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CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

International Cooperative Programme on Modelling and Mapping of Critical Loads and Levels and Air Pollution Effects, Risks and Trends

DRAFT CHAIR's REPORT

of the

the 33rd meeting of the Programme Task Force

4th – 6th April 2017 in Wallingford, UK

Draft document

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TABLE OF CONTENTS

Introduction 2

1. Results of the Call for Data 2014 2015 3

2. National contributions to effect-based work (under the LRTAP Convention, including the call for data) 9

3. Experimental and modelling results of abiotic and biotic impacts of air pollution and climate change 10

3.1. Summary of the scientific discussions 12

4. Mapping Manual issues, WGE and ICP progress 13

5. Progress under the LRTAP Convention and ICP M&M workplan 16

5.1. 2018 – 2019 Work plan issues concerning WGE and ICP M&M 16

5.2. 2016 - 2017 work plan and reporting to WGE in 2018 18

5.3. NFC tour de table 19

6. Closure of the meeting 20

7. ICP M&M Task Force recommendations to the Working Group on Effects, discussed at the TF 33rd meeting, Wallingford, 4-6th April 2016 21

8. Annexes 23

8.1. Tour de table 23

8.2. List of participants to the meeting 29

8.4. Bibliography 33

8.5. Final agenda of the meeting 34

INTRODUCTION

57 delegates from the following 23 countries participated to the meeting: Austria, Canada, Croatia, Czech Republic, Denmark, France, Germany, Italy, Iceland, Latvia, Lithuania, Norway, P.R. China, Poland, Russia, Serbia, Spain, Sweden, Switzerland, The Netherlands, United Kingdom, USA.

The Bureau of the Working Group on Effects, the ICP Vegetation, the ICP Waters, the ICP Forests, the Joint Expert Group on Dynamic Modelling and the Coordination Centre for Effects (CCE) were also represented. The list of participants is attached as Annex 1.

TF decisions were reviewed by the participants during the meeting. Presentations and posters were made available on the ICP M&M website (www.icpmapping.org).

Prof Rosemary Hails, Director of Biodiversity and Ecosystem Science at the CEH, welcomed the participants to the meeting. She explained that it was important for CEH to work on impacts of human activities on ecosystems and to find solutions to the observed problems. Thus, the three main fields of activity of CEH are monitoring, modelling and management and decision support tools.

Prof. Ian Boyd, DEFRA chief scientific advisor, explained that air quality was the second item on the top of the political agenda, just behind Brexit. However, in the last 5 years, there does not

seem to have been any decoupling between a country growth and its emissions. To break this coupling, both incentives and regulations are required as well as putting emission reduction at the centre of the economic model.. Tackling sulphur emissions was "easy". Now, remains the difficult work, with nitrogen and especially ammonia. Policy ambitions need to remain high and not to be satisfied with some too small improvements.

Echoing Prof Ian Boyd conclusion, Prof David Fowler entitled his key speech "Thanks goodness we did sulphur first!". Sulphur sources were large and few. It has been easy to control them. Sulphur biochemical cycle is simple and effects responded immediately. For oxidised nitrogen and even more for reduced nitrogen, sources are numerous, biogeochemistry is complex and ecosystems are slow to respond to changes in deposition. Further, we now know that nitrogen inventories are underestimated. We also know that ammonia emissions are strongly influenced by climate conditions (temperature and humidity) and that the main chemical species in the air shifted from NH_4SO_4 to NH_4NO_3. It is therefore important to continue the work on N impacts on ecosystems, and to ask for better inventories of N emissions.

Ms Anne Christine Le Gall, ICP M&M Chair, presented the organisation of the workshop and task force meeting. She indicated that the discussion would focus on the results of the 2015-2017 call for data and on the development of effect-based work. One significant part of the meeting would aim at securing the future of the group in the context of the shutdown of the CCE. She thanked the CCE for nearly 30 years of support, scientific advice and tools developments. The last sessions of the meeting would address an update of the publication of the Mapping Manual, collaboration and organisational issues within the LRTAP Convention.

The TF adopted the minutes of 2016 meeting without modifications. Minor modifications were announced to the Agenda of the 2017 meeting (annex II).

Mr Jean-Paul Hettelingh, head of the Coordination Centre for Effects, explained that according to present knowledge (and funding), the CCE as we know it at the RIVM, and as it has been functioning since 1990 will close down by the end of 2017. CCE operations during 2017 can continue and be finalized thanks to additional funds provided by Germany, Sweden, Switzerland, Norway, France and the Nordic Council of Ministers. The Executive Body is undertaking actions for a new programme centre to be identified if possible before the end of 2018.

1. Results of the Call for Data 2014 2015

Session chair: Jean-Paul Hettelingh

Presentations were given by Jaap Slootweg and Max Posch (CCE), Ed Rowe, Simon Rizzetto, Kari Austnes and Hans Dieter Nagel.

Summary of the discussion on the call for data

At their 1st joint session (Geneva, 14-18 September 2015), the Steering Body to the EMEP and the Working Group on Effects the Working Group on Effects " welcomed and supported the planned new Call for Data by CCE directed to National Focal Centres of ICP Modelling and Mapping to be issued in the fall of 2015" (para. 51; ECE/EB.AIR/WG.1/2015/2).

This ICP M&M task responds to the requirements of the LRTAP Long-term strategy (ECE/EB.AIR/WG.5/2010/17) and of the work plan 2016-2017 as adopted by the Executive Body in December 2016 (work plan item 1.1.1.15). This task covers the "call for data on biodiversity critical loads" and should "ensure that the European critical loads database be updated and available for the Convention's effects-oriented air pollution policies".

13 parties responded to the call and updated their acidification and eutrophication critical loads. 6 parties provided biodiversity critical loads, for a wide range of number of sites (5 in Italy, 1 266 997 in Germany).

The CCE prepared maps with the software R in order to prepare and potentially facilitate the transfer of the database and its use to a new programme centre of the ICP M&M. While ranges of critical values generally meet Mapping Manual recommendations, the CCE recommended that parties should check their submitted values. The CCE insisted that the standard of submitted data should be kept high, and that it was important that the source of data should remain transparent. A decrease in quality of submissions may be the consequence of decreasing funding.

The CCE further explained that the European background database is prepared in collaboration with Alterra, using the methodology described in the Mapping Manual. Following WGE recommendations, the background database is applied to calculate critical loads for countries that do not submit data. The European critical loads database, that consists of data submitted by NFCs and of the European background database for other countries, is used for integrated assessment modelling by CIAM for policy support. The 2015-2017 call for data has now been completed:

- The Critical Loads for acidification and eutrophication have been updated in the European Critical Load database.
- Critical loads for biodiversity (CLbio) have been submitted by 6 countries.
- The CCE compiled a biodiversity critical loads database for the UNECE region as "European background database of biodiversity critical loads". This database can be used for scientific purposes including options for the further support of the NFC development of these novel critical loads.
- The TF concluded that the critical loads for acidification and the critical loads for eutrophication could be used for integrated assessment and therefore for policy support. However, it was recommended that the CLbio methodology and associated thresholds should continue to be subject to scientific research in general, and as much as possible by an increasing number of NFCs, before considering their use for policy support. It was recommended that the CLbio development be continued by the NFCs and, short of an operational CCE, in collaboration with Alterra as appropriate.

Consequences for European critical load maps

There were no major changes in the European Critical loads (CL) for eutrophication and acidification. A difference between critical loads of 2017 and 2015 can be distinguished in for example the Czech Republic and in Germany. Critical loads for Czech ecosystems became lower compared to the map of 2015, because short of a Czech data submission, the European background database was used. For areas in the north of Germany revised critical loads for acidification have been submitted.

The chair encourages NFCs to inform their ministries in charge of the environment but also in charge of agriculture or nature of the availability of the CL methodology, data and of their applicability for policy support in the fields of air pollution as well as nature conservation, climate change issues and agriculture development.

It was agreed that NFCs could update, and if necessary correct, their critical load submissions and their national reports by Friday 5th May 2017. It would be preferable that reports and updates of critical data were sent together.

Follow up of the 2015-2017 Call for Data

In the context of the uncertainty following the shutdown of the CCE, the discussion on the future of the critical load databases highlighted the following points of attention:

- The RIVM is committed to make sure that the database is transferred in its integrity and its quality to the institute that will take over the ICP M&M Programme Centre. It is equally committed to make sure that the 2017 European critical loads database for use in integrated assessment modelling is transferred to EMEP-CIAM.

- It is recommended that the WGE issues a call for 2018 reports of NFCs to the 34th Task Force of the ICP M&M, regarding the continuation of the 2015-2017 call for data on biodiversity critical loads and that the ICP M&M community (NFCs) continues the development of biodiversity critical loads including:
    - The compilation of the national biodiversity critical load database and, short of continued existence of the RIVM-CCE, that NFCs optionally seek collaboration with ALTERRA (Wageningen, The Netherlands; Dr. Gert jan Reinds, Gertjan.Reinds@wur.nl)
    - The continued use of the CCE template and recommendations of the 2015-2017 call for data.
    - The NFC safeguard of national data of the continued work mentioned hereabove until submission can be orchestrated by the CCE successor.
    - The development of the links/coordination with biodiversity community, at international, national and local levels.

It was also suggested that small (NFC-initiated) workshops could be organised to share knowledge and competences on biodiversity CL.

The Task Force recognised the progress made in calculating biodiversity critical loads and also appreciated the work done by NFCs to update their eutrophication and acidification critical loads. These tasks allow to increase the robustness of data in the European critical loads database and ensure coherence with the parties' knowledge of their ecosystems.

