38th Task Force Meeting of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests)

Virtual Meeting, 2–3 June 2022

Minutes

Opening

1 The 38th Task Force Meeting (TFM) of ICP Forests was held online, with 77 participants from 28 countries (see Annex I).

2 Marco Ferretti (MF), Chairman of ICP Forests, opened the meeting and welcomed all participants from the ICP Forests/WGE community and other external bodies on behalf of the ICP Forests. He expressed his gratitude to Päivi Merilä (NFC Finland) and the Natural Resources Institute Finland (Luke), the ICP Forests Scientific Committee, and all abstract submitters for their preparation of this year's TFM and ICP Forests Scientific Conference FORECOMON, which were both to be held in Helsinki. However, due to the Russian attack on Ukraine, the TFM was held online and FORECOMON postponed to the following year. MF also thanked Juliane Henry and the Federal Ministry of Food and Agriculture (BMEL) in Germany, the Thünen Institute and the Programme Co-ordinating Centre of ICP Forests (PCC) for organizing the meeting online.

Item 1 Adoption of the agenda and of the minutes of the last Task Force Meeting

3 The Task Force adopted the agenda of the meeting and approved the minutes of the 37th Task Force Meeting.

Item 2 Report by the Programme Co-ordinating Centre (PCC) on activities and progress since the 37th TFM

4 Kai Schwärzel (KS), Head of the Programme Coordinating Centre (PCC) of ICP Forests presented the **PCC's progress report since the last ICP Forests Task Force Meeting**. He presented the meetings organized by the ICP Forests community and the publications issued by ICP Forests (reports, ICP Forests Briefs). He also presented the awareness raising and advocacy activities initiated and carried out by the PCC. For example, the PCC in co-operation with the Swiss Federal Office for the Environment FOEN and the Northwest German Forest Research Institute NW-FVA led a Special Forest Session at the 8th Global Nitrogen Conference (30.5.-3.6.2021). Another example of awareness raising and advocacy is the organization of a joint webinar by ICP Forests and Forest Europe entitled 'Monitoring and Assessing Forest Health'. Finally, it would be worth mentioning that the PCC commented on the new EU initiative 'EU Forests – New EU Framework for Forest Monitoring and Strategic Plans'.

5 KS showed how ICP Forests contributes to the implementation of the Work Plan of the Air Convention and how ICP Forests contributes to the revision of the Gothenburg Protocol. He then presented other initiatives concerning the work of ICP Forests. It is worth mentioning here the initiative of the PCC and the Chairman to resume ICP Forests activities in countries that have suspended their monitoring. In addition, a questionnaire was presented for programme leavers. The aim of this

questionnaire is to preserve some of the expertise and insight of those who have worked for ICP Forests for many years. An overview of the finances was given. In 2021, the PCC received $115,100 from the UNECE. Of this, 97% was used for Staff and other personnel costs and 3% for General operating and direct costs.

6 Alexa Michel (PCC) presented the structure and highlights of the new **2022 Technical Report** (TR) and thanked everyone for their contributions. She recommended to read the draft carefully and send suggestions for change to her by 16 June 2022. She will then distribute a final draft for approval by the TF.

7 MF presented a new proposal for a comprehensive **ICP Forests 2025 – 40 Years Assessment Report (AR).** He showed the motivation, main features, provisional timelines, and roles in the preparation of the report. By including published data and results from outside the ICP Forests, he emphasized the difference to the Ecological Studies book (ESB) whose publication is also aimed at 2025. During the discussion, the idea of another anniversary report similar to the ones in the past was welcomed. Concerns were raised about the expected workload in addition to the ESB. It was suggested that the data users or policy makers report on the relevance of ICP Forests, to publish the AR as a more focussed version of the ESB, or hire a professional scientific writer. MF invites the TF to send him and the PCC written feedback by the end of June.

Item 3 Revision of the ICP Forests Manual

8 Anne-Katrin Prescher (AKP) from the PCC presented the latest changes to **Manual Part I** on *Objectives, strategy, and implementation of ICP Forests* and **Manual Part XIV** on *Sampling and analysis of deposition* for approval by the TF and thanked all authors and contributors. A major revision of Manual Part I is planned for the next revision of all Manual parts in 2025. AKP explained again the differences between a minor Manual update, which can be implemented any time, and a major update every five years. The latest versions are always available on the ICP Forests website with all changes listed at the end of the document.

9 The TF adopted both Manual revisions with the following amendment in Manual Part I, Section 2.1, Objective III: Change of wording, new sentence: *Maintain and provide high quality, harmonized, accessible data managed in one central database.*

Item 4 The ICP Forests Database: Status and future work

10 Till Kirchner (TK), Data Manager at the PCC, informed the TF about the „**general status of the database and data portal**“. All technical problems of the data portal could be solved before the start of the last data submission period (see minutes TFM 2021). All Manual changes agreed on in 2020 could be implemented successfully. TK described the new free Level II dataset (decision of the TF in 2018), which is available under: http://icp-forests.org/open_data . Using a fictitious example TK explained step by step how this dataset can be used by interested users to analyze the ICP Forests database if it fits the needs of a project. TK summarized some aspects of how to publish additional future datasets derived from the ICP Forests monitoring data. The general idea is to develop gap filling and aggregation algorithms to create “ready to use“ datasets in a standardized way which simplify the further usage of the data.

11 During the discussion, TK informed the TF that the open dataset will soon be properly announced and available from the ICP Forests website. He suggested to wait until the gap filling of the data is finished before discussing the publication of aggregated data at the next Task Force Meeting.

Item 5 Status of the Ecological Studies book (ESB)

12 KS reported on the challenges (e.g. data quality and completeness) and on the motivation for a publication in the Ecological Studies book series by Springer (e.g. to improve the data infrastructure, bring together various scientists, and increase the visibility of ICP Forests). He showed the general book structure and reported on the progress since the last TFM, on responsibilities of the parties involved and on agreements reached so far. He again encouraged the TF to (re-)submit data to improve and complete the ICP Forests database and finished by listing the next steps in the ESB preparation.

