TASK FORCE ON INTEGRATED ASSESSMENT MODELLING (TFIAM)

45th session, 23 - 25 May 2016
Lisbon, Portugal

Chairs report – version 22 June 2016

I. INTRODUCTION

1. This report describes the results of the 45th session of TFIAM, held from the 23rd to the 25th of May 2016 in Lisbon, Portugal. The presentations made during the meeting and the reports presented are available at: www.iiasa.ac.at/TFIAM/past-meetings.html

2. Thirty-three experts attended, representing the following Parties to the Convention: Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, Switzerland, the Russian Federation, and United Kingdom of Great Britain and Northern Ireland. Other bodies represented were the EMEP Centre for Integrated Assessment Modelling (CIAM), the ICP Vegetation Task, the Task Force on Techno-Economic Issues (TFTEI), the JRC Institute for Environmental Sustainability, the European Topic Centre on Air Pollution and Climate Change Mitigation, the European Environment Bureau (EEB/Airclim) and CONCAWE.

3. Mr. R. Maas (Netherlands) and Mr. S. Åström (Sweden) chaired the meeting.

4. Ms. Ana Teresa Perez, Director of the Environmental Protection Agency in Portugal welcomed TFIAM to Lisbon and opened the meeting.

II. OBJECTIVES OF THE MEETING AND NEWS FROM OTHER BODIES

5. Mr. Maas presented the latest developments within the CLRTAP, and defined the purpose of the 45th TFIAM meeting, which were to learn about recent European policy analysis and CIAM model developments, and to learn from parties' experience of assessing co-benefits and trade-offs between climate change and air pollution.

6. News on the Air Convention:

- The CLRTAP Scientific Assessment report is to be published on the 31st of May in the Norway house, Brussels. Air pollution remains an international problem and especially agricultural emissions would require more attention. See: http://www.unece.org/env/lrtap/welcome.html
- The TF health has launched a new Health impact assessment model (AIRQ+: http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/activities/airq-software-tool-for-health-risk-assessment-of-air-pollution) and started work on revising the Air Quality Guideline values.
- TF EIP has requested information from the parties regarding whether they report particulate matter emissions including condensables or not.
- The discontinuation of the CCE financing leads to challenges. At the short term it needs to be ensured that data collected in 2017 is made available to CIAM in order to be able to include biodiversity changes in policy formulation. In the longer run, there is a need to develop a new focal point for assessing multiple

stressors on biodiversity (including climate and land use changes) and to link the critical loads approach traditionally used within the Air Convention to assess ecosystem impacts with other concepts such as the ecosystem services approach and the planetary boundaries approach.

III. RECENT POLICY ANALYSIS WITH GAINS

7. CIAM presented how the GAINS model had been used to estimate how much impact policy instruments have had on emissions. In hypothetical scenarios without decoupling of emissions from economic growth, acidification and human health impacts would have increased with a factor 30 for acidification from 1990 levels and with a factor 3 for PM-related human health impacts. For ozone, the ozone fluxes to forests have been reduced with some 30% and ozone related human health impacts with some 70%, eutrophication impacts would have been a factor 3 higher than what it is currently.

8. New GAINS work included the analysis of the Eco-design directive, the Medium Combustion plants (MCP directive, and the revised Non-Road Mobile Machinery (NRMM) directive. In comparison to the modelled cost-effective strategy that was developed to support the EU NEC directive proposal, the three directives would achieve additional emission reductions. The turnover rate of the existing capital stock was a critical assumption in the calculations.

9. Other GAINS work was related to estimating the source-apportionment of PM concentrations in large cities. New results for Asia Delhi show similar results as for Europe. Even in very large cities like Delhi, up to 60% of total PM-concentrations is caused by sources far outside of the cities. The GAINS model has also been applied for the Global Health Impact Assessment of WHO. A critical assumption was the use of a non-linear exposure-response relationship. At higher concentration levels, changes would show less additional health impacts than the same changes at lower concentration levels. For additional information see: http://www.iiasa.ac.at/web/home/research/researchPrograms/air/Program-Overview.en.html

IV. UPDATES ON EUROPEAN SCIENTIFIC RESEARCH

10. During the last year, the Task Force for Techno-economic instruments (TFTEI) had developed the emission abatement cost calculation tool for large point sources: ERICCa_LCP (Emission Reduction Investment and Cost Calculation). This tool is available on the TFTEI web page. TFTEI has also produced Guidance documents for emission reductions from mobile emission sources. Currently TFTEI develops guidelines for VOC-measures and cost calculations (ERICCa_VOC). TFTEI provides a Clearing House on reduction techniques with the aim to provide information on BAT. See: http://tftei.citepa.org/en/