Summaries of presentations, as submitted by their authors to the ICP M&M chair.

***Jaap Slootweg and Max Posch*: CCE compilation and analysis of NFC submissions following the call for data 2015-2017**

A summary of the data submissions is as follows:

13 Parties	Results of the 2015-2017 CCE call for data in ICP M&M network			
	# Critical load site records by Parties			Reports
	Eutrophication	**Acidification**	**Biodiversity**	
Austria	26,937	15,643		x
Belgium	27,763	25,542		x
Finland	31,245	1,051		x
France	38,992	38,992	38,992	x
Germany	1,266,997	1,266,997	1,266,997	x
Ireland	191,856	153,762		
Italy	31,965	32,322	5	
Netherlands	84,797	68,47	67,396	x
Norway	165,076	13,987		x
Poland	239,066	239,066		
Sweden	9,316	16,225		x
Switzerland	29,216	10,731	76	x
United Kingdom	381,216	365,315	16,423	x
Total	2,524,442	2,248,103	1,389,889	9

The European background database compiled by the CCE for critical loads for acidification, eutrophication and of biodiversity is used to enable the mapping critical loads, and the assessment of exceedances, for all ecosystems in the EMEP-region for which Parties did not submit critical loads data.

***Ed Rowe, Susan Jarvis and Jane Hall*: Upscaling calculations of biodiversity-based Critical Load functions for UK habitats.**

The MADOC-MultiMOVE model has been used to calculate biodiversity-based critical load (CL) functions. Functions were submitted for 16,554 UK bog sites in response to the CCE Call for Data. Since the critical value of the Habitat Quality Index was defined by running a scenario with N deposition set to the empirical CL for nutrient N (CLempN), values of CLNmax are always close to CLNmax. There was more variation in CLSmax, illustrating greater acid-sensitivity with less precipitation. However, CLSmax values were typically 50-100 % greater than CLmaxS, showing that it takes considerable acidity deposition to cause as much damage to biodiversity as deposition of N above CLempN, at least for these bog sites. Data were not submitted for other habitats, due to uncertainty over the selection of positive indicator species.

***Simon Rizzetto*: Critical Loads for Biodiversity at the French territory scale using ForSafe-Veg-Ecoplant and PROPS modelling: converging issues?**

The French NFC has answered to the 2017 call for data submitting updated data for CLacid and CLeut on actualized forest ecosystems (including national protection status), using the new 0.1° x 0.05° EMEP grid, and updated values for precipitation, air temperature and drainage. Few changes were observed compared with the previous data submitted in 2015. However, some ecosystems appeared less sensitive for sulfur and more sensitive for nutrient N.

CLbdiv and HSi were calculated using the PROPS model at the territory scale and at site scale, and the ECOPLANT model on ICP forest sites. Using PROPS, CLbdiv indicated more sensitive ecosystems both for sulfur and nitrogen. But these results need to be considered with caution because of the influence of the PROPS model parametrization, and of the Eunis level of description chosen to establish the list of representative species. The ECOPLANT model has been calibrated for French forest species on the basis of more than 6000 releves. This allowed to developed robust logistic regression models to compute species response to five main environmental factors (pH, C/N, precipitation, T°, light). The first HS indices obtained on few sites with ECOPLANT differ from PROPS results but are consistent with VEG predictions published by Rizzetto et al. (2016). This work using ECOPLANT is under progress and will be extended to the whole french ICP forest network.

***Kari Austnes*: Exploring critical loads for biodiversity for Norwegian birch forest sites**

As a first exploration of critical loads for biodiversity for Norway, critical loads were estimated for four nutrient poor birch forest sites, situated along a gradient in climate and nitrogen deposition. The tools provided by the CCE were applied, i.e. the critical loads were based on the PROPS model. A 2D model was used, and the normalised HSI threshold was set at 0.8. A comparison of PROPS probabilities with observed probabilities (proportion of sample plots with observations out of 50 sample plots per site) was done for two sites, showing good correspondence for many species, but marked deviations for some. Single species critical loads plots were made for one site. Again some marked deviations from expected N sensitivity were observed. The CLSmax was generally very high. This was also seen for the critical loads calculated per site. The site CLNmax was lower than the empirical critical load, and considered as potentially too low by the experts. This, together with questions regarding the representativity of the PROPS database for Fennoscandian systems and conceptual issues regarding species selection and the HSI threshold resulted in no submission of these data to the CCE, but suggestions for further work has been made. The empirical critical loads for Norway have also been updated.

***Hans Dieter Nagel*: New Results of Critical Load Calculation including Biodiversity in Germany**

2. SCIENTIFIC SESSION:

2.1. NATIONAL CONTRIBUTIONS TO EFFECT-BASED WORK (UNDER THE LRTAP CONVENTION, INCLUDING THE CALL FOR DATA)

Session chair: Anne Christine Le Gall

Presentations were given by Jane Hall, Alessandra de Marco, Ulli Dragosits, Lukas Kohli, Ed Rowe.

Summaries of presentations, as submitted by their authors to the ICP M&M chair.

***Jane Hall*: Current status of UK ecosystems**

Jane Hall presented a summary of the trends in critical load exceedances for UK habitats and designated sites at risk from the adverse impacts from acidification and eutrophication. This showed improvements over time, especially for acidity, but showed significant areas still at risk, with 44% of the acid-sensitive habitat areas with critical load exceedance, and 63% of nitrogen-sensitive habitat areas with critical load exceedance. These results are based on UK 5x5 km deposition data (based on measurement data), and contrast with exceedance results calculated and mapped at the European scale (using deposition from GAINS) and published in CCE reports. The European maps show much smaller areas of UK habitats with exceedance of critical loads (8% for acidity, 15% for nitrogen), highlighting the differences that may occur when different deposition data/models are used. The UK work also showed that the ammonia critical level for bryophytes and lichens (1 ug/m3) is exceeded across 60% of the UK land area, and recent work applying the new flux-based ozone critical levels suggest that virtually all woodland areas have exceedance of ozone critical levels. Further reductions in nitrogen deposition, and particularly reduced nitrogen, are required to reduce the areas of habitats at risk from the adverse impacts from air pollution.

***Dani Kurz and Beat Rihm*: Update of Swiss critical loads including biodiversity as criterion**

In the data submission 2017, CLempN for (sub-)alpine scrub habitats were set to 10 kg N/ha/a (previously 7 kg N/ha/a) based on a national evaluation of biodiversity and deposition data. As proposed by ICP Waters, a new CLempN was mapped for alpine oligotrophic softwater lakes (4 kg N/ha/a). CLacid were resubmitted unchanged as in the submission 2015. Biodiversity critical loads (CLbdiv) were calculated for 79 forest plots in Switzerland (a subset of the 319 sites used for static and dynamic modelling) considering habitat-specific plant communities, a limit of 0.4 eq/ha/a for deposition and HSI as metric for changes in biodiversity. The following models were used: PROPS-CLF (2D), Veg-CL and VeCH-CL. Input required to run the models was extracted from input/output of the acidity critical load run submitted in 2015. Compared to the PROPS and Veg critical load models, VeCH-CL tended to produce lower critical S and N loads irrespective of the critical limit (i.e. fraction of HSImax) applied. Focussing on output of PROPS-CLF (2D) and 80% protection as reference critical limit (i.e. 0.8·HSImax), CLSmax was lower than CLmaxS at around 12% and CLNmax was lower than CLmaxN at around 57% of the sites. Both CLNmax and CLmaxN were, however, cut back by CLnutN in the combined critical load function.

***Ulli Dragosits, Tomlinson, S.J., Carnell E.J., Dore A.J., Misselbrook T.H. , Langford B., Mullinger N., Nemitz E., Sutton M.A. & Tipping E.*: Historical trends in nitrogen and sulphur deposition in the UK: 1800 to present**

Historic deposition estimates of nitrogen (N) and sulfur (S) were reconstructed for the period 1800-2010 for the UK. Emission sources were quantified for agriculture, combustion, industry, transport, power generation, etc. through bottom-up modelling using a wide range of historic datasets and literature, and modelling the spatial distribution. The atmospheric transport model

FRAME was used to calculate the historic time series of deposition maps, taking account of European background emissions.

Major drivers of change in N and S during this period include the Industrial Revolution, combustion-powered transport (trains, ships, cars) replacing horse-power and sailing ships, large-scale mineral fertiliser production from the 1950s through the Haber-Bosch process, and international efforts to reduce air pollution. The results demonstrate the very large increases in N & S deposition during the 19th and 20th century, peaking in the late 20th century. Since then, S deposition reductions have been a big success story, and there have been considerable decreases in NOx emissions following international legislation (e.g. combustion plants, catalytic converters). However, reduced N (mainly from agricultural source) is now the largest source of N deposition in the UK, largely unchanged over recent decades and predicted to remain stable, given current policy.

***Julian Aherne*: Biodiversity critical loads for irish habitats : preliminary results**

***Lukas Kohli*: Validating space-for-time substitution for N deposition**

In Switzerland possible relationships between N deposition at high spatial resolution and plant survey data from the Biodiversity Monitoring (BDM) were analysed. So far the analyses related spatial variation in N deposition with biodiversity measures at a given time. This has led to quantitative exposure-response relationships for two habitats (EUNIS E2.3 and F2.2) and the relationships were used to make predictions about the temporal loss of biodiversity due to N deposition (Roth et al. 2015). This approach is known as space-for-time substitution. The increasing temporal coverage of the BDM data now allows to compare predictions using the space-for-time substitution with real temporal changes in plant richness. We present new findings form the BDM, relate them to our approach and would like to discuss future avenues of gradient study analyses with the experts of ICP M&M.