13 During the discussion, the book was acknowledged as a great opportunity for improving the incompleteness and quality of the ICP Forests data.

14 Catherine Hilgers (PCC) informed the TF about **progress on data science at ICP Forests**. Gap filling for the forthcoming Ecological Studies book is her main focus. She is developing a missing data methods handbook, interviewed chapter authors about their data needs, prepared a first draft of a filled Meteorology data set using ERA5-Land data, shared plans for the Deposition data set to be filled with EMEP data, and noted improvements in coding practices at ICP Forests. She made a request to NFCs that they test filled Meteorology data on a few modeled test sites in different parts of Europe. An email about the latter is forthcoming.

Item 6 Reports by the ICP Forests Expert Panels and Committees on activities and progress since the 37th TFM

15 **EP Ambient Air Quality** (Chair: Diana Pitar, Co-Chair Elena Gottardini)
Diana Pitar presented the meetings at which EP leadership participated in the last year (Expert Workshop on Ammonia, 28-29 March 2022 in Dessau/online, held in the framework of the CLRTAP) and the issues discussed at their last EP meeting with 23 participants from 12 countries. She mentioned the contribution of the EP to different reports and listed four major publications related to the EP AAQ. The results of the last year online photo exercise were presented, as well as other QAQC activities. A revised photo exercise is planned for next summer, as well as the preparation of minor revisions to the Manual Part VIII – *Assessment of Ozone Injury* and Part XV – *Monitoring of Air Quality*. She presented data availability and data quality for the database and the status of the resubmission / correction of the database by the countries, and progress in writing the ESB chapters.

16 **EP Biodiversity and Ground Vegetation** (Chair: Roberto Canullo, Co-Chair: Jean-Luc Dupouey)
Roberto Canullo presented topics discussed at their last EP meeting with 18 participants from 13 countries, recent minor Manual changes, and authors and data availability of the ESB. The TF approved Leena Hamberg from the Natural Resources Institute Finland LUKE as new Co-Chair of the EP Biodiversity and Ground Vegetation.

17 **EP Crown Condition and Damage Causes** (Chair: Nenad Potočić, Co-Chair: Volkmar Timmermann)
Nenad Potočić informed about a pending decision on a minor change to the Manual related to tree damage status, the establishment of a new Ad-hoc Working Group on Tree Physiology led by Filippo Bussotti and Martina Pollastrini from the University of Florence UNIFI, the status of the work for the ESB, and Level I and Level II data availability. A new section on QA/QC was included in the TR 2022 chapter on crown condition with a list of participants in the 2021 Photo ICC.

18 **EP Deposition** (Chair: Arne Verstraeten, Co-Chairs: Peter Waldner, Daniel Žlindra)
Arne Verstraeten reported on the status of the data resubmission. He presented the core group of authors and an overview of the data availability for the chapter in the Ecological Studies book. He listed 13 publications and highlighted the one by Marchetto et al. (2021). The analysis for the TR 2022 revealed a possible effect of the COVID19-lockdowns on the depositions of NO_3-N and sscSO$_4$-S. At the last EP meeting in Prague some minor changes to the database and files for reporting were discussed

and a FAQ section was added to the guidelines for submission. An update of the Manual Part XIV on Deposition including a new section on the measurement and analysis of mercury was presented to the TF for approval. The next EP meeting will be held as part of the JEPM in 2023

19 AV announced that Daniel Žlindra is leaving as a co-chair of the EP and he thanked him for more than 15 years of commitment and personal dedication to the EP. The TF approved Andreas Schmitz from the State Agency for Nature, Environment and Consumer Protection of North Rhine-Westphalia, Germany, as new Co-Chair of the EP Deposition.

20 **EP Foliage and Litterfall** (Chair: Pasi Rautio, Co-Chair: Liisa Ukonmaanaho)
Pasi Rautio and Liisa Ukonmaanaho reported on the status of foliage and litterfall data submission and corrections, a minor update of the Manual, new publications, and data availability of foliar/litterfall data.

21 **EP Forest Growth** (Chair: Tom Levanič, Co-Chair: Tanja Sanders)
Tom Levanič presented the main outcomes and decisions from the last EP meeting, planned changes of the Manual, and the status of the work for the ESB. He listed data requests and publications including growth data. The TF approved Monika Vejpustkova from the Czech Forestry and Game Management Research Institute as another Co-Chair of the EP Forest Growth.

22 **EP Meteorology, Phenology, and LAI** (Chair: Stephan Raspe, Co-Chair: Stefan Fleck)
Stephan Raspe reported on the last EP meeting with 39 participants from 17 countries held in Prague May 5–7, 2022. A working group of quality assurance in meteorology with Karl Gartner (Austria), Vit Šrámek (Czechia), and Lothar Zimmermann (Germany) was built. The Expert Panel will produce a regular contribution on weather condition to the Technical Report from 2023 onwards. Regarding the phenological survey, results from the first photo trainings course were presented showing a good consistency of the assessment with variation mostly ± 1 score. The beginning and end of the phenological phases could be determined with high accuracy. Furthermore, it was decided to establish a facilitated upload of hemispherical pictures for LAI assessment. And the conditions for the continuation of time-series in heterogeneous plots shall be defined in the Manual. For the ESB chapter "Phenology of Canopy Leaf Area" a Working Group of contributors is being put together, including external experts in phenological modelling and allometric models. The biogeographical regions with missing data for meteorology, phenology, or LAI were listed.

23 Stephan Raspe resigned as Chairman of the Expert Panel but will remain Co-Chair for Phenology; Stefan Fleck remains Co-Chair for Canopy Leaf Area. The TF approved Lothar Zimmermann from the Bavarian State Institute of Forestry as new Chair of the EP Meteorology, Phenology, and LAI.

