAM took note of the presentation by Enrico Pisoni (European Commission Joint Research Centre). The EU FAIRMODE project focuses on supporting improvements in air quality modelling, emission inventories, identification of best practices for air quality management, policy enforcements, emission projections and emissions and air quality modelling. There are several methods to assess the source contribution to secondary aerosols concentrations. To identify effective measures a brute-force (scenario) approach with air quality models is advised.

7. TFIAM took note of the presentation by Simone Schucht (France) and Mike Holland (UK) on a new study on marginal damage costs of air pollution in the region EEA38 and the United Kingdom, and on externalities from industrial facilities reporting emissions to E-PRTR. For the Gothenburg Protocol pollutants, due to new data and knowledge, the estimated marginal damage costs are higher than earlier estimates. One of the conclusions from the new study is that transboundary external effects are important and damage cost assessments should, hence, include both damage in the emitter country and damage to other regions. Future updates of the work should, amongst others, consider knowledge on new health response relationships and coefficients.

8. TFIAM took note of the presentation by Felicity Hayes from ICP Vegetation. Inter alia, improved models to estimate grain yield effects of POD (Phytotoxic Ozone Dose) is developed, as well as data on relations between ozone fluxes and tree species. Currently, 8 species are mapped. In addition, ICP Vegetation is engaged in outreach research in several African countries. Changes in PODs are calculated in GAINS to the extent they are part of the EMEP-model output. The results are rather insensitive for changes in European NO<sub>x</sub> and VOC-emission and seem to depend

more on background ozone levels that result from hemispheric emissions of methane and other ozone precursors.

#### **IV. UPDATES ON NATIONAL SCIENTIFIC ASSESSMENTS**

9. TFIAM took note of the presentation by Marta Garcia Vivanco (CIEMAT – Spain), who presented research made to support Spanish greenhouse gas and air pollution emission reduction plans. Interesting is that the increased amount of renewable electricity (low-sulphur), analysed in a scenario with electric car use, could have the collateral effect of increasing concentrations of gaseous ammonia, due to less formation of secondary aerosols. The impact of increasing the share of renewable electricity should be further analysed in combination with other measures. Increased use of certified biomass in residential heating systems stands out as a measure with negative health impacts.

10. TFIAM took note of the presentation by Enrico Turrini (University of Brescia, Italy) on how reduced intake of animal protein for human food can affect emissions of air pollutants, PM-population exposure, metabolic health benefits and associated mortality indexes. Through a study of social acceptability, the total applicable rate of reduction of animal protein consumption is currently no more than 25%. Financial compensation was not included in the study.

11. TFIAM took note of the presentation by Alison Davies (Defra-UK) and Helen Apsimon (Imperial College London). The United Kingdom aims to be a co-chair on the Global Forum on Air Quality (GFAQ) and is working with the integrated Assessment model (UKIAM) to analyse future scenarios in order to assist in setting new PM<sub>2.5</sub> targets. The latest modelling indicates a big improvement over the next decade towards attainment of the current WHO guideline of 10 µg/m<sup>3</sup>, enhanced by abatement measures to meet emission ceilings in 2030. However, despite improvement there will still be exceedance in London which has the highest concentrations. Further analysis of emission reduction in urban areas show remaining large uncertainties related to non-exhaust PM<sub>2.5</sub>-emissions e.g. from electric vehicles and overall uncertainty for small-scale domestic wood burning and cooking. Modelling is now extending out to 2050 and encompassing climate measures. Xavier Querol asked for inclusion in models of the formation of secondary organic aerosols from biogenic VOC-emissions.

12. TFIAM took note of the presentation by Antonio Piersanti (ENEA, Italy). By 2030 Italy is not reaching reduction commitments of the EU NEC Directive. Italy therefore will need to implement additional emission control measures. A group of 5 measures can improve air quality related human health in Italy with at least some 7% compared to the baseline scenario for 2030. For the Italian regions, the avoided damage costs thanks to these WAM measures on top of the WM measures range between 0,06-0,23% of GDP in 2010. Additional measures to meet the 55% greenhouse gas emission targets were not yet taken into account.

13. TFIAM noted the presentation by Elena de Angelis (University of Brescia, Italy), who presented air quality effects of various road transport and electricity production scenarios for Northern Italy. The scenarios were designed and computed through a multi-objective approach to select an optimal mix of energy sources for electricity

production and mobility with respect to air quality and greenhouse gas emissions in the region.