***Ed Rowe, Jones L, Dise NB, Evans CD, Mills G, Hall J, Stevens CJ, Mitchell RJ, Field C, Caporn SJ, Helliwell RC, Britton AJ, Sutton M, Payne RJ, Vieno M, Dore AJ & Emmett BA*: Pressure, midpoint and endpoint metrics of N pollution: current and proposed metrics**

We reviewed metrics of N pollution pressure, metrics that illustrate achievement of a desired endpoint, and midpoint metrics that illustrate progress towards such endpoints. Due to the persistence of N in ecosystems, N pollution pressure may be better reflected by cumulative deposition than by current deposition. However, ecosystems can withstand a certain amount of N pollution, and deposited N generally becomes less active over time, so it is appropriate to calculate cumulative deposition in excess of the empirical critical load during a preceding period such as 30 years, rather than total deposition since a fixed date. Many proposed midpoint metrics such as pH or soil N/C ratio respond slowly or inconsistently to N pollution, or are affected by other drivers. Changes in moss tissue N concentration (corrected for species) are comparatively cheap to measure and are a good indicator of recent N pollution at lower rates of N deposition (< 25 kg ha^{-1} yr^{-1}). At higher rates, nitrate leaching rate is a responsive midpoint metric. Endpoint metrics should reflect things people care about, such as water quality or biodiversity. Many different endpoint metrics have been proposed for biodiversity. In a separate study, the prevalence of positive indicator species was found to reflect expert assessments of overall habitat quality better than the other metrics assessed, such as species richness.

2.2. Experimental and modelling results of abiotic and biotic impacts of air pollution and climate change

Session chair: Ed Rowe.

Presentations were given by Seraina Basin, Anne-Lena Wahl, Chris Fields, Anthony Dore, Gert Jan Reinds, Wieger Wamelink, Maria Francesca Fornasier, Jaap Slootweg and Jean Paul Hettelingh.

Summaries of presentations, as submitted by their authors to the ICP M&M chair.

Seraina Bassin, Ulrike Zell, Matthias Volk, Jürg Fuhrer: *N-induced changes in root litter decomposition: links to soil parameters and plant species composition*

Carbon and nitrogen cycling as well as their immobilization in soils is determined by litter decomposition rates, which in turn are influenced by litter quality and edaphic/climatic factors. Although dominant plant inputs into soil in grasslands are belowground, little is known about the effect of elevated nitrogen (N) deposition on root decomposition.

A reciprocal transplantation experiment was set up to distinguish effects of altered litter quality from N effects on edaphic conditions. This was done in a long-term experiment, in which 36 turf monoliths from a subalpine pasture were exposed for six years to elevated N (+50 kg N ha-1 yr-1, N50) or remained as control (N0). In the seventh year, litter bags containing roots either from N0 or from N50 monoliths were buried for three months in the top soil layer of both the N0 and N50 monoliths.

Root litter mass loss was significantly increased by +15% by N deposition. Moreover, consistent positive correlations were found for decomposition of the two litter types with pH (Pearsons' correlation: 0.5 and 0.65 for N0 and N50 litter respectively) - probably due to better nutrient availability at higher pH - and with sedge abundance (Pearsons' correlation: 0.65 and 0.68 for N0 and N50 litter), but only in N50 monoliths. This suggests that sedge abundance, being up to 300% higher in N50, was a key driver for the observed increased root mass loss in N50 monoliths.

As a result of shifts in species composition and individual plants' physiological adaptation, chemical composition of roots was significantly altered by the N addition (C:N ratio (-6%), P concentration (-8%), K concentration (-31%), Ca concentration (-21%), ADL:lignin ratio (-12%)). These changes were of minor importance for litter decay in N0 monoliths. However, strong positive correlations between P and K concentration, respectively and mass loss in N50 plots explain why highest decay rates occurred when P/K-rich N0-litter was introduced into N amended, sedge-dominated monoliths.

These results show that elevated N deposition may increase root decomposition rates primarily by changing edaphic conditions through shifts in species composition (the presence of sedge increases the decomposition). Under such conditions, likely due to P and K co-limitation of the decomposer community, litter chemistry gains in importance. Overall however in soil environment also causes high variations in decomposition rates.

Anne-Lena Wahl, S. Bassin, M. Volk, J. Fuhrer: ***Arbuscular Mycorrhizal Fungus interactions under climate change in mountain regions: preliminary results***

A transplantation experiment to investigate interaction effects of six levels of climate warming (-1.2 up to +3.2°C), two levels of water availability (irrigated and not irrigated) and two levels of N fertilisation (0, +15 kg N ha^{-1} yr^{-1}) on plant- AMF relationships in subalpine grassland of different soil origin was conducted in Ardez, Switzerland (2013-2017). Soil origin had no effect but with increasing soil potassium content root colonisation rate by AMF increased. N fertilisation also led to higher colonisation and increased cover of non-mycorrhizal sedges. This suggests that plants using AMF foraging strategies use AMF to forage for limiting nutrients. As not soil phosphorous but soil potassium content affected colonisation rate, potassium seems the limiting nutrient here. Colonisation also increased with 3.2°C warming combined with drought: AMF are important for water acquisition after a certain drought threshold. Considering AMF in the investigation of global change effects on plant diversity could help to improve our understanding.

Chris Fields et al.: ***An application of VSD+ Studio and MADOC - Multimove dynamic modelling to produce site-specific critical loads***

Critical loads for acidity and nutrient nitrogen represent the main policy tool to control air pollution impacts at protected sites, yet there is evidence from gradient surveys that many species are lost below the critical load. This may be because pollutants and their effects can accumulate over many years. Dynamic modelling may offer some solutions to this problem by enabling site-specific critical loads to be calculated, thereby, customising the pollutant response through the addition of a temporal element which considers pollutant accumulation.

As part of their operating permit conditions, operators of some UK Electricity Supply Industry (ESI) power stations and refineries were required to undertake a period of monitoring at key N2000 protected sites that were potentially vulnerable to acidification and eutrophication. This study uses monitoring data collected by CEH as part of this and focusses on Skipwith Common, a SSSI heathland site in North Yorkshire. At around 13 kg N ha^{-1} yr^{-1}, site monitored deposition is at the low end of the heathland critical load range for nutrient N yet there is evidence of acidification, soil C:N is low and leachate N is high suggesting N saturation. Vegetation condition also appears poor with a low occurrence of Common Standards Monitoring (CSM) positive indicators: forb species and some bryophytes present have been associated with high N deposition in survey work.

Here, we apply the VSD+ model and the MADOC-MultiMOVE model chain to calculate site-specific critical loads. We also test a new critical limit for biodiversity based on the habitat suitability for 31 CSM positive indicator species and investigate the impact of pollutant reduction and climate change scenarios on habitat suitability. Results suggest that the site will fail to meet future conservation objectives even under a pollutant reduction scenario of 20%, and highlights the need to consider more invasive management practices at many of our protected sites

Anthony Dore: **Modelling the concentration of NH3 and exceedance of the critical level in the UK**

Gert Jan Reinds: **Latest developments on VSD+ - PROPS modelling**

Wieger Wamelink: PROPS, how to go forward?

In 2017 the article about the PROPS model will be finished. We will investigate what the determining abiotic factors per plant species are by applying multivariate analysis on the dataset behind PROPS. This analysis will also include traits as seed dispersal besides the abiotic soil parameters, including P, K, Mg and Ca. Furthermore, we will investigate if a multiple spline response function will improve the predictive power of PROPS and meanwhile also prevent the sometimes very awkward reaction of the one step method to the dataset when extrapolating.

Maria Francesca Fornasier: **Recent advances in the application of VSD chain of models on 5 Italian forest sites**

Jaap Slootweg: **Analysing the distribution over abiotic parameters of plant species occurrence**

Jean-Paul Hettelingh and Maximilian Posch: **Critical loads for biodiversity and exceedances using the CCE background data base**

Robustness analysis combines exceedances of CL of nutrient nitrogen, empirical nitrogen and biodiversity. Thus, it shows areas where exceedance of one or several of these parameters is likely or very likely to occur. This approach allows to increase confidence in the area at risk and to set up no regret policies.

Conclusions and recommendations include:

- The geographical pattern of sensitive ecosystems (with low "classical critical loads") in Europe does not change significantly between the databases of 2015 and 2017.
- Areas at risk of acidification (exceedances of CLaci) in 2005 and 2020 cover 10% and 5% respectively (relevant for policy support) of Ecosystem areas
- Areas at risk of eutrophication (exceedances of CLeut) in 2005 and 2020 cover 67 % and 59 % respectively (relevant for policy support) of ecosystem areas.
- [Areas at risk of change of biodiversity (exceedance of CLbio)) in 2005 and 2020 cover 19 % and 17 % respectively] (for IAM research purpose)
- Areas where the likelihood of exceedances ranges from "likely" to "virtually certain" seem to be located in western-central Europe, irrespective of whether the risk of acidification, eutrophication or loss of biodiversity is addressed.

2.3. SUMMARY OF THE SCIENTIFIC DISCUSSIONS

The discussions highlighted that while sulphur reduction had been very efficient and had led to significant improvements in the ecosystems, nitrogen remains a problem, especially reduced nitrogen. The necessity to carry out invasive management practices in areas submitted to high nitrogen deposition to improve the ecosystem conditions was highlighted. Several methodological issues also remain to calculate critical loads of biodiversity. Further the "classical" critical loads (acidity and eutrophication) and their exceedances can still be improved

and harmonised. Moreover, improved emissions inventories and political ambition are needed so that ammonia impacts on ecosystems can be reduced. One hypothesis may be that ammonia emissions may increase in a warmer climate with less acidic atmosphere (because of lower sulphuric and nitric acids in the air). As ammonia emissions from ecosystem increase, ammonia is expected to remain longer in the air but not necessarily to be transported on longer distances.