24 **EP Soil and Soil Solution** (Chair: Bruno De Vos, Co-Chairs: Nathalie Cools, Tiina M. Nieminen)
Bruno De Vos informed the TF about quality improvements of the solid soil databases S1 (Level I) and SO (Level II). Registration for a data resubmission workshop for soil solution on 16 September 2022 will open soon. The Horizon Europe project Pathfinder was accepted, the FORWARDS proposal submitted. A scientific publication and an ICP Forests Brief on heavy metals are in preparation. BDV gave an overview of the data availability of solid soil and soil solution data on Level II and solid soil on Level I plots and asks for (re-)submissions of soil and soil solution data. He encouraged individual countries to ask for their national Level I central lab BioSoil data from the European Soil Data Centre (ESDAC) at JRC and send it to the FSCC. He also asked for support from each country in the reclassification of soils from WRB 2006 to WRB 2014/2015, which is essential for ecocluster classification, and offered his help if needed. He also asked the TF for an update of contact information of solid soil and soil solution experts on the ICP Forests Website[1]. Planned future activities centre around the ESB project.

[1] http://icp-forests.net/page/expertlist

25 **Working Group on QA/QC in Laboratories** (Chair: Alfred Fürst (AF), Co-Chair: Anna Kowalska) Alfred Fürst informed about the progress of the ring tests since the last TFM: 11th Deposition & Soil Solution Ringtest[2], 24th Foliage & Litterfall Ringtest[3] and the 10th Soil Ringtest[4]. In case of a failed ring test, the NFCs will be informed by the PCC. The current status of the laboratory qualification can be seen on the ICP Forests website[5]. The causes of a failed qualification are also indicated.

26 Since the beginning of the 1990s, a total of 45 ring tests have been conducted. An article on the development of the ring test programme and the WG QA/QC in laboratories will be published in the Technical Report 2022. The 8th Meeting of the Heads of the laboratories took place at the WSL in Switzerland. The minutes and the presentations can be found on the ICP Forests webpage[6]. AF thanked the team of the WSL for the invitation and for the perfect organization of this meeting. The next meeting of the heads of the laboratory should be a hybrid meeting too and Turkey offered to organize it in spring 2024.

27 Alfred Fürst will retire on 1 August 2022 after 27 years in ICP Forests. The Task Force approved Anna Kowalska from the Polish Forest Research Institute as new Chair of the WG QA/QC in Laboratories and Tamara Jakovljević from the Croatian Forest Research Institute as new Co-Chair.

28 **Quality Assurance Committee** (Chair: Manuel Nicolas)
Manuel Nicolas reported on the committee's activities, and he submitted to the TF a new draft mandate for the period until 2025, with a time schedule defined in an annex. After the revision of the Manual Part III adopted in 2021, the main target is to support EPs in updating the QA/QC procedures accordingly in each Manual part, for the next revision planned in 2025. The Committee will also be in charge of the next revision of the Manual Part II and Part III. Other tasks include the support (a) of EPs in the organisation of internal exercises and in the regular evaluation of data quality objectives and indicators, and (b) of the PCC in setting up a new reporting system in the ICP Forests database for quality in the field and defining a practical framework for reporting the overall quality of the programme, e.g. in the annual Technical Report. The Task Force approved the new mandate of the Quality Assurance Committee for the period until 2025.

29 **Scientific Committee** (Chair: Marcus Schaub, Co-Chair: Lars Vesterdal)
Marcus Schaub reported on the committee's activities since the last TFM. They had again reviewed the summaries by EP Chairs of scientific studies on air pollution effects on forests, which the PCC uses for their WGE reporting. MS and Nathalie Cools represent ICP Forests in the H2020 eLTER Preparatory Phase Project (eLTER PPP) and H2020 eLTER PLUS. A special issue in *Frontiers in Forests and Global Change* was published based on FORECOMON 2021 presentations. Another special issue is planned with contributions from everyone whose FORECOMON 2022 abstract was accepted. FORECOMON 2022 had been postponed to 2023. MS acknowledged the preparation work of Päivi Merilä and her team at the Natural Resources Institute Finland Luke for this year's FORECOMON which had been postponed to 2023.

30 On behalf of the ICP Forests Task Force, MF thanked Alfred Fürst, Daniel Žlindra, and Stephan Raspe for their dedication and commitment in leading ICP Forests Expert Panels/Working Groups over many years. He then welcomed the new chairs and co-chairs wishing a successful collaboration in the coming years.

[2] http://icp-forests.net/group/qualityinlaboratories/page/deposition-and-soil-solution-ringtest-and-qa-qc-information
[3] http://icp-forests.net/group/qualityinlaboratories/page/foliage-and-litterfall-ringtest-and-qa-qc-information
[4] http://icp-forests.net/group/qualityinlaboratories/page/soil-ringtest-and-qa-qc-information
[5] http://icp-forests.net/page/working-group-on-quality
[6] http://icp-forests.net/group/qualityinlaboratories/page/document-archive#Birmensdorf

Item 7 Recent selected scientific findings originated from ICP Forests data (invited presentations)

31 **Aldo Marchetto** from the Italian National Research Council CNR reported on the results of a **comparison between measured and modelled deposition**, proposed by the ICP Forests discussion group and recently published on "Frontiers in Environmental Science". The results of the EMEP MSC-W model, which evaluates wet and dry deposition through a chemical transport model, were compared with the results of the analyses of samples collected in 2010-14 in 62 wet only, 240 bulk open field and 246 throughfall samplers belonging to the EMEP Chemical Co-ordinating Centre CCC and ICP Forests monitoring networks. Nitrate and sulfate deposition compared well, in particular for low values where the effect of local sources are less important. For ammonium deposition local sources are more important, and measured deposition was generally lower than modelled. This pattern was even more evident in throughfall because of nitrogen retention in tree canopy. *Marchetto A, Simpson D, Aas W, et al (2021) Good agreement between modeled and measured sulfur and nitrogen deposition in Europe, in spite of marked differences in some sites. Front Environ Sci 9. https://doi.org/10.3389/fenvs.2021.734556*