14. TFIAM noted the presentation by Andrew Kelly (EnvEcon, Ireland) who presented recent fine spatial scale studies on air, climate and just transition-related policy in the built environment. A fine scale composite index constructed from available data on buildings, heating systems, and household attributes, enabled development of an objective mapping system of energy poverty risk. This in turn offers an assessment tool of the impacts of air and climate policy measures on that risk. The second study focused on a national climate policy to install 400,000 air source heat pumps in households by 2030. The preliminary results show that a special targeting of just 11,000 of those heat pumps on identified PM<sub>2.5</sub>-concentration hot spots could deliver a strong air quality improvement. Combined with the replacement of solid fuel boilers in these hotspots can lower hotspot PM<sub>2.5</sub> concentrations by up to 35% whilst offering a comparable climate outcome to a policy without targeting

## **V. Activities aligned with the Gothenburg protocol review and TFIAM work plan**

15. Mr. Åström gave an overview of the TFIAM 2020-2021 work plan items and their status and launched a discussion on suggestions for the focus for future work plans. Most of the work plan items are progressing well, but more efforts are needed for structured inventory of TFIAM outreach activities.

16. TFIAM took note of the presentation by Katarina Yaramenka (IVL, Sweden), on the costs of inaction on current air quality challenges. The costs of environmental damage in most cases tend to exceed the costs of abatement measures. The damage costs are – as a percentage of GDP - significantly higher in EECCA/SEE countries than in EU and USA.

17. TFIAM took note of the presentation by Mr. Maas. The ammonia assessment report has been submitted to the WGSR. Significant emission reductions are available that would not exceed the damage costs of emissions.

18. TFIAM took note of the presentation by Nadine Allemand (Task Force on Techno-Economic Issues). There are several PM-abatement measures available that would also significantly reduce emissions of black carbon: residential burning of coal and wood, (agricultural) waste burning, replacing old diesel vehicles. CITEPA produced complementary information to the Air Convention PM/BC guidance document.

19. TFIAM took note of the presentation by Guus Velders (RIVM, the Netherlands), on the recent developments of EPCAC. In addition to reaching out to policy makers from city to global level, EPCAC is setting up a database of measures to reduce emissions and improve air (including non-technical measures). EPCAC plans an autumn meeting for 2021.

20. TFIAM took note of the presentation by Gregor Kiesewetter (CIAM), on current and expected work on downscaling, expanding and connecting multiple scales in the GAINS model. Recent examples from the Indian module of GAINS showed promising potential for GAINS Europe. Hopefully, an extended and updated GAINS Europe module will be available by early 2022, which will make it possible to cover all European and Central Asian countries of the UNECE region with a unified

atmospheric calculation scheme. It has already been successfully implemented in South Asia for improved sectoral-spatial source allocation of ambient PM<sub>2.5</sub> concentrations and cost effectiveness analysis.

21. TFIAM discussed the draft answers to the questions raised by the Gothenburg Protocol review group and made several additions that will be included in the next version. TFIAM suggested to include measures to reduce ship emissions and emissions from waste treatment in the list of effective remaining abatement options; to look at possibilities to develop a scenario that would meet ecosystems critical loads and WHO- air quality guideline values in 2050; and to apply multilevel modelling methods to improve local air quality, with a possible link to the Russian local air quality programme. GAINS cost-effectiveness analysis should include sensitivity analyses of including condensables, NO<sub>x</sub> from agricultural soils and NMVOC from livestock manures as well as deposition targets for marine ecosystems. TFIAM advised to adapt the timeline for question 2.1c (on the impact of transboundary transport on local concentrations) from spring 2021 to spring 2022, in order to be able to apply transfer coefficients in GAINS that are based on EMEP model runs that use a finer source-receptor methodology; and question 3.1d,e (on the impact CLE and MTR scenarios on health and ecosystems) from fall 2021 to fall 2022, in order to include updated emission data from EECCA and SEE countries. TFIAM supported efforts to develop a guidance document on non-technical and structural measures (e.g., changes in mobility, diets), if so desired by the WGSR.

22. TFIAM noted progress in the initiative to revive the Network of National Integrated Assessment Modellers (NIAM) aimed at more frequent informal contact between national experts and policy makers, and extended exchange of information than possible during the TFIAM meetings. See: <https://www.umweltbundesamt.de/en/about-niam>. NIAM intends to first focus on national health impact assessments. TFIAM appreciated the offer to feed back NIAM-findings in the TFIAM-meetings.