Interactions between air pollution and climate change, nitrogen and phosphorous should continue to be an important focus of effect oriented research under the LRTAP Convention. Developments in VSD + PROPs model chain will be pursued to assess model sensitivity. Also it will be necessary to verify model responses and increase the number of habitats included in the modelling.

NH_3 critical levels are exceeded over 60% of the UK, according to national models and monitoring. On a European scale, areas at risk of acidification, eutrophication and loss of biodiversity caused by a reference emission scenario under the NECD in 2020 have been computed to cover 5%, 59% and 19% of European ecosystems classified according to EUNIS. Areas where the likelihood of exceedances ranges from "likely" to "virtually certain" *seem* to be located in western-central Europe, irrespective of whether the risk of acidification, eutrophication or loss of biodiversity is addressed

3. MAPPING MANUAL ISSUES, WGE AND ICP PROGRESS

Chair: Anne Christine Le Gall

On behalf of Isaura Rabago, WGE Chair, Jesper Bak (as vice chair of the WGE) informed the participants on the main recommendations issued by EB or the WGE. These included:

- The revision of the mandates for the WGE and EMEP ICPs and TF. Previous mandates had last been written more than 15 years ago.
- The request to elaborate the 2018-2019 workplan in the light of the Scientific Assessment Report (*Towards Cleaner Air: Scientific Assessment* Report, published in 2016[1]).
- The scientific focus of the WGE-EMEP meetings in September 2017 will be of interaction between ecosystem monitoring and modelling to better inform WGSR and EB about trends and impacts of air pollution and to identify strengths and gap of the monitoring network, databases and models.
- The setup of a **common WGE portal** is in progress. The aim of the portal is to provide an overview and a one point access to the data and knowledge collected by the WGE (the Inspire Directive requires that data collected under public funds in the EU is made freely available to the public). Free availability of data increases the visibility of WGE work and its transparency. Initially short description of all ICPs will be presented (before September 2017) with links to ICP's websites.
- Fresh news from WGE chair present at a EU meeting in Brussels indicated that there had been discussion at EU level on article 9 of the revised National Emission Ceiling Directive (2016/2284) and on its annex 5. Article 9 makes monitoring mandatory and Annex 5 lay out indicators to be used and refers to the Convention Manuals and methodologies. They are therefore documents that may be used by NFCs to support their requests for funding. The need for a sustainable funding for monitoring was recognised.

[1] http://www.unece.org/fileadmin/DAM/env/lrtap/ExecutiveBody/35th_session/CLRTAP_Scientific_Assessment_Report_-_Final_20-5-2016.pdf

The ICP M&M Chair presented the update of the mandate for the ICP M&M and its Programme Centre, as drafted following a template prepared by EMEP and WGE Chairs together with the Secretariat. This document has been requested by the EB to:

- Better identify the activities of the different groups under the Convention, improve visibility and facilitate communication.
- Simplify the Convention workplans as routine tasks should be in the mandate and no longer in the workplans.
- Show how parties beneficiate from the Convention work.

This document is expected to be valid for at least 5 years.

The discussion led to some modifications suggested by the NFCs. As a result, a revised text proposal for the ICP M&M mandate will be sent to the Secretariat by the ICP M&M Chair. It is expected that the Secretariat suggests or makes some further changes to homogenise the mandates between the different groups.

Mr. Harry Harmens (UK), Chair of ICP Vegetation, gave an overview of recent activities of the ICP Vegetation. A main deliverable has been the revision of ozone critical levels for vegetation as described in the amended Chapter 3 of the Modelling and Mapping Manual of the LRTAP Convention, based on methodologies and response functions discussed at the UNECE 'Ozone Critical Levels' Workshop, 7 – 8 November, 2016, Madrid, Spain (and two preceding preparatory workshops) and the 30th ICP Vegetation Task Force meeting, 14 – 17 February, 2017, Poznan, Poland. At the 30th ICP Vegetation Task Force meeting, 21 flux-based ozone critical levels were adopted for crops, forest trees and (semi-)natural vegetation. No changes were made to concentration-based ozone critical levels. Mr. Harmens gave examples of the exceedance of ozone flux-based critical levels in the UK for 2015. He also described potential opportunities to stimulate participation of EU Member States in the ICP Vegetation monitoring networks with the implementation of the amended National Emissions Ceilings Directive (Directive (EU) 2016/2284), in force since December 2016. Finally, Mr. Harmens described i) a new methodology developed to identify globally areas with high plant diversity at high risk from high ozone fluxes; ii) the contributions of the ICP Vegetation to the Tropospheric Ozone Assessment Report and to discussions in the Climate and Clean Air Coalition on developing metrics for the evaluation of methane and black carbon interventions, and iii) the medium-term workplan (2017 – 2020) of the ICP Vegetation.

Reto Meier presented the outcome of the Olten Workshop where the calculation of N immobilisation in soil has been discussed (cf document "*Concluding Report Olten Workshop on long-term N immobilisation.pdf*" sent to participants on 23/03/2017). An updated section V.3.1.3.1 to be included in the Mapping Manual has been drafted and was submitted to the ICP M&M TF. This led to intense discussion and finally a consensus on a text (in Annex). According to the procedure set up in 2015 and 2016, the text is to be submitted to the WGE for approval. Meanwhile this text will be posted on the ICP M&M website together with Chapter 5. This workshop has been organised thanks to Switzerland and Germany.

With the update of Chapter 3 by ICP Vegetation and this last modification included in the Chapter 5, the Mapping Manual can be translated into Russian. Dr Serguei Gromov (national EANET Activity Centre in Moscow) has offered to translate the Mapping Manual in Russian. The document is therefore to be sent to him.

The chair informed the ICP M&M TF that the TF on measurement and modelling (under EMEP) planned to evaluate the sensitivity of CL exceedance to the deposition calculated by different atmospheric models. Any NFC interested to participate to this exercise should contact the TFMM chair (Augustin.colette@ineris.fr). Antony Dore explained that he had started such comparisons with UK models and CL exceedances and that to his experience the two parameters that lead to

the greatest differences between the models were the velocity of ammonia dry deposition and the wet deposition on uplands.

Summaries of presentations, as submitted by their authors to the ICP M&M chair.

ICP Waters, Kari Autnes

The aims of the ICP Waters are to assess the impact of atmospheric pollution on surface waters, collecting information on and producing reports on trends and dose/response relationships. The latest report was on macroinvertebrate biodiversity in relation to acidification and climate change. A thematic report on mercury in fish is currently in progress. Trends for lakes only affected by air pollution will be investigated. Work on the thematic report for 2018 has also been started. The objective of this report is to give an overview of the current acidification status for surface waters, as a supplement to the assessment of exceedance of critical loads of acidity. An enquiry has been sent to the NFCs, and the ICP M&M NFCs are encouraged to assist with information on acid sensitivity, where needed. The ICP Waters web pages have been upgraded, with visualization of monitoring data and trends. The next task force meeting will be held in Uppsala May 9-11, as a joint meeting with the ICP Integrated Monitoring.

***Jennifer Phelan*: Critical Loads, Deposition, and Exceedances in the United States – Critical Load Mapper Tool**

National Atmospheric Deposition Program (NADP) – Critical Loads of Atmospheric Deposition (CLAD) has formed four working groups (WGs) to address critical load (CL) topics of importance to the CL community in the U.S. These include: adding new data to the U.S. National Critical Load Database (NCLD), characterizing CL uncertainty, synthesizing multiple CLs in protected areas, and evaluating the uncertainty in total deposition estimates. In addition, the CL Mapper Tool, an interactive, online tool, supported by the U.S. Environmental Protection Agency (EPA), National Park Service (NPS), and Forest Service (FS) is being developed to map N and S deposition, acidification and eutrophication CLs, and CL exceedances from 1850-2100 in the continental U.S. This tool will enable federal and state agencies, the general public and other interest groups the ability to understand regional and national sensitivities of aquatic and terrestrial ecosystems to the deposition of atmospheric pollutants.

***Christopher Clark*: Highlights on Recent Advances in Critical Loads Research in the U.S.: New Critical Loads, Methods, Models, and Online Tools**

There are many ongoing advances in the U.S. related to critical loads of nitrogen and sulfur. Dr. Clark gave a brief overview of eight projects: (1) Species level CLs for herbaceous species (Simkin et al.), (2) Species level CLs for tree species (Horn et al.), (3) Updated lichen CLs (Geiser et al.), (4) Aquatic eutrophication CLs in high elevation lakes (Williams et al.), (5) Spatially contiguous estimates of aquatic eutrophication (McDonnell et al.), (6) Updates to national BCw estimates with PROFILE (Whitfield et al.), (7) Development of a US-PROPS database, and (8) a National Park Workshop on air quality and ecosystem services (Blett et al.). Following, Dr. Clark presented more details on the herb and tree CL projects (#1 and #2). The herbaceous CL project is a follow on from Simkin et al. (2016, doi/10.1073/pnas.1515241113), and reports critical loads for 185 herbaceous species in the U.S. It is under development and anticipated to be submitted to a scientific journal in the summer of 2017. The tree CL project is an assessment of N and S critical loads for 94 species of trees in the U.S. It is under review at Nature Plants and we anticipate its acceptance in summer 2017. For both taxonomic groups (herbs and trees), there was a wide range of responses, with some species highly vulnerable, and others not. These findings will help researchers and policy makers identify areas and species at risk to atmospheric deposition of N and S.