32 **James Weldon** from the Swedish University of Agricultural Sciences showed results from a study on the **effect of N deposition on bryophyte communities**. Question: At a European scale, can a eutrophication signal and/or a negative impact of nitrogen deposition on forest bryophyte diversity be seen? Data from ICP Forests Level II and ICP IM was used. Responses examined were species evenness and richness, community N preference (Ellenberg) and functional diversity index (based on broad morphological traits - life form, life strategy). Explanatory variables used were NH_4 and NO_3 throughfall deposition. Canopy cover, precipitation, forest age and type, soil pH (also latitude/longitude/survey year). qGAM models were used, allowing non-linear responses. It was found that N deposition is significantly associated with increased bryophyte community mean Ellenberg N values and decreased species evenness on a European scale. This suggests an increased dominance of nitrophilous species. The effect sizes are modest, with a decline of at most ca. 15% in evenness attributable to N deposition. The impact of N deposition on mean Ellenberg N preference is greater, at most a ca. 20% increase. *Weldon J, Merder J, Ferretti M, et al (2022) Nitrogen deposition causes eutrophication in bryophyte communities in central and Northern European forests. Ann For Sci 79:24. https://doi.org/10.1186/s13595-022-01148-6*

33 **Luciana Jaime** from the CREAF Department of Ecology was not present at the meeting but made her presentation available to the TF on the shared documents folder. She presented a study that assessed the **recent patterns of bark beetle disturbance and forest resistance across European coniferous forests during the 2010–2018 period**. For that, they used the ICP Forests database to obtain bark beetle attack and tree mortality on 130 plots including five host trees and five bark beetle species. Then, they analyzed the overall forest resistance and species-species responses, in terms of bark beetle attack and derived mortality, in relation to the distance to the climatic niche optimum of species, previous drought events and plot characteristics. Regional patterns revealed that forests in central, north, and east of Europe could be at risk under the attack of multivoltine bark beetle species. They found that overall forest resistance to beetle attack was determined by several driving factors, which varied among species responses. The environmental position of the affected forest within the host and beetle species' climatic niche and plot characteristics mediated the influence of drought on the resistance to beetle attack. In turn, forest resistance to derived mortality was determined exclusively by the maximum intensity and duration of drought events. Their findings suggest that the joint influence of drought events and bark beetle disturbance will threaten the persistence of European coniferous forests, even in those tree populations close to their species' climatic optimum. *Jaime L, Batllori E, Ferretti M et al. (2022) Climatic and stand drivers of forest resistance to recent bark beetle disturbance in European coniferous forests. Global Change Biology 28:8. https://doi.org/10.1111/gcb.16106*

34 **Mark Anthony** from the ETH Zurich presented **linkages between soil microbiome diversity and European forest tree growth**. Soil microbiomes are important mediators of forest functioning. In this presentation, the importance of ectomycorrhizal fungal (EMF) diversity, a key constituent of the forest microbiome, was linked to tree growth and forest carbon capture rates. Their study shows that EMF composition was linked to a three-fold difference in tree growth rate even when controlling for the primary abiotic drivers of tree growth. Fast tree growth was associated with EMF communities harboring high inorganic but low organic nitrogen acquisition gene proportions and EMF which form contact versus medium-distance fringe exploration types. These findings suggest that EMF composition is a strong bio-indicator of underlying drivers of tree growth and/or that variation of forest EMF communities causes differences in tree growth. MA also showed a sneak peek of the results from their more recent analysis of the entire soil microbiome, including all fungi and bacteria. Total soil fungal composition was strongly correlated with total forest carbon storage whereas bacterial composition was only weakly correlated. This works provides the first systematic analysis of the links between the soil microbiome and forest carbon storage across Europe. *Anthony M, Crowther T, van der Linde S et al. (2022) Forest tree growth is linked to mycorrhizal fungal composition and function across Europe. ISME J 16:1327–1336.* https://doi.org/10.1038/s41396-021-01159-7

35 **Jan-Peter George** from the University of Tartu presented **European-wide mortality dynamics and defoliation patterns in ash that reveal rapid population decline because of ash dieback**. European ash (*Fraxinus excelsior*) and narrow-leafed ash (*F. angustifolia*) are keystone forest tree species with a broad ecological amplitude and significant economic importance. Besides global warming both species are currently under significant threat by an invasive fungal pathogen that has been spreading progressively throughout the continent for almost three decades. Ash dieback caused by the ascomycete *Hymenoscyphus fraxineus* is capable of damaging ash trees of all age classes and often ultimately leads to the death of a tree after years of progressively developing crown defoliation. While studies at national and regional level already suggested rapid decline of ash populations as a result of ash dieback, a comprehensive survey at European level with harmonized crown assessment data across countries could shed more light into the population decline from a pan-European perspective and could also pave the way for a new conservation strategy beyond national borders. Data from the ICP Forests Level I crown condition monitoring from 27 countries were presented resulting in >36,000 observations. They found a substantial increase in defoliation and mortality over time indicating that crown defoliation has almost doubled during the last three decades. Hotspots of mortality are currently situated in southern Scandinavia and north-eastern Europe. Overall survival probability after nearly 30 years of infection has already reached a critical value of 0.51, but with large differences among regions (0.20-0.86). Both a Cox proportional hazard model as well as an Aalen additive regression model strongly suggest that survival of ash is significantly lower in locations with excessive water regime and which experienced more extreme precipitation events during the last two decades. Their results underpin the necessity for fast governmental action and joint rescue efforts beyond national borders since overall mean defoliation will likely reach 50% as early as 2030 as suggested by time series forecasting. *George J-P, Sanders T, Timmermann V et al. (2022) European-wide forest monitoring substantiate the necessity for a joint conservation strategy to rescue European ash species (Fraxinus spp.). Sci Rep 12:4764.* https://doi.org/10.1038/s41598-022-08825-6

Item 8 Reports by other bodies under the Air Convention

36 Krzysztof Olendrzynski (KO) from the **UNECE Secretariat of the Convention** gave an update on recent developments under the Convention. He listed highlights from the 41st Session of the Executive Body, 60th session of the Working Group on Strategies and Review, and 7th joint session of the EMEP SB/WGE, and Extended Bureaux meeting. He also reported on the latest capacity building activities in EECCA countries, and communication and outreach activities.