11. The proposal for the development of an International Nitrogen Management System-project (INMS) aims at developing joint management strategies for nitrogen, with funding sought from the United Nations Environment Programme (UNEP), implemented through the Global Environment Facility (GEF). The project is in a final review phase and will focus on improved data collection, regional demonstration projects, costs and effects of nitrogen policy measures, as well as improved nitrogen modelling. See: http://www.inms.international/

12. The ICP vegetation has applied a global ozone flux model developed by EMEP/MSC-West, which enabled analysis of ozone impact on crop losses on a global level. The current estimate is that globally, ozone exposure causes almost 10% wheat production loss with an economic value of almost €25 billion per year. However, analysis also shows in many parts of the world that ozone only partially explains the difference between the optimal and the observed yield ('yield gap'). The ICP Vegetation has the last years also published reviews of ozone impacts on biodiversity and has mapped Natura 2000 habitats at potential risk from ozone impacts. See: http://icpvegetation.ceh.ac.uk/. Currently ICP Vegetation is involved in a number of analyses, inter alia an international moss survey for the analysis of heavy metal accumulation and nitrogen concentrations.

13. TFIAM took note on the developments of the EU-project SEFIRA, that used interviews, focus group workshops, and discrete choice analysis (16 000 questionnaires) to identify acceptability of suggested air pollution abatement instruments. One interesting result is that citizens perceive that industry is (still) the main source of air pollution, followed by transport. The link with food and agriculture is hardly recognized. Transport behaviour was seen as the most important individual contribution to cleaner air. There were differences between countries, income levels, age groups and gender in their preference for behavioural change versus paying a price for polluting the air. See: http://www.sefira-project.eu/

14. TFIAM took note of the newly developed interactive SHERPA tool, developed by the JRC. SHERPA aims at providing information for air quality managers in regions and cities. It addresses questions such as: What can I influence in terms of control in my region? Which sectors or pollutants are most important? With whom should I coordinate action? How large are the impacts of actions? SHERPA includes the air quality impacts of local and regional policies as well as policies implemented in a wider region or at the European scale. SHERPA uses a simplified source-receptor model. The methodology is able to reproduce the country-to-grid source receptor relationships of the CHIMERE air quality model. TFIAM advised to make additional tests and to check how SHERPA behaves in comparison to EMEP model. SHERPA can be downloaded from: http://aqm.jrc.ec.europa.eu/sherpa.aspx .

V. NATIONAL EXPERIENCES CO-BENEFITS /TRADE-OFFS OF CLIMATE & AIR POLICY

15. Several experts presented national analyses of the impact of additional climate and energy policies on air pollution. Although there are differences in climate policy ambition levels between countries, TFIAM noted that in general these policies would offer more reduction of emissions of SO_2 and NO_x than included in the current national baseline scenarios in GAINS. In those cases where climate measures also included reductions of methane and N_2O emissions from the agricultural sector, also ammonia emissions could become lower, because such policies would lead to a reduction in fertilizer use, cattle numbers and dietary change.

16. Encouragement of domestic biomass burning as part of a climate policy would potentially increase residential emissions of particulate matter and POPs. In order to avoid this, such climate measures would need to be accompanied by stricter emission standards for small combustion sources. Also efforts to influence 'clean wood

burning' behaviour (including the choice of wood quality and ignition techniques) will be important to prevent an increase in emissions.

17. Encouraging the use of diesel cars as part of climate policy, could also lead to less NOx-reduction as would be the case when the share of petrol cars was increased. Because of this several cities consider to discourage the use of diesel cars.

18. Besides the costs and effects, societal acceptability and need for new legal arrangements appeared to be important criteria in omitting certain policy measures from the whole basket of potential additional measures. In one case a multi criteria analyses was performed to explicitly take into account societal acceptability and lacking legal framework in the assessment of potential measures.

19. In several countries, the potential of local scale measures to meet air quality limit values or to further reduce health risks have been assessed. In most cases it was found that local measures alone were insufficient, despite that compared to (inter)national assessment studies more measures to influence local transport behaviour have been included, e.g. as part of a comprehensive approach to promote healthy life styles.

20. TFIAM took note of the presentation from the ETC/ACM on emissions from domestic heating in Europe. Residential combustion of wood, coal and oil is a major contributor to exceedances of Benzo(a)pyrene (BaP) and PM2.5 target- and limit values in Europe. Emissions of BaP show an increase, which is strongly related with the increase in wood combustion (and the emissions of PM2.5 from domestic wood combustion). Only 12% of the European population lives in areas with concentrations of BaP lower than 0.12 ng/m^3 (corresponding to the WHO acceptable risk level of one cancer incidence in 10^5 inhabitants). 11% of the European population live in areas under the WHO guideline values of 10 µg/m^3. Domestic wood burning can cause 5-40% of total PM2.5 concentration during the heating season. Emissions from wood combustion are very dependent on a large number of behavioural factors, and cause a broad uncertainty range around generic emission factors.