***Silvina Carou*: Global Mapping of Total Atmospheric Deposition in Support of Critical Loads: Results of a World Meteorological Organization Workshop**

The Global Atmosphere Watch (GAW) Programme of the World Meteorological Organization is embarking on a new initiative to produce global maps of total atmospheric deposition for specific atmospheric chemicals including sulfur, nitrogen, and ozone. The scientific approach for this initiative is called measurement-model fusion of total atmospheric deposition (MMF-TAD). The approach requires global-scale measurements of atmospheric trace gases, particles, precipitation composition, and precipitation depth, coupled with modelling results from global and regional chemical transport models. MMF-TAD projects are already underway in Sweden, the USA, the United Kingdom, and Canada. A workshop was held in Geneva (28 Feb to 2 March, 2017) in order to review the state of the science and assess the feasibility and path forward for using measurement-model fusion techniques to map total atmospheric deposition, as well as gases and particles, on a global scale. The workshop was attended by 41 participants from 12 countries. Outcomes of the workshop include an identification of science and policy drivers for this work; conclusions and recommendations on measurement-model fusion/mapping techniques, global atmospheric measurements, and chemical transport/deposition modelling; a proposed multiple-phase path forward; and a recommendation to write a "Roadmap for the Future". It was also agreed that collaboration between the atmospheric and ecosystem effects communities will be very important to the success of this project. The above outcomes are described in detail in the workshop report, which will be available in May 2017 on http://www.wmo.int/pages/prog/arep/gaw/WorkshoponMeasurementModelFusion.html.

4. Progress under the LRTAP Convention and ICP M&M workplan

Presentations on ICPs activities were given by Harry Harmens for ICP Vegetation (cf previous section), Kari Austnes for ICP Waters, and by Andreas Schmitz for ICP Forests.

The progress in the CL work carried out in the USA was presented by Jennifer Phelan and Christopher Clark.

The ICP M&M chair informed the Task Force participants of a number of changes in the Convention:

- A New Chair for the WGSR have been elected in 2016 for 2 years: Jennifer Kerr (Canada)
- EB and WGE Chairs encourage ICPs to open their meetings to "new" and "young" scientists to stimulate the work and to increase visibility. They also encourage everyone to "advertise" the work done under the Convention by mentioning LRTAP collaboration and by using the LRTAP logo.
- A "Clean Air Forum" will be organised by the EU in November 2017. Major European meeting where air quality in cities;
- Another "Saltsjobaden" meeting will be organised in spring 2018 (in Gotheborg). This series of meetings are used to develop a strategic view of air pollution policies. They shape the Convention Work.

4.1. 2018 – 2019 Work plan issues concerning WGE and ICP M&M

The Convention's Scientific Assessment Report has identified 10 key findings, balancing the successes (reduced acidification, longer life expectancy, availability of technical and non-technical measures, control costs lesser than benefits, co-benefits of integrated climate and air pollution approaches) with the remaining difficulties (exceedances of critical loads, continued risks of ozone, heavy metals and POPs, populations exposed to high levels of PM and Ozone). Overall, past and future successes of the Convention are dependent on the level of coordination

at scientific and policy levels. NFCs are encouraged (again) to highlight its messages to their funding ministries.

An ad-hoc policy response group has elaborated 130 short and long term recommendations based on the Scientific Assessment Report. They should be taken into account by the Convention bodies to formulate the 2018-2019 workplan (but are not yet available). The main message is, without much surprise:

- A shared diagnostic: there are needs for:
    - Reducing uncertainties in emissions
    - Maintain and increase quality assurance in monitoring
    - Better combine (or connect) effects and concentration/deposition monitoring
    - Make the link with the urban and global scales
- Intensify cooperation between EMEP and WGE groups and within each body; **propose objectives shared by several groups**

  Cooperation with other organizations through **concrete projects** is essential as cooperation outside the UNECE region
- **Increase visibility and availability of data produced by the convention**

  "EMEP, the Working Group on Effects and their subsidiary bodies including the International Cooperative Programmes are requested to systematically improve access to data via the internet, and to establish a common web-based portal, as indicated in the workplans (short to long-term)"

First elements of the workplan shall be sent to the WGE Chair by the 20th May for presentation at the WGSR meeting in June. A consolidated version shall be discussed in September at the WGE-EMEP meeting. Each group is expected to submit 2 to 3 objectives, with the associated deliverables, the time line for their production, the in and out-LRTAP collaborations involved, the allocated resources.

The TF agreed on proposing three main objectives for the 2018-2019 workplan. In the absence of a programme centre, the ICP M&M ambitions for 2018-2019 are necessarily limited.

	Objective 1:	Objective 2:	Objective 3:
Description	Transfer the EU DB safely to CIAM following adoption (WGE) of results of the 2015-2017 call for data (september 2017).	Translation of the Mapping Manual to Russian	Following a call to be issued by the WGE in 2017 to report to the 34th TF M&M (2018) on results of the continuation of the NFC-response to the CCE call for data 2015-2017 and consolidate resulting data of the CLbio until these can be submitted to a CCE-successor
Associated deliverables	The 2017 DB for CL acidification and eutrophication transferred to CIAM. Use of the CL acidification and eutrophication by CIAM for policy support.	The Mapping Manual translated in Russian	Continuing the compilation of biodiversity critical loads, e.g. by NFC-verification of the information for BioScore habitats that has been used by the CCE and Alterra to compile critical loads of biodiversity in the EMEP region. Short of an operational CCE, an option for NFCs is to seek collaboration with Alterra and with other

	Objective 1:	Objective 2:	Objective 3:
			ICPs (NFCs). And/or (depending on parties). Preparation of national CL bio according to instructions in the 2015-2017 call for data (extension of the CFD). NFCs should report on their work in respnse to this WGE call, but withhold data until a new CCE becomes operational.
Time period for production	2018	End of 2018	April 2018
The involved collaboration	CCE-CIAM	ICP M&M - Russian federal service for hydrometeorology and environmental monitoring, National EANET activity centre.	NFCs and optionally seek collaboration with Alterra in particular after the CCE has interrupted its activities at the end of 2017.
The allocated resources	CCE-CIAM	In kind (France and Russia).	Depending on (In kind) funding: NFCs and Alterra.

4.2.2016 - 2017 WORK PLAN AND REPORTING TO WGE IN 2017-2018

Via the work plan (document **ECE/EB.AIR/133/Add.1),** EB requests WGE[2]:

The ICP M&M and CCE report to the WGE reflects the revised workplan for CCE activities that was adopted by the Executive Body at its 36th Session (Geneva, 15-16 December 2016). Funds for these CCE activities in 2017 have been provided by Germany, Sweden, Switzerland, Norway and the Nordic Council of Ministers. Following the original description of workplan items (shaded bullets) some of which conducted by the Task Force M&M, results are summarized (hollow bullets) as follows:

- Coordinate a call for data on biodiversity CL and Ensure that European CL DB is updated and available for IAM (1.1.1.15). Aim the call at all parties, including EECCA countries.
    - Results will be described in the CCE final status report 2017-2018.
    - Contributions have not been submitted by EECCA countries. EECCA countries have not participated in Task Force M&M meetings in recent years since funding has become limited. However, it can be noted that EECCA countries are informed of effect oriented work under the Convention through the outreach activities of the UNECE secretariat.

[2] The list below is a selection of items common to several ICPs/TF. Actions specific to ICPs and not involving ICP M&M are not mentioned here.

- Update of the Mapping Manual and its translation into Russian (1.1.1.16)
    - Updated Mapping Manual is available on the ICP M&M web site.
    - Translation into Russian has been undertaken.
- Investigate synergies and trade-offs between air pollution, climate and nature policies as well as synergies between local and international policy measures and their effects (1.1.3.3)
    - Using submitted critical loads and the background database a tentative analysis of areas at risk following a reference scenario of the National Emission Ceiling Directive have been conducted and presented at the TF M&M.
    - To produce a tentative deliverable under funds provided by the Nordic Council of Ministers (for CCE work in 2017), an attempt is made to include, in chapter 1 of the CCE Final Report 2017 (CCE FR2017, *in prep.*), a tentative analysis of critical load variability under climate change, e.g. under a temperature increase by 3° C following the "Representative Concentration Pathway" RCP4.5 scenario ("stabilisation").
- Assess implications of air pollution mitigation strategies in the Northern Hemisphere for health, ecosystem and climate impacts (1.1.4.2) and Explore possible uses of EMEP/WGE tools, data and infrastructure to support AMAP activities (1.3.1)
    - Discussion at the Joint WS AMAP-HTAP about global air pollution scenarios.
    - The CCE presented the work done on CLs (of N and S) for the northern hemisphere.
- Develop common standards for all ICPs and a web portal approach to enable access to data/information (1.4.1)
    - The CCE and ICPM&M websites are regularly updated, in particular with information relevant to NFCs.
- Assess scientific and policy outcomes within the Convention over the past few decades, including scientific understanding, trends and achievements under the Gothenburg Protocol, and outline future challenges
    - The CCE and ICP M&M have contributed to "Scientific Assessment Report" (Maas & Grennfelt, 2016) and to the "Trends report" (De Wit et al, 2015).
- Develop and apply indicators of biodiversity targets in cooperation with CBD and the INI (2.3.8)
    - While the ICP M&M has continued to further develop the Habitat Suitability Index more information is awaited regarding the possible input of the TFRN.