37 KO explained that the current position of the UNECE is that no member country may be excluded from a UNECE meeting. In case of future needs, he UNECE Secretariat can launch online meetings in some cases but physical meetings in Geneva cannot be supported.

38 Isaura Rábago, **Chair of the Working Group on Effects** under the UNECE Air Convention, provided an update on current WGE and Convention issues. She listed previous meetings and WGE contributions to the review of the Gothenburg Protocol. Topics to be discussed at the upcoming 8th Joint EMEP-WGE session (12-16 September 2022) include Annex I, which is a more elaborate compilation of scientific findings to be included in the review of the Gothenburg protocol, access to EMEP and WGE data, and a letter of co-operation with eLTER (EU ESFRI).

39 Sophie Standring, Chair of the **Forum for International Cooperation on Air Pollution FICAP**, could not be present at the meeting but had prepared a presentation on the newly established Forum for International Cooperation on Air Pollution, which was made available to the TF in the shared documents folder. The forum aims to promote international collaboration towards preventing and reducing air pollution to improve air quality globally. The forum is open to wide participation from interested Parties from all regions, Non-Government organisations and experts. The goal is to provide mutual learning, expertise and foster collaboration between countries and organizations to improve regional air quality. The first Task Force meeting will be held in Bristol, United Kingdom, from 10-12 October 2022, which will be an opportunity to shape the forum, foster information-sharing and stimulate the engagement of non-UNECE countries and regions to help tackle air pollution. This will be followed by the first forum event to be held in Sweden in March 2023. For more information or any questions, please get in touch with John Salter (john.salter@defra.gov.uk) or Petra Hagstrom (petra.hagstrom@naturvardsverket.se).

40 Kari Austnes, Head of the Programme Centre of **ICP Waters**[7], gave an overview of ICP Waters activities. The Task Force Meeting 2022 was held in Spain together with ICP Integrated Monitoring. Publications and reports are available at icp-waters.no. The two most recent thematic reports are both on nitrogen. One is on biological effects of nitrogen deposition on surface waters. This was a contribution to the revision of the empirical critical loads of nitrogen and included a literature review and new data analyses. The latter showed that nitrogen deposition gives increased algal production per unit P in the lower nitrogen deposition range. The other report is on nitrogen trends and spatial patterns, relating concentration levels to catchment properties, climate and nitrogen deposition. Nitrate concentrations are generally declining, but not to the same extent. The work plan for 2022 includes a report on biological trends and recovery, and for 2023 on base cation trends. For 2023-2024 there are plans to update the ICP Waters manual, and there is potential for a collaboration with ICP Forests on nitrogen trends. ICP Waters contributes to processes inside the CLRTAP, as well as related to the EU National Emission Ceilings and Water Framework Directives.

41 James Weldon gave an update on **ICP Integrated Monitoring**[8] activities. After many successful years at SYKE in Finland the ICP IM Programme Centre has now moved to SLU in Sweden. The new team was introduced, as well as information about the new website at www.slu.se/en/icp-im. The joint Task Force Meeting with ICP Waters in Spain 10-12 May was a success. An introduction to the planned Extended IM monitoring was given, where less intensively monitored sites in habitats other than forests will be added. This has the added benefit of facilitating reporting under the NEC directive. The 2022-23 work plan involves operationalizing and advertising the Extended IM network, and launching a project modelling biodiversity impacts in co-operation with the Centre of Dynamic Modelling CDM. Activities during 2021-2022 included the migration of the Programme Centre, work on the revision of the Gothenburg Protocol. Scientific papers currently either at the stage of manuscripts or submitted

[7] http://www.icp-waters.no/
[8] http://www.slu.se/en/icp-im20

include a paper on the impacts of internal catchment-related nitrogen parameters to TIN leaching, a paper on HM trends in concentrations and fluxes across ICP IM sites in Europe, and a paper on the effects of N enrichment on forest bryophyte vegetation.

42 Felicity Hayes, Chair of the **ICP Vegetation**[9], reported on achievements of the ICP Vegetation in 2021 and their future work plan. They welcome further participation in a second workshop on the review of Critical Levels for NOx in fall 2022. ICP Vegetation has published several leaflets/brochures on ozone impacts on vegetation, a YouTube ozone overview[10], an online course[11], and updated their ozone injury guides on the ICP Vegetation website. More than 30 countries will participate in a pilot study on mosses as biomonitors of microplastics as indication of atmospheric deposition. They found no significant decline of N in moss between 2005 and 2015, no significant change of Hg since 1990, but significant declines of Cd (-64%) and Pb (-82%) since 1985.

43 Thomas Scheuschner from the Co-ordination Centre for Effects (CCE) presented recent activities of the **ICP Modelling and Mapping[12] (ICP M&M) and the CCE**. He informed about the latest meeting of the ICP M&M (3-5 of May, 2022, online) and presented some highlights of the ICP M&M group discussions: (1) Current work and time plan for the Gothenburg review process, (2) content of next call for data, (3) terminology for critical loads (CL) derived by modelled changes of plant species composition. He also presented some recent projects co-ordinated by the CCE: The finished project about updating the background CL database and the almost finalized project about updating the empirical Critical Load. Several projects recently started e.g. updating the receptor map for the CL calculation, reviewing the Critical Limits for the CL calculation, estimating the impact of climatic factors to the current CL modelling framework. Beside these projects the recent work to support the review of the Gothenburg protocol was presented as well.

44 Sara Jutterström from the **Centre for Dynamic Modelling (CDM)** under the ICP M&M gave an overview of the current and planned activities of the CDM in accordance with the workplan for 2022/2023. CDM plans for an expert workshop focused on modelling interaction between air pollution and climate change. The workshop will explore links between carbon cycling used in climate reporting and nitrogen cycling investigated within CLRTAP. The workshop is planned at the end of 2022 or early 2023. The second activity of CDM is to complete a report (due in 2023) on “Modelling impact of air pollution on biodiversity”. The aim of the report is to be used as guidance for calculating critical loads using modelled biodiversity change. Such guidance will be needed when including an option to include modelled change of species as one of the options for setting critical loads for sulphur and nitrogen.

