Achievements of the ICP Vegetation in 2020 and future work plan

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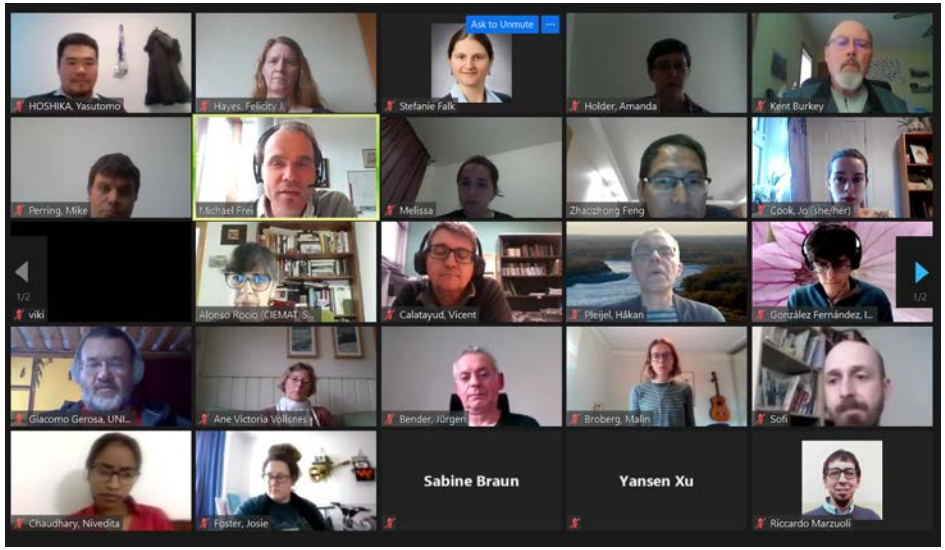
Task Force Meeting 2021



22-24 February 2021
125 participants from 35 countries, by Zoom

Condensed programme, including separate moss and ozone specific sessions, plenary session, and breakout discussion/poster/informal sessions

(2022 meeting planned to be in Kaunus, Lithuania)

Mapping Manual – Annexes Added

SBD-B (Scientific Background Document)
Gap-filling (for flux-effect modelling) - added