Further, the CCE has participated to ICP Waters-Integrated monitoring meeting, collaborated to ICP IM to apply VSD PROPS model for the assessment of CL of biodiversity, collaborated with CIAM to provide policy support information, provided assistance to the ICP M&M chair for the organisation of this meeting, reported data and information to the WGE and to EB, maintained and updated the CCE and the ICP M&M web sites…

4.3. NFC TOUR DE TABLE

NFCs were requested (kindly) to provide the chair of the ICP M&M with a short written description (5-10 lines) of their activities in writing, addressing the following points (when relevant):

- What are your planned activities for 2017-2019 regarding effects of air pollution on ecosystems?

- Would you be able to respond to the objective 3 proposed in the workplan (validation of the background database for biodiversity CL in collaboration with Alterra or/and preparation of national biodiversity CL according to instructions in the 2015-2017 call for data (extension of the Call for data)) by April or September 2018.
- What are your planned activities for 2017-2019 regarding effects of air pollution on ecosystems?
- Do you have regular and direct contacts with your ministries of agriculture/ nature/ environment?

Contributions are expected by 30th April and should be sent to Anne-christine.le-gall@ineris.fr. They will thereafter be compiled into an annex to the present report.

5. CLOSURE OF THE MEETING

The decisions listed in the minutes were presented to the participants, discussed and modified according to discussion.

Finally, the chairwoman and the representative of the CCE thanked the hosts of the meeting for the excellent organisation of the meeting and the quality of the venue.

The chairs of the sessions, their speakers and the meeting participants were acknowledged and thanked for providing opportunities for discussions and for improving the community modelling capacity, little by little, step by step, so that tools for policy makers are made available to support air as well as nature conservation policies.

Finally, The National Institute for Public Health and The Environment (RIVM) gratefully acknowledges additional funds provided by Germany, Sweden, Switzerland, Norway and The Nordic Council of Ministers, in support of final CCE tasks to be performed in 2017, as noted by the Executive Body at its 36th Session (Geneva, 15-16 December 2016.

The location of the 2018 meeting will be confirmed at a later date.

6. ICP M&M Task Force recommendations to the Working Group on Effects, discussed at the TF 33rd meeting, Wallingford, 4-6th April 2016

The following recommendations have been agreed upon during the meeting and may not be modified, except, if requested, at the next ICP M&M TF meeting.

The ICP M&M Task force recommends that:

- A new ICP M&M programme centre to succeed the current CCE is set up to support the group research and activities as soon as possible, as without a programme Centre the ICP M&M will be unable to fulfil its mandate.
- The WGE approves the updated critical load database for eutrophication and acidification so that these data can be submitted to EMEP-CIAM for inclusion in the GAINS model for use in integrated assessment modelling for the support of air pollution, nature and climate policies.
- The WGE at the 3rd joint session with the EMEP Steering Body calls NFCs to report to the 34th TF M&M (2018) on results of the continuation of the NFC-response to the CCE call for data 2015-2017 on biodiversity critical loads (CLbio) and consolidate resulting data of the CLbio until these can be submitted to a CCE-successor. For this work NFCs can be guided by the following options:
    - seek collaboration with Alterra, as appropriate, in order to evaluate data relative to national habitats that have been included in the background database for biodiversity critical loads.
    - continue the preparation and development of national biodiversity critical loads according to instructions presented in the documentation of the 2015-2017 call for data on biodiversity critical loads.

  The deadline for these tasks is **April 2018** in which month a report to the 34th session of the TF M&M is to be presented. The NFC reports will then be compiled in the annual reporting of the TF M&M to the fourth joint session of the EMEP Steering Body and the WGE (September 2018). NFCs are requested to consolidate compiled data on critical loads of biodiversity, following the CCE template provided for the 2015-2017 call for data, until submission becomes possible to the successor of the CCE.
- The WGE further supports the continued development of the following aspects of the biodiversity critical loads methodologies:
    - Assessment of models by model intercomparison and by comparing models to field data,
    - Inclusion of more habitats in PROPs,
    - Development of a methodology to choose species for biodiversity critical loads,
    - Investigation into biodiversity endpoints and into the sensibility of the critical loads to thresholds,
    - Assessment of abiotic factors determining species occurrence and traits: climate change, nutrients (P, K,), …
    - Explore the further development of critical loads in the framework of nature policies and possible impacts on selected ecosystem services.
- The WGE supports also the continued development and consolidation of acidification and eutrophication critical loads.
- The WGE approves the updates of Chapters 3 and of the section V.3.1.3.1 on nitrogen immobilization in Chapter 5 of the Mapping Manual.

The TF agreed that NFCs could update, and if necessary correct, their critical load submissions and their national reports by Friday 5th May 2017.

Finally, the Task force and all its NFCs expressed their deepest thanks and gratitude to Jean Paul Hettelingh, Max Posch and Jaap Slootweg for the technical work as well as the leadership they provided during the 27 years of existence of the CCE. The TF and NFCs also thanked Angela Schlutow and Hans Dieter Nagel who will retire from their long-standing contribution as German experts and NFC.

7. ANNEXES

7.1. UPDATED TEXT FOR SECTION V.3.1.3.1 OF THE MAPPING MANUAL

V.3.1.3.1 Nitrogen Immobilisation

N_i refers to the long-term net immobilisation (accumulation) of N in the root zone, i.e., the continuous build-up of stable C-N compounds in (forest) soils. In other words, this immobilisation of N should not lead to significant changes in the prevailing C/N ratio. This has to be distinguished from the high amounts of N accumulated in the soils over many years (decades) due to the increased deposition of N, leading to a decrease in the C/N ratio in the topsoil. Using data from Swedish forest soil plots, Rosén et al. (1992) estimated the annual N immobilisation since the last glaciation at 0.2–0.5 kg N/ha/yr (14.286–35.714 eq/ha/yr). Similar rates of 0.2 – 0.8 kg N/ha/yr (14.286–57.142 eq/ha/yr) have also been calculated by Höhle et al. (2017) based on German, French and Swiss soil data.

For estimating site specific long-term net N immobilisation measured N stocks in soil, for example from the ICP Forests network, may be used. The average rate of N immobilisation calculated as the ratio of the N stock divided by soil age may be regarded as the maximal acceptable value for a sustainable long-term net N immobilisation. N immobilisation, however, is not a linear process. Most net N immobilisation occurs in an early state of soil development (Egli et al. 2012, Olsen 1958, Jenny 1965, Lichter 1998) which is already completed in many soils in Europe. For soils in a dynamic equilibrium state, e.g. soils with A-B-C horizons, in undisturbed environments a net N immobilisation close to zero can be assumed. It should be pointed out, however, that higher values (closer to present-day immobilisation rates) have been used in critical load calculations. However, there is no consensus yet on long-term sustainable immobilisation rates.

New references

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Jenny, H. (1965): Bodenstickstoff und seine Abhängigkeit von Zustandsfaktoren. Zeitschrift für Pflanzenernährung, Düngung, Bodenkunde Band 109, Heft 2, 97-112

Lichter, J. (1998). Rates of weathering and chemical depletion in soils across a chronosequence of Lake Michigan sand dunes. Geoderma, 85, 255-282.

Olson, J. (1958). Rates of Succession and Soil Changes on Southern Lake Michigan Sand Dunes. Botanical Gazette, 119(3), 125-170. Retrieved from http://www.jstor.org/stable/2473440

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Rosen K., Gundersen P., Tegnhammar L. (1992): Nitrogen enrichment of Nordic forest ecosystems: The Concept of Critical Loads. Ambio, Vol. 21/5. 364-8

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Sogn TA, Stuanes AO, Abrahmsen G (1999) The capacity of forest soil to absorb anthropogenic N. Ambio 28:346-349

7.2. TOUR DE TABLE

Austria

- What are your planned activities for 2017-2019 regarding effects of air pollution on ecosystems?

Our main activities are linked to the joint modelling effort of ICP Integrated Monitoring and ICP Modelling and Mapping, which is also part of a research activity within the H2020 eLTER project. The Austrian NFC is responsible for the modelling biodiversity metrics at about 30-40 sites across Europe. A scientific manuscript should be ready by the end of 2017. The CL work depends on funding and there are not yet any concrete plans since they are tightly related to the ICPs and CCEs plans.

- Would you be able to respond to the objective 3 proposed in the workplan (validation of the background database for biodiversity CL in collaboration with Alterra or/and preparation of national biodiversity CL according to instructions in the 2015-2017 call for data (extension of the Call for data)) by April or September 2018?

This kind of activities depend on a year-by-year budget. Hence any official document we can use to acquire the funding from the ministry would be very helpful. We consider the validation of the biodiversity CL at a national level to being very important and would hence be very willing to support this activity

- Do you have regular contacts with your ministries of agriculture/nature/environement? do you report your CL work to any of these ministries?

We work very closely with the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management and report any activities regarding CLs to them

- What are your main concerns about the immediate future (2017-2018 as far CL work is concerned)?

The Austrian NFC has actively contributed to the further development of the modelling and mapping of CL, particularly the Biodiversity CL, during the last couple of years. The Austrian CL maps have been updated and significant progress has been made to regionalize biodiversity CL across Austria. As to the latter we are not quite there but the work necessary to map biodiversity CL to the entire area of Austria would be achievable within only one or two years. However, our possibilities depend on a year-to-year funding, which depends on concrete data calls. Hence, our concerns are that with the lower activity of the CCE, the NFC funding will be lower or it may even cease totally. Nevertheless, if activities could continue after few years the expertise within our agency would still be available. The NFC is therefore hopeful in continuing the CL work and to cooperate in future with a newly set up CCE.