Item 9 Co-operation, initiatives and projects with other international organizations and programs

45 **Hiroyuki Sase (Network Center for the EANET, the Asia Center for Air Pollution Research)** reported on the progress of the Acid Deposition Monitoring Network in East Asia (EANET) and its ecosystem monitoring. EANET as the regional network has been monitoring acid deposition and its impacts in 13 countries from Northeast Asia and Southeast Asia since 2001. As the recent progress, EANET adopted the supplementary document for the scope expansion, in which PM and surface ozone have been officially included as the target species in addition to acidic substances. Simultaneously, the EANET Project Fund and Project Guideline was also adopted in order to promote specific non-core activities in cooperation with partner organizations and co-financers. Inter-regional cooperation activities could also be considered, if appropriate co-financers could be found. The Fourth Periodic

[9] https://icpvegetation.ceh.ac.uk/
[10] https://youtu.be/OBEJB-60jQU
[11] https://www.ceh.ac.uk/training/ozone-and-tropical-agriculture
[12] https://www.umweltbundesamt.de/en/Coordination_Centre_for_Effects

Report on the State of Acid Deposition in East Asia (PRSAD4) is in printing and will be available soon. Several publications and the new project on air-pollution legacy pools were also reported as the scientific progress. The 10th International Conference on Acid Deposition, ACID RAIN 2020, will be held in Niigata, Japan, 18-21 April 2023 and the abstract submission will open on 1 July 2022.

46 **Thomas Haußmann** gave a report on **Forest Europe** activities. Already 32 years ago, Forest Europe signatories expressed their endeavour for a close co-operation concerning assessment and monitoring with ICP Forests, which resulted in a very productive and close cooperation for over three decades. During the current German chairmanship (2021-2024), Forest Europe focuses on Sustainable Forest Management (SFM), a pan-European Forest Risk Mechanism (FoRISK), and Green Jobs and Forest Education. In addition, an innovative Rapid Response concept for High Level Policy debate on emerging issues, and cross-cutting communication initiatives are overarching focuses. The work towards a co-ordinated FoRISK shall facilitate a transparent collaboration between forest-related stakeholders to strengthen the adaption of pan-European Forests to Climate Change building on knowledge exchange and sound science-based data back-to-back with major European related processes to strengthen synergies, added-values and avoid duplications. From September 2022 until February 2024, a FoRISK Pilot is foreseen with the preliminary focus on wildfire, pests and diseases as well as storm while addressing interrelations of forest risks to strengthen forest adaptation and resilience. In this regard, the importance of sound forest health monitoring is one of the key pillars to work towards a successful FoRISK building on the close cooperation between ICP Forests and Forest Europe.

47 **Sabine Augustin** from the **Federal Office for the Environment FOEN** in Switzerland presented links to YouTube videos on the effects of nitrogen in forests that aim at the general public and were published by FOEN. The videos are available in German[13], French[14], and Italian[15].

48 **Johannes Breidenbach** from the Norwegian Institute of Bioeconomy Research NIBIO introduced the TF to a HorizonEurope-funded RIA titled **PathFinder**, which starts in September 2022 with a duration of four years. The consortium consists of 23 European partners and is led by the Norwegian Institute of Bioeconomy Research (NIBIO). In a nutshell, PathFinder will provide both tools and participatory processes for evidence-based policies in the EU that foster synergies between forest-based bioeconomy and biodiversity to utilize the potential of Europe's forests to mitigate climate change and halt the loss of biodiversity. The PathFinder project will develop a consistent European forest monitoring and carbon reporting system that combines field observations and remote sensing data to conduct consistent national and EU level LULUCF Greenhouse Gas Inventories (GHGIs) and provides information on biodiversity and other key forest ecosystem services. The precise forest information of the monitoring system will feed into a new scenario framework that forecasts future forest scenarios and outcomes of forest management alternatives. The scenarios facilitate trade-off analysis of forest ES and are potential alleys in the pathway assessment. The pathway assessment is a participatory activity in which novel monitoring and scenario studies are integrated with EU-level stakeholder visions and knowledge.

49 **Mirco Barbero** (MB) from the **European Commission – DG Environment** informed about the latest policies with regard to European soils. Since forests and forests soils are intimately linked, it is worth following up what is being developed in Soil Policy at EU level. Within the European Green Deal, the new EU Soil Strategy, adopted in November 2021, brings a policy framework and concrete actions to achieve the vision of Healthy Soils in the EU by 2050. Healthy soils means soils capable of providing multiple ecosystem services at the same time (e.g. food, wood or biomass, water cycling, carbon storage, basis for biodiversity). The flagship initiative of the Strategy is the Soil Health Law proposal, in

[13] https://www.youtube.com/watch?v=Ccw_8FQi5F0
[14] https://www.youtube.com/watch?v=atBXkM76wVs
[15] https://www.youtube.com/watch?v=HRPHQ5RZc9s

preparation for 2023. On this, an intense discussion with Member States is ongoing within the Soil Expert Group, together with the consultation of different stakeholders and general public. The Soil Expert Group will be enlarged in September 2022 to include a balanced representation of organizations from civil society. These initiatives are in close co-ordination with the development of the EU Soil Observatory, which elaborates soil data from LUCAS soil, covering as well forest soils. It will be further working on the integration with national data and on developing links with forest monitoring.

50 During the discussion, MB explained that the EU Soil Observatory takes data from LUCAS and is not yet integrating data from individual countries. Sampling of forest soils is less dense than for agricultural soils in LUCAS and a link with forest monitoring should be developed. He approves of the established connection with ICP Forests.

51 **Alessandro Cescatti** from the **European Commission, Joint Research Centre (JRC)** did not attend the meeting and no presentation was given.

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52 On behalf of the Natural Resources Institute Finland LUKE, Päivi Merilä invited the Task Force to the 10th Scientific Conference of ICP Forests FORECOMON 2023 and 39th Task Force Meeting in Helsinki, Finland, the following year. The Task Force thanked Finland for the kind invitation.

53 On behalf of the Task Force, Marco Ferretti thanked everyone contributing to the successful 38th Task Force Meeting and closed the meeting.