21. Denmark is aiming for a 100% renewable electricity and heat system by 2050, and a transport system that is to a large extent dependent on renewable energy. There will be substantial co-benefits for air pollution. However, the connection to air pollution is not linear since the transport system will still we be based on combustion. Air pollution is not an significant driver in the Danish energy plans. Energy security is the main driver.

22. The German climate and energy policy is driven by the 2011 decision to phase out nuclear power by 2022. An analysis of an Energy Transition scenario shows that a reduction of CO_2-emissions with 42% from the 1990 level will have no impact on NH_3, NMVOC and PM2.5, but will reduce emissions of NO_x and SO_2 in addition to the baseline projections. Emission reduction of SO_2 is mainly caused by reduced coal use. PM2.5 emissions from domestic heating have increased in Germany between 1997 to 2011 due to increased use of wood combustion. Nationally the PM2.5 emission from wood combustion is now larger than from traffic.

23. Recent integrated assessment modelling in Spain has focused on estimating PM2.5 emissions and PM2.5 concentrations in Spanish cities. Modelling was performed both on city level and street level. The results showed inter alia that congestion in one specific part of the city could increase the NO_x emissions in that part with up to 65%. Currently city emission abatement strategies are assessed as part of the new Air Quality and Climate Plan for Madrid.

24. Air quality and climate research in Ireland focused on transport and domestic heating. Available data enabled an estimation of road transport activity distributions across all roads of Ireland. A study on the potential for retrofit of air source heat pumps in the residential sector showed that residential sector emissions of NO_x and PM2.5 could be substantially reduced with net costs savings, while greenhouse gases could be reduced by some 4 million tons under one defined scenario. An evaluated Irish non-ETS climate scenario would decrease emissions of NO^x and SO_2 substantially, but would increase emissions of NMVOC and PM2.5 due to the increased use of biomass recommended under that specific climate scenario.

25. In Finland the impact of nearly-zero energy buildings (nZEB) on emissions of air pollutants and greenhouse gasses in 2030 is expected to be low, as the current policy proposal focusses on new buildings.

26. The current climate and energy scenario for the Netherlands shows a CO_2 emission reduction with 20% by 2030 from 2010, implying 25% reduction in SO_2, 12% NO_x and 47% PM2.5. An illustrative scenario where 40% of fossil use was replaced with wind energy would give additional health benefits of the same order of magnitude as the proposed revised NEC directive.

27. Portugal had calculated emission scenarios for both greenhouse gases and air pollution. Between 2005 and 2030, 30-40% reduction of greenhouse gasses is projected. Assuming that all measures from the national air strategy will enter into force, the requirements of the revised Gothenburg for 2020 will be met for all pollutants. Nevertheless, by 2020, some locations are expected to remain in non-compliance for the PM10 and NO_2 limit values. For ozone, the non-compliance is expected to be substantial.

28. France had developed an evaluation chain for decision support in the development of the national air pollutant emission reduction plan using a multicriteria analysis approach. Currently the exceedance of limit values for PM10, PM2.5, NO_2, and ozone is fairly wide spread and more measures are needed. The French study also includes measures that are not commonly included in integrated assessments, such as “knowledge improvement” measures and “incentive” measures. The French study examines the impact of each measures on emissions reduction, costs, benefit, societal acceptance, legal leverages and co-benefits for PAH, heavy metals and Greenhouse gasses. The study identified the level of public aversion or support for certain measures on the basis of its attention in news media and expert consultation. Moreover, the study identified if new measures could be introduced within the existing legal framework or would require new legislation. The set of measures and their evaluation was intensively discussed with key stakeholders. The impacts on average annual concentrations can be presented measure by measure at a high spatial resolution.

29. The analysis of potential co-benefits between air pollution and greenhouse gas policy in Sweden by 2030 focussed on transport, Non-Road Mobile Machinery (NRMM), and small-scale domestic wood combustion. Preliminary results showed the relative importance of large scale infrastructure changes and of scrapping initiatives to reduce emissions from the oldest vehicles, machines and domestic heating units.