Canada (Ireland)

Croatia
Croatia has not submitted national contribution in 2017 within the Call for data 2015-2017 deadline due to the organisational and financial reasons. National data in European Background Data Base will be checked and confirmed. In 2016 the assessment of existing resources and data were done and the use of ICP Forest Level II and NATURA 2000 were proposed. The Croatian NFC will continue further development of work on CLbio in support to policy requirements, according to a recommendations and conclusions of 33rd TF M&M meeting.
Czech Republic (mail from Irena to Jaap, 30/03/2017)
Czech biotopes (habitats) classified with use of the forest typology and its change into the EUNIS classes according to the Catalogue of habitats and their diagnostic species are different substantially from the habitats and species used in the PROPS selection tool. Slight changes in the primary database of critical loads based on the mass balance method have been carried out. New values of base cation depositions (averages for the period of 2009-2013) for forests have been elaborated and an assessment of DOC on the base of soil solution measurements in 2005-2010 has been carried out. Updating the CL databa will probably take until june, the complete database of critical loads may be sent (work will take for next 1 or 2 month, probably). I wish myself to provide you by a good work and databases of truthful critical loads.
Denmark
France
In 2017-2018, the French NFC expects to continue the investigations on modelling CLbdiv by using PROPS and ForSAFE-ECOPLANT models, first on French ICP forest sites and then upscaling to the whole French territory. Consolidated HSi are planned to be extended to a hundred ICP forest sites and on 39 000 ecosystems. Combinations of nitrogen deposition and regional climate change scenarios by 2100 will be applied on common and protected ecosystems (N2K and national protection status). Meanwhile a continuous updating of the CL database has to be performed, as well as the development of tools to improve CLbdiv models links to the database. A web mapping interface is also planned to be developed in order to open the French CL maps to public use. However, the French NFC has no idea of what will be going on for 2018-2019, since the French EPA (ADEME) no longer supports the ICPs projects within the WGE and the LRTAP Geneva convention. The present-day projects supporting the NFC work and particularly the engineers salaries is about to be over. The key persons in charge of CL modelling and model development will also leave the NFC. Consequently, in relation with these constraints and uncertainties, the validation of the background database for biodiversity CL (in collaboration with Alterra or/and by preparing of national biodiversity CL) according to instructions in the 2015-2017 call for data (extension of the Call for data by April or September 2018), is not foreseeable.

Moreover, we have no contact with the Ministry of Environment, which is supposed to potentially support the French participation to the ICPs. In the present situation, the French EPA and the NFC were in close contact, by the way of a EPA corresponding engineer who followed up the projects and the French NFC participation to the ICP M&M work plans.
Germany
Italy
In Italy, the NFC and experts would work on validation of the background database for biodiversity CL if they manage to get the resources to develop the necessary. Therefore, if the CCE (or Programme Centre) was to develop an Access or another application to calculate the CLbio using the SMB database, Italy would certainly apply it. The Italian NFC and experts periodically send an account of the annual meeting of the ICPM&M to environmental ministry office. The Italian NFC main concerns about the immediate future is to find out a way to run VSD chain models in every relevant ecosystems on national territory and to calculate CLbio.
Latvia
Lithuania
The Netherlands
During recent years the Dutch NFC has worked on modelling of biodiversity and critical loads for biodiversity. Computed critical loads have been used in the European critical load database but also used in the Dutch Integrated Approach to Nitrogen (PAS; Ministry of Economic Affairs & Ministry of Infrastructure and the Environment, 2015) and in various regional and national policy indicators. The work on biodiversity modelling will continue throughout 2017-2019. Special attention will be paid to intercomparison of different Dutch soil models, but also to the three objectives of the proposed ICPM&M-workplan. In collaboration with Alterra we will be able to update the current Dutch critical load database for biodiversity by April/September 2018. We will also prolong our contacts with the various Dutch ministeries. Our main concern is that the international cooperation on critical load

work will decrease now the CCE is no longer operational.
Norway
In 2017, we will write a report on exceedances for Norway. This is done every fifth year, using the updated deposition data (from measurements) and the most recent critical loads. Our work is only planned one year at a time, but hopefully we can continue to work on critical loads of biodiversity, unless other critical loads issues seem more pressing. This means we can most likely respond to objective 3 in the work plan at some level. Validation of the background database may be a good first step to continue the work on biodiversity critical loads. Given that this work cannot start until 2018, September seems more feasible than April, but April may be possible. The NFC has regular contact with the Norwegian Environmental Agency, with written reports on activities twice a year, and informal contact in between. Priorities and plans for future work are discussed. One concern about the future is that budgets have slowly declined over the years. They are still sufficient to follow up on meetings and some improvement/development of the critical loads, but not for any larger scale projects, which is probably needed to develop critical loads of biodiversity on a national scale. We are also deeply concerned about the situation for the CCE.
PR China
Poland
In response to the CCE "call for data 2015-17", the Polish NFC has submitted an updated critical loads data (CLacid, CLeut) including input parameters for their calculation. An updated CL data can be used by CIAM for integrated assessment modelling with GAINS-Europe. Further work will be focused on modelling deposition effects and biodiversity risk for habitats on Natura 200 sites in Poland. The critical loads database as well as additional biodiversity indicators will be tested. Polish NFC is still participating in study for developing biodiversity indicators related to sulphur and nitrogen deposition, led by ICP Integrated Monitoring. The VSD+ modelling for 3 IM forest stations across Poland is already done.
Serbia

Spain
Sweden
Switzerland
Switzerland will produce updated Swiss maps for ammonia concentrations, nitrogen deposition and CLN exceedance for the reference year 2015 based on new data on farms and animal numbers. It will continue its support for the N-addition/climate change experiment in Swiss alpine grasslands running until end of 2018 and also plans to continue the N-addition experiment in the alpine Furka region evaluating N-eutrophication effects on vegetation cover on three different soil types. Further evaluation of nitrogen effects in Swiss ecosystems based on data from the Swiss Biodiversity Monitoring covering all Switzerland will be investigated using the concept of cumulative exposure over critical loads. The NFC will also evaluate how the biodiversity critical loads that were submitted for the data call 2015-2017 can be developed further. Switzerland will continue its participation in ICP Modelling and Mapping, ICP Vegetation, ICP Forests, ICP Waters, ICP Integrated Monitoring, ICP Materials and the Task Force on Health.
United Kingdom
• What are your planned activities for 2017-2019 regarding effects of air pollution on ecosystems? The UK has Defra funding until May 2019 to continue work on (a) maintaining the traditional critical loads and updating UK deposition and exceedance data and summary statistics annually; (b) the further development and application of biodiversity-based critical loads to additional habitats at the UK scale. The UK NFC would also like to acknowledge the financial contribution from Defra for hosting of the 2017 ICP M&M meeting in the UK. • Would you be able to respond to the objective 3 proposed in the workplan (validation of the back ground database for biodiversity CL in collaboration with Alterra or/and preparation of national biodiversity CL according to instructions in the 2015-2017 call for data (extension of the Call for data)) by April or September 2018? As above, the UK has funding to continue work on biodiversity-based critical loads according to the 2015-2017 call, and extension of the call to April or September 2018. As usual it can help to have the Call announced officially (from WGE) to help ensure continued funding. • Do you have regular contacts with your ministries of agriculture/nature/environement? do you report your CL work to any of these ministries?

The UK has regular contact with the Department for Environment, Food & Rural Affairs (Defra) as that is the ministry that funds the current UK critical loads work. The UK also has regular contact with the Statutory Nature Conservation Bodies; staff from the Joint Nature Conservation Committee (JNCC) and Natural England (NE) sit on the Steering Group for the Defra funded critical loads project.

- What are your main concerns about the immediate future (2017-2018 as far CL work is concerned)?

The current lack of funding to support the continuation of the existing CCE, and concerns about a long/large gap until funding and an organisation able to take on the CCE role is found.

United States (non-official) NFC Summary

National Atmospheric Deposition Program (NADP) – Critical Loads of Atmospheric Deposition (CLAD), as the non-official National Focal Centre (NFC) of the United States (U.S.), plans to continue developing terrestrial and surface water critical loads, and including them in the United States (U.S.) National Critical Load Database (NCLD). We also plan to make progress with our scientific working groups (WGs) focused on characterizing critical load and deposition uncertainty and the representation of multiple critical loads in protected areas. The U.S. was not able to submit data in response to the 2015-2017 Call-for-Data for critical loads of biodiversity and has no plans to respond to objective 3 proposed in the workplan, as the background database prepared for European countries by the Coordination Centre for Effects (CCE) is not applicable to the U.S. We will communicate with the appropriate representatives and delegates within U.S. federal agencies to inform them of NADP-CLAD non-official NFC activities and provide a summary of the 2017 ICP M&M 33rd Task Force Meeting (including the discontinued role of the Netherlands as the CCE - Programme Centre). NADP-CLAD believes the WGE-CCE plays a central and important role in advancing the science characterizing the impacts of atmospheric pollutant on terrestrial and aquatic ecosystems. Thus, continued support for WGE-CCE and establishing a new Programme Centre is a central concern of NADP-CLAD.