ANNEX I – List of Participants

No	Name	First name	Organisation	Country
1	Anthony	Mark	ETH Zurich	Switzerland
2	Apuhtin	Vladislav	Estonian Environment Agency	Estonia
3	Augustin	Sabine	Federal Office for the Environment FOEN	Switzerland
4	Austnes	Kari	Norwegian Institute for Water Research NIVA	Norway
5	Badea	Ovidiu	National Institute for Research and Development in Forestry	Romania
6	Barbero	Mirco	European Commission – DG Environment	Belgium
7	Benham	Sue	Forest Research	United Kingdom
8	Breidenbach	Johannes	Norwegian Institute of Bioeconomy Research NIBIO	Norway
9	Canullo	Roberto	Camerino University	Italy
10	Češljar	Goran	Institute of Forestry, Belgrade	Serbia
11	Cools	Nathalie	Research Institute for Nature and Forest INBO	Belgium
12	Cummins	Thomas	University College Dublin UCD	Ireland
13	De Vos	Bruno	Research Institute for Nature and Forest INBO	Belgium
14	Đorđević	Ilija	Institute of Forestry	Serbia
15	Eigirdas	Marijus	Lithuanian State Forest Service	Lithuania
16	Faias	Sónia	Institute for Nature Conservation and Forests ICNF	Portugal
17	Ferretti	Marco	Swiss Federal Research Institute WSL	Switzerland
18	Flanagan	Shane	Department of Agriculture, Food and the Marine	Ireland
19	Fleck	Stefan	Nordwestdeutsche Forstliche Versuchsanstalt NW-FVA	Germany
20	Fürst	Alfred	Federal Research and Training Centre for Forests, Natural Hazards and Landscape BFW	Austria
21	George	Jan-Peter	University of Tartu	Estonia
22	Gheorge	Florenta	Institute Alexandru Ciubotarum, National Botanical Garden	Moldova
23	Haertel	Jens	Forest Europe, Liaison Unit Bonn	Germany
24	Haggenmüller	Katrin	Thünen Institute of Forest Ecosystems	Germany
25	Hamberg	Leena	Natural Resources Institute Finland LUKE	Finland
26	Haußmann	Thomas	Forest Europe, Liaison Unit Bonn	Germany
27	Hayes	Felicity	ICP Vegetation, UKCEH	United Kingdom
28	Henry	Juliane	Federal Ministry of Food and Agriculture	Germany
29	Hilgers	Catherine	Thünen Institute of Forest Ecosystems	Germany
30	Ingerslev	Morten	University of Copenhagen	Denmark
31	James Casas	Alice	ICP Modelling & Mapping - INERIS	France
32	Jutterström	Sara	ICP M&M – CDM, Swedish Environmental Research Institute	Sweden
33	Kirchner	Till	Thünen Institute of Forest Ecosystems	Germany
34	Kowalska	Anna	Forest Research Institute	Poland
35	Koutla	Katerina	Hellenic Ministry of Reconstruction of Production, Environment & Energy	Greece
36	Leca	Stefan	National Institute for Research and Development in Forestry	Romania
37	Lech	Paweł	Forest Research Institute	Poland
38	Levanic	Tom	Slovenian Forestry Institute	Slovenia
39	Marchetto	Aldo	Italian National Research Council CNR	Italy
40	Martins	Helena	University of Lisbon	Portugal
41	Merilä	Päivi	Natural Resources Institute Finland	Finland
42	Michel	Alexa	Thünen Institute of Forest Ecosystems	Germany
43	Michopoulos	Panagiotis	Hellenic Agricultural Organization “DEMETER”	Greece
44	Moldan	Filip	ICP M&M – CDM, Swedish Environmental Research Institute	Sweden
45	Nicolas	Manuel	Office national des forêts	France
46	Nieminen	Tiina M.	Natural Resources Institute Luke	Finland
47	Olendrzynski	Krzysztof	Convention Secretariat, UNECE	Switzerland
48	Öztürk	Sıtkı	Republic of Turkey - General Directorate of Forestry	Türkiye
49	Pavlenda	Pavel	National Forest Centre NLC	Slovakia
50	Pitar	Diana	INCDS Marin Dracea	Romania
51	Potočić	Nenad	Croatian Forest Research Institute	Croatia
52	Prescher	Anne-Katrin	Thünen Institute of Forest Ecosystems	Germany
53	Rábago	Isaura	WGE - CIEMAT	Spain
54	Raspe	Stephan	Bavarian State Institute of Forestry	Germany
55	Rautio	Pasi	Natural Resources Institute Finland	Finland
56	Sanders	Tanja	Thünen Institute of Forest Ecosystems	Germany
57	Sase	Hiroyuki	EANET - Asia Center for Air Pollution Research (ACAP)	Japan
58	Schaub	Marcus	Swiss Federal Research Institute WSL	Switzerland