30. In order to assess the potential co-benefits between climate and air pollution policies Switzerland had commissioned IIASA to develop scenarios using the (Swiss) GAINS model. The analysis showed the impact on air pollution from ambitious

climate policies (WAM) compared to the existing climate policies (WEM), from ambitious air pollution scenarios (MTFR) compared to existing air pollution scenarios (CLE), as well as the combination of WAM and MTFR (=MCE). The results showed clear impacts of WAM climate policies on emissions of air pollution in Switzerland. Even ammonia emissions would decrease, as methane and N_2O reductions would imply a reduction of fertilizer use and cattle densities. Cost-effective measures focusing on agriculture and small wood burning devices would bring compliance with the WHO air quality guidelines for PM2.5 into reach by 2030, assuming that transboundary contributions will be reduced significantly by the revised NEC directive.

VI. OTHER INTEGRATED ASSESSMENT WORK

31. Measurements of real world emissions of Euro-6 cars in the United Kingdom emphasized the importance of addressing the high primary NO_2 emissions from the diesels as well as their wide range of exceedance of standards for NO_x. Just two of 39 Euro-6 diesels had achieved the standard of 80 mg/km of NOx, and the average could be significantly improved by removing the worst few cars. Data are publicly available at: www.emissionsanalytics.com. The UKs Committee on Medical Aspects of Air Pollution, COMEAP has been reviewing the health impacts of exposure to NO_2. The resulting costs of exposure of the UK population to NO_2 are comparable with those attributed to fine particulate matter (https://www.gov.uk/government/publications/comeap-long-term-exposure-to-air-pollution-and-chronic-bronchitis). Based on interim advice from COMEAP the UK Department of Environment, Food and Rural Affairs has updated its guidance on valuing changes in emissions of NO_x and concentrations of NO_2, with very much higher damage costs attached to traffic emissions in cities. See:https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/460401/air-quality-econanalysis-nitrogen-interim-guidance.pdf . Comparison of technical measures and behavioural changes in cities illustrate the need to consider wider co-benefits: improvements in physical fitness from active travel far outweigh the health impacts of exposure to air pollution and accident risks.

32. TFIAM noted the presentation by AirClim on measures to reduce NO_x emissions from international shipping. A report will be published soon on the impacts of reducing emissions by introducing a Nitrogen Emission Control Area (NECA) in the Baltic and the North Sea. The results show a gradual decrease in NO_x emissions from international shipping after 2021. However with economic instruments, for example a levy and fund system, on the entire shipping fleet, emissions could be reduced more and quicker with a levy at the level of 2-3 € / kg NO_x.

33. Results of joint Integrated Assessment activities by Sweden and the Russian Federation show that baseline emissions of NH_3 for the Oblasts studied could increase by 12% between 2005 and 2030, but that there is a relatively large reduction potential. Scenario results show inter alia that a NH_3 emission reduction strategy for the European part of Russia would have a relatively large impact on the region of Moscow due to the regional proximity to high emitting regions. A major source of uncertainty with respect to the black carbon emissions is the location and intensity of gas flaring.

34. Consultant EMRC updated the task Force on progress in the monetisation of health as well as ecosystem impacts. EMRC had a.o. been involved in health monetisation studies for London (https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution), the Balkans (http://www.env-health.org/resources/projects/coal-s-unpaid-health-bill/coal-s-unpaid-health-bill-in-the/) and OECD (https://www.oecd.org/env/indicators-modelling-outlooks/OECD_CIRCLE_web-2014.pdf). Changes in damage estimates have occurred due to the direct health impacts from NO_2 exposure and because air pollution is associated with more types of diseases, including e.g. diabetes, obesity and dementia.

35. The ÉCLAIRE-project (http://www.eclaire-fp7.eu/sites/eclaire-fp7.eu/files/eclaire-files/documents/Deliverables/D18_3.pdf) enabled to improve the valuation of crop losses and reduced forest growth due to ozone exposure. Several methodologies were applied to value biodiversity losses due to excess nitrogen: e.g. the willingness to pay for biodiversity protection, the restoration costs to maintain favourable conditions for species in nature areas, or the emission mitigation costs to comply with EU Nature directives or the UN Convention on Biodiversity. GAINS optimizations showed that an optimal strategy based on health impacts only would entail biodiversity co-benefits, but that the benefits of an additional biodiversity ambition would exceed the additional costs, even if the method with the lowest monetary value for biodiversity was used.

VII. WORK PLAN

36. During the past year TFIAM was involved in the coordination of the Scientific Assessment Report that is now finalised. The Task Force also participated in the February workshop organised by TF HTAP and AMAP on hemispheric scenarios and policy strategies. The 46th meeting of TFIAM will be held in May 2017 in France. In cooperation with the JRC, TFIAM intends to organise a meeting in spring 2017 on the options for local scale policies back-to-back with the meeting of the FAIRMODE project.