7.3. LIST OF PARTICIPANTS TO THE MEETING

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7.6. FINAL AGENDA OF THE MEETING

UNECE Convention on Long-range Transboundary Air Pollution

Working Group on Effects

International Cooperative Programme
on Modelling and Mapping
of Critical Levels & Loads and Air Pollution Effects, Risks and Trends
(ICP M&M)

Agenda[3] topics[4]

(Final)

33rd ICP M&M Task Force Meeting

on assessments of impacts of air pollution, and interactions with climate change, biodiversity and ecosystem services

Tuesday 4th – Thursday 6th April 2017

Wallingford, UK

Sponsored by:
Department for Environment Food & Rural Affairs (DEFRA), United Kingdom.
Centre for Ecology & Hydrology (CEH), Wallingford, United Kingdom.
French National Institute for Industrial Environment and Risks (INERIS), France.
Coordination Centre for Effects (CCE) at RIVM, The Netherlands

The National Institute for Public Health and The Environment (RIVM) gratefully acknowledges additional funds provided by Germany, Sweden, Switzerland, Norway and The Nordic Council of Ministers, in support of final CCE tasks to be performed in 2017, as noted by the Executive Body at its 36th Session (Geneva, 15-16 December 2016).

[3] Speakers are kindly requested to include an opportunity within their timeslot to allow for clarifying discussions and feedback

[4] If provided by a speaker, abstracts/short summaries are included at the end of the agenda following an endnote to the presentation title.

TUESDAY 4TH APRIL 2017

08:00 Departure of the bus to Wallingford (from Oxford)

Opening of the 33rd TF and Key Note Session		
Chair: Jane Hall		
9:00 -9:15	***Registration and mounting of posters***	
9:15-9:30	*Welcome to CEH*	*Prof. Rosemary Hails,* *Director of Biodiversity and Ecosystem Science at CEH.*
9:30-9:45	*Welcome from Defra*	*Prof. Ian Boyd, Defra Chief Scientific Advisor*
9:45-10:00	*Objectives of the meeting,* *On the status of the CCE*	*Anne-Christine Le Gall/* *Jean-Paul Hettelingh*
10:00 - 10:30	***KEYNOTE*** *Taking stock – long term trends and trajectory to recovery*	*Prof David Fowler, CEH*
10:30 -11:00	***Coffee break and Poster session in the presence of poster authors***	

Topic 1: Result of the Call for Data 2015-2017		
CHAIR: JEAN-PAUL HETTELINGH		
11:00-11:30	*CCE compilation and analysis of NFC submissions following the call for data 2015-2017*	*Jaap Slootweg and Max Posch*
11:30-11:40	***Discussion***	
11:40-12:00	*Upscaling calculations of biodiversity-based Critical Load functions for UK habitats.*	*Ed Rowe, Susan Jarvis, Jane Hall*
12:00-12:20	*Critical Loads for Biodiversity at the French territory scale using ForSafe-Veg-Ecoplant and PROPS modelling: converging issues?*	*Rizzetto S., Kuhn E., Gégout J.C., Belyazid S., Haunold S., Probst A.*
12:20-12:40	*Exploring critical loads for biodiversity for Norwegian birch forest sites*	*Kari Austnes*
12:40-13:00	*New Results of Critical Load Calculation including Biodiversity in Germany*	*Hans Dieter Nagel*
13:00-14:00	***Lunch***	

Tuesday 4th April 2017…Contd

Topic 2: National contributions to effect-based work (under the LRTAP Convention, including the call for data) *Chair: Anne Christine Le Gall*		
14:15 - 14:35	*Current status of UK ecosystems*	*Jane Hall*
14:35 - 14:55	*Update of Swiss critical loads including biodiversity as criterion*	*Dani Kurz and Beat Rihm*
14:55 - 15:15	*Coupling climate change and air pollution impacts on forests: un update*	*Alessandra De Marco*
15:15-15:35	*Historical trends in nitrogen and sulphur deposition in the UK: 1800 to present*	*Ulli Dragosits*
15:35 - 15:55	***Discussions on Topics 1 and 2***	
15:55 - 16:10	***Coffee break and Poster session***	
16:10 - 16:30	*Validating space-for-time substitution for N deposition*	*Lukas Kohli*
16:30 - 16:50	*Pressure, midpoint and endpoint metrics of N pollution: current and proposed metrics*	*Ed Rowe, Jones L, Dise NB, Evans CD, Mills G, Hall J, Stevens CJ, Mitchell RJ, Field C, Caporn SJ, Helliwell RC, Britton AJ, Sutton M, Payne RJ, Vieno M, Dore AJ & Emmett BA*
16:50 – 17:20	***Task Force conclusions and recommendations on Topics 1 and 2***	*Anne Christine Le Gall*

17:30 departure of the bus to Oxford

Wednesday 5th April 2017

08:00 Departure of the bus to Wallingford (from Oxford)

Topic 3: Experimental and modelling results of abiotic and biotic impacts of air pollution and climate change *Chair: Ed Rowe*		
9:00 - 9:20	*N-induced changes in root litter decomposition: links to soil parameters and plant species composition*	*Seraina Bassin, Ulrike Zell, Matthias Volk, Jürg Fuhrer*
9:20 – 9:40	*Arbuscular Mycorrhizal Fungus interactions under climate change in mountain regions: preliminary results*	*Anne-Lena Wahl*
9:40 – 10:00	*An application of dynamic modelling to produce site-specific critical loads*	*Chris Fields, Ed Rowe, Rob Kinnersley and Sarah Watkins*

10:00 - 10:20	*Modelling the concentration of NH3 and exceedance of the critical level in the UK*	*Anthony Dore*
10:20 - 10:40	***Discussion***	
10:40 - 11:00	***Coffee break and Poster session in the presence of poster authors***	
11:00 - 11:20	*Latest developments on VSD+ - PROPS modelling*	*Gert Jan Reinds*
11:20 - 11:40	*Effect of nitrogen deposition and climate change on plant species occurrence: the PROPS model.*	*Wieger Wamelink*
11:40 - 12:00	*Recent advances in the application of VSD chain of models on 5 Italian forest sites*	*Maria Francesca Fornasier*
12:00 - 12:20	*Analysing the distribution over abiotic parameters, of plant species occurrence*	*Jaap Slootweg*
12:20-12:40	*Critical loads for biodiversity and exceedances using the CCE background data base*	*Maximilian Posch and Jean-Paul Hettelingh*
12:40 - 13:00	***Discussion and Task Force conclusions and recommendations on Topics 2 and 3***	*Anne-Christine Le Gall*
13:00 - 14:00	***Lunch***	

Topic 4: Mapping Manual issues, WGE - and ICP progress		
Chair: Anne Christine Le Gall		
14:00-14:20	*Update on WGE and Convention issues*	*Jesper Bak (vice-chair of the WGE)*
14:20-14:40	*Review of (**and discussion on**) the ICP M&M mandate*	*Anne Christine Le Gall*
14:40-15:00	*Update on ICP Vegetation activities, including Chapter 3 of the Modelling and Mapping Manual - ozone critical levels for vegetation*	*Harry Harmens*
15:00-15:20	*Outcomes of the N-immobilisation workshop in Olten*	*Reto Meier*
15:20-15:40	***Discussion on Topic 4***	
15:40-16:00	***Coffee break and Poster session in the presence of poster authors***	
16:00-16:20	*Effects of Climate Change and air pollution (EMEP) on forest defoliation (ICP) - data base for indicator(s) development*	*Slavissa Popovic*
16:20-17:00	*Update on ICP Waters activities*	*Kari Austnes*
17:00-17:20	***Discussion & Task Force conclusions and recommendations on Topic 4***	*Anne-Christine Le Gall*

17:30 departure of the bus to Oxford

Dinner *(Pembroke College, Oxford at 20:00 hrs.)* *If you registered to join for dinner, please be reminded to pay 25 pounds at the registration desk on Tuesday or Wednesday. Drinks can be purchased separately at the Hall bar as of 19.30 hrs. to be taken in to the dinner.*

Thursday 6th April 2017

08:00 Departure of the bus to Wallingford (from Oxford)

Topic 5: Progress under the LRTAP Convention and ICP M&M work plan *Chair: Anne-Christine Le Gall*		
9:00 - 9:20	*Status of ICP Forests*	*Andreas Schmitz*
9:20 - 9:40	*Critical Loads, Deposition, and Exceedances in the United States – Critical Load Mapper Tool*	*Jennifer Phelan*
9:40 - 10:00	*Highlights on Recent Advances in Critical Loads Research in the U.S.: New Critical Loads, Methods, Models, and Online Tools*	*Christopher Clark*
10:00-10:20	*Global Mapping of Total Atmospheric Deposition in Support of Critical Loads: Results of a World Meteorological Organization Workshop*	*Silvina Carou*
10:20 - 10:45	*Tour de Table on national progress in the field of effects-based policy support in general and ICP M&M workplan issues in particular*	*All NFCs or country representatives*
10:45 - 11:00	***Coffee break and poster session***	
11:00 - 11:30	*Status of the ICP M&M and its Programme Centre and Proposed contributions to 3rd joint session of EMEP and WGE (Geneva, Sept. 2017)*	*Anne-Christine Le Gall*
11:30 - 11:45	***Discussion***	
11:45 - 12:30	***Task Force Conclusions on topic 5;*** ***Draft ICP M&M minutes of the 33rd TF M&M;*** ***Adoption of the draft minutes and closure of the 33rd ICP M&M Task Force meeting***	*Anne- Christine le Gall*
13:00	***Lunch***	

14:00 departure of the bus to Oxford

Posters ***(POSTER SESSIONS ARE COMBINED WITH COFFEE BREAKS)***	
Calculation of critical loads with differentiated targets (for specified sensitive elements of an area)	*Jesper Bak*
Atmospheric N deposition, O3 and climate interactive effects in Mediterranean ecosystems	*Héctor García Gómez*
Accounting for forestry practices in Swedish critical loads calculations	*Filip Moldan*
ALSO WELCOME: - ***Non-registered last-minute Posters, e.g. addressing ecosystem effects of air pollution including interactions with other policies*** - ***Posters to backup oral presentation***	