## **VI. EFFECT OF THE COVID-LOCKDOWN ON AIR QUALITY**

23. TFIAM took note of the presentation by Enrico Pisoni (European Commission Joint Research Centre), with a focus on developing a method to separate effects of meteorology from emission reductions during the first lockdown in 2021. A numerical application for the Po Valley indicated that PM<sub>10</sub>-concentrations were not significantly affected by the lockdown in Italy. The large NO<sub>x</sub> emission reductions during the lockdown, led to increased ozone, which (via the increase of oxidants) favoured the formation of nitrate. Also, PM<sub>10</sub> emissions from wood combustion remained high.

24. TFIAM took note of the presentation by Johanna Appelhans (UBA, Germany) on the effects of the COVID lockdown on air pollution in Germany. Although the lockdown measures have had substantial short-term effects on NO<sub>2</sub> concentrations in Germany, on an annual basis, the effects are around 1µg/m<sup>3</sup> for NO<sub>2</sub>. Road transport measures were most important for reducing urban NO<sub>2</sub> concentrations. The effect on PM<sub>10</sub> concentrations was insignificant.

25. TFIAM took note of the presentation by Cristina Guerreiro (NILU, Norway) on the effects of the COVID lockdown on European air quality. Also here significant

reductions in NO<sub>2</sub> concentrations were found, and small or insignificant effects on PM-concentrations. For both, variance is large, and the meteorological conditions must be taken into account.

## VII. ANY OTHER BUSINESS

26. TFIAM took note of the potential need to further address microplastics as a specific part of PM-pollution. Microplastics are interesting and likely an important area to be covered by air pollution scientists. But the knowledge, e.g., on effective measures, appears not yet to be ready for integrated assessment modelling.

27. There are numerous interesting meetings and opportunities for TFIAM outreach during the following year. Examples mentioned during TFIAM 50 are:

- SESYNC WEBCAST 28<sup>th</sup> April 2021:  
<https://www.sesync.org/news/mon-2021-04-12-1914/webinar-uncertainty-transparency-and-robustness-in-socio-environmental>,
- OECD Report Launch 28<sup>th</sup> April 2021:  
<https://www.oecd.org/environment/agenda-launch-event-economics-benefits-of-air-quality-improvements-in-arctic-council-countries.pdf>,  
Link to register:  
[https://meetoecl1.zoom.us/webinar/register/WN\\_ZxuKxVisTsGbMziqQAyCAA](https://meetoecl1.zoom.us/webinar/register/WN_ZxuKxVisTsGbMziqQAyCAA)
- An EUA-BCA virtual forum 29<sup>th</sup> of April 2021:  
<https://blackcarbonarctic.eu/>
- The Health Effects Institute will organize a virtual Workshop on Air Pollution and Health in Southeast Europe, two days between 7-11 June 2021, [www.healtheffects.org](http://www.healtheffects.org)
- Society for Benefit-Cost Analysis summer workshops, especially the Cost-Benefit Analysis of Environmental Health Interventions. July 12, 9:00 am -12:00 pm US ET & July 13, 6:00 pm - 8:00 pm US eastern time:  
[https://www.benefitcostanalysis.org/sbca\\_online\\_workshops.php#Benefit-Cost%20Analysis%20in%20Low-%20and%20Middle-Income%20Countries](https://www.benefitcostanalysis.org/sbca_online_workshops.php#Benefit-Cost%20Analysis%20in%20Low-%20and%20Middle-Income%20Countries)
- Quadrennial Ozone Symposium (QOS 2021) 3<sup>rd</sup> – 9<sup>th</sup> of Oct. 2021:  
<http://qos2021.yonsei.ac.kr/>
- The European Commission CCM conference on Modelling for Policy Support, 22<sup>nd</sup> – 26<sup>th</sup> of November 2021:  
[https://knowledge4policy.ec.europa.eu/event/2021-eu-conference-modelling-policy-support-collaborating-across-disciplines-tackle-key\\_en](https://knowledge4policy.ec.europa.eu/event/2021-eu-conference-modelling-policy-support-collaborating-across-disciplines-tackle-key_en)
- MODSIM virtual conference 28<sup>th</sup> November – 3<sup>rd</sup> of December 2021:  
<https://www.mssanz.org.au/modsim2021/index.html>

## VIII. CONCLUSIONS

28. TFIAM discussed and identified several draft answers to the questions raised by the Gothenburg Protocol review group and made several additions, including timing of deliverables, that will be included in the next version of the TFIAM answers to the review questions.

29. TFIAM supported efforts to develop a guidance document on non-technical and structural measures (e.g., changes in mobility, diets). If the WGSR requests such a guidance document, a special group will be tasked to prepare that.