No	Name	First name	Organisation	Country
59	Scheuchner	Thomas	German Environment Agency UBA	Germany
60	Schmitz	Andreas	State Agency for Nature, Environment and Consumer Protection of North Rhine-Westphalia	Germany
61	Schwärzel	Kai	Thünen Institute of Forest Ecosystems	Germany
62	Simončič	Primož	Slovenian Forestry Institute SFI	Slovenia
63	Skudnik	Mitja	Slovenian Forestry Institute SFI	Slovenia
64	Sousa Uva	José	Institute for Nature Conservation and Forests ICNF	Portugal
65	Šrámek	Vít	Forestry and Game Management Research Institute	Czechia
66	Timmermann	Volkmar	Norwegian Institute of Bioeconomy Research NIBIO	Norway
67	Ukonmaanaho	Liisa	Natural Resources Institute Finland LUKE	Finland
68	Vejpustkova	Monika	Forestry and Game Management Research Institute	Czechia
69	Verstraeten	Arne	Research Institute for Nature and Forest INBO	Belgium
70	Vesterdal	Lars	University of Copenhagen	Denmark
71	Waldner	Peter	Swiss Federal Research Institute WSL	Switzerland
72	Weldon	James Kurén	ICP IM, Swedish University of Agricultural Sciences SLU	Sweden
73	Widmer	Miriam	Federal Office for the Environment FOEN	Switzerland
74	Wulff	Sören	Swedish University of Agricultural Sciences	Sweden
75	Zimmermann	Lothar	Bavarian State Institute of Forestry	Germany
76	Zubieta	Belen	MITERD-Spain	Spain
77	Zvirbulis	Uldis	Latvian State Forest Research Institute "Silava"	Latvia
78	Simončič	Primož	Slovenian Forestry Institute SFI	Slovenia
79	Skudnik	Mitja	Slovenian Forestry Institute SFI	Slovenia
80	Sousa Uva	José	Institute for Nature Conservation and Forests ICNF	Portugal
81	Šrámek	Vít	Forestry and Game Management Research Institute	Czechia
82	Timmermann	Volkmar	Norwegian Institute of Bioeconomy Research NIBIO	Norway
83	Ukonmaanaho	Liisa	Natural Resources Institute Finland LUKE	Finland
84	Vejpustkova	Monika	Forestry and Game Management Research Institute	Czechia
85	Verstraeten	Arne	Research Institute for Nature and Forest INBO	Belgium
86	Vesterdal	Lars	University of Copenhagen	Denmark
87	Waldner	Peter	Swiss Federal Research Institute WSL	Switzerland
88	Weldon	James Kurén	ICP IM, Swedish University of Agricultural Sciences SLU	Sweden
89	Widmer	Miriam	Federal Office for the Environment FOEN	Switzerland
90	Wulff	Sören	Swedish University of Agricultural Sciences	Sweden
91	Zimmermann	Lothar	Bavarian State Institute of Forestry	Germany
92	Zubieta	Belen	MITERD-Spain	Spain
93	Zvirbulis	Uldis	Latvian State Forest Research Institute "Silava"	Latvia

ANNEX II – Agenda of the 38th Task Force Meeting of ICP Forests

2 June 2022 (Thu)

09:00 – 09:05	**Opening** • Welcome address from the Chairman of the ICP Forests
09:05 – 09:15	**Item 1 | Adoption of agenda/minutes** Adoption of the 38th TFM agenda and of the 37th TFM minutes (*)
09:15 – 10:05	**Item 2 | Report by the Programme Co-ordinating Centre (PCC) on activities and progress since the 37th TFM** • WGE/1: Progress on WGE Workplan 2022-2023 • WGE/2: WGE Reporting (Gothenburg Protocol Review process) • Meetings/ Conferences • Publications/1: Technical Report 2022 (*) and ICP Forests Briefs • Publications/2: Proposal for a 40 years Assessment Report 2025 • Initiative to reactivate ICP Forests activities in countries that have suspended their monitoring • Financial statement
10:05 – 10:20	**Item 3 | Revision of the ICP Forests Manual (*)**
10:20 – 10:40	**Tea / coffee break**
10:40 – 11:10	**Item 4 | The ICP Forests database - Status and future work** • Data publication concept (*)
11:10 – 12:00	**Item 5 | Status of the Ecological Studies book** • Progress since the 37th Task Force Meeting • Responsibilities of the parties involved & agreements reached so far • Improvement and completion of data in the ICP Forests database • What next? • Gap filling update
12:00 – 13:30	**Lunch**
13:30 – 15:00	**Item 6 | Reports by the ICP Forests Expert Panels and Committees on activities and progress since the 37th TFM** • EP Ambient Air Quality • EP Biodiversity and Ground Vegetation (*) • EP Crown Condition and Damage Causes • EP Deposition (*) • EP Foliage and Litterfall • EP Forest Growth (*) • EP Meteorology, Phenology and LAI (*)
15:00 – 15:15	**Coffee/ Tea Break**
15:15 – 16:15	**Item 6 | Reports by the ICP Forests Expert Panels and Committees on activities and progress since the 37th TFM (continued)** • EP Soil and Soil Solution • Working Group on QA/QC in Labs • Quality Assurance Committee • Scientific Committee

3 June 2022 (Fri)

09: 00 – 09:05	Resumption of the meeting
09:05 – 10:15	**Item 7 | Recent selected scientific findings originated from ICP Forests data** Aldo Marchetto: Comparing measured (ICP Forests) and modelled (EMEP) deposition James Weldon: Nitrogen deposition causes eutrophication in bryophyte communities in central and northern European forests Luciana Jaime: Drivers of forest resistance to bark beetle disturbance in European forests Mark Anthony: Linkages between soil microbiome diversity and European forest tree growth Jan-Peter George: European-wide mortality dynamics and defoliation patterns in ash reveal rapid population decline because of ash dieback
10:15 – 10:45	**Item 8 | Reports by other bodies under the Air Convention** • News from the Convention (Krzysztof Olendrzynski) • News from the Working Group on Effects (Isaura Rabago) • Forum on International Co-operation of Air Pollution (Sophie Standring)
10:45 – 11:15	**Tea / coffee break**
11:15 – 12:05	**Item 8 | Reports by other bodies under the Air Convention** Continued • ICP Waters (Kari Austnes) • ICP IM (James Weldon) • ICP Vegetation (Felicity Hayes) • ICP M&M (Thomas Scheuschner) • CDM (Filip Moldan)
12:05 – 12:15	**Comfort Break**
12:15 – 13:25	**Item 9 | Co-operation, initiatives and projects with other international organizations and programs** Hiroyuki Sase: Acid Deposition Monitoring Network in East Asia (EANET) Thomas Haußmann: Forest Europe Annemarie Bastrup-Birk: European Environment Agency (EEA), Forest Information System for Europe (FISE) Johannes Breidenbach: Norwegian Institute of Bioeconomy Research (NIBIO), Horizon Europe project *Pathfinder* Mirco Barbero: European Commission, Land use & Management Alessandro Cescatti: European Commission, Joint Research Centre (JRC)
13:25 – 13:35	**Item 10 | AOB**
13:35	**Closing of the 38th Task Force Meeting**

(*) Decision items