30. The effectiveness of ammonia to form secondary PM<sub>2.5</sub> due to reduced sulphur and NO<sub>x</sub> concentrations in the atmosphere can have effects on cost-effectiveness of ammonia control to improve human health and shift the deposition pattern of nitrogen on ecosystems. This potential impact needs to be discussed and analysed further.

31. It would be beneficial to include the recent improvements of the GAINS modelling in south-east Asia into the European module of the GAINS model (including its eastward expansion). These developments include fine scale source receptor modelling (EMEP-u) enabling multi-scale policy modelling with GAINS.

32. Synthesis work as well as new studies reconfirm the substantial costs of inaction on air pollution throughout the UNECE geographical domain, although with significant regional variation. Damage costs (or costs of inaction) from sectoral activities or projects should include transboundary effects and not cut-off at the border.

33. Short-term studies of air pollution during pandemic-induced lockdowns show a decrease of NO<sub>2</sub>-concentrations during 2020. In general, they do show less significant, and variable, impact on fine particulate matter. Long-term effects remain to be studied.

34. Atmospheric dispersion of microplastics was recognised as an important area of concern, with synergies with emission control of primary particulate matter. But at this stage, the knowledge base does not appear to be ready for analysis with IAM.

35. TFIAM welcomed the initiative to revive the Network of National Integrated Assessment Modellers (NIAM) aimed at more frequent informal contact between national experts and policy makers, and extended exchange of information than possible during the TFIAM meetings.

36. The web broadcast of TFIAM (including Russian interpretation) is functional and should continue during forthcoming (hybrid) sessions, preferably (budget allowing) with interpretation into Russian.

## Annex 1: 2020-2021 Workplan items

Decided at the 39<sup>th</sup> Executive Body of the Air Convention

([https://www.unece.org/fileadmin/DAM/env/documents/2019/AIR/EB/ECE\\_EB.AIR\\_144\\_Add.2-2001545E.pdf](https://www.unece.org/fileadmin/DAM/env/documents/2019/AIR/EB/ECE_EB.AIR_144_Add.2-2001545E.pdf))

WP item	Activity	Outcome	Lead Body(ies)	Resources
1.1.1.2	Harmonize PM inventory emissions and modelling, accounting for condensables	Expert workshop(s) on condensables (2020-2021, as needed) + Reporting to EMEP Steering Body	MSC-W and other relevant bodies, notably CEIP, TFMM, TFEIP, TFIAM, TFTEI	Nordic Council of Ministers/other sources
1.1.3.1	IAM-Framework for the review of the amended Gothenburg Protocol (AGP),  Assessment of extent to which long-term targets will be met (in 2020–2030–2050)	Position paper for the review of AGP (2020)  Data and scenario analyses (2021)	TFIAM and CIAM	In-kind + EMEP mandatory contribution
1.1.3.2	Assessing observed trends in air pollution at the various scales  Follow-up on the measurement (twin-sites) and modelling approaches to assess the long-range contribution to urban air pollution.  Linkages between global and regional air pollution	Note to the review of the Gothenburg Protocol (2020)	TFMM, TFHTAP, TFIAM, MSC-W	In-kind
1.1.3.3	Ammonia: Contribute to improve understanding of expected benefit of ammonia mitigation	Ammonia assessment report in 2020	TFIAM with support from TFMM, TFRN and national experts	In-kind
1.1.4.1	EPCAC road map	Position paper on multiscale interactions (2020)  Two annual meeting of EPCAC (2020 and 2021)	TFIAM with nominated experts	In-kind
1.1.4.4	Investigations on global scenarios and assessment of global	Report (2021)	TFIAM and TFHTAP	In-kind



WP item	Activity	Outcome	Lead Body(ies)	Resources
	sectoral mitigation measures			
2.1.3	Discuss control strategies to recommend for use by the TFHTAP of air pollution in future scenarios	Development of policy questions + recommendations on priority sectors	WGSR, TFIAM, TFHTAP	
2.1.6	Undertake a review of the control costs currently used with a view to improving –on an ongoing basis – the cost-effectiveness analyses produced by the GAINS model	Review of control costs currently used and update	TFTEI, TFIAM	Funding needed
2.1.7	Produce a report for policymakers that clearly sets out the costs of controls versus the costs of inaction	Report for policymakers	TFTEI, TFIAM	Norway has kindly contributed
2.2.1	Development of guidance in relation to prioritizing reductions of particulate matter from sources that are also significant sources of black carbon	Draft guidance document submitted for adoption by the Executive Body at its 40th session	TFTEI, TFIAM	Currently the project EUABCA will contribute, but more in-kind is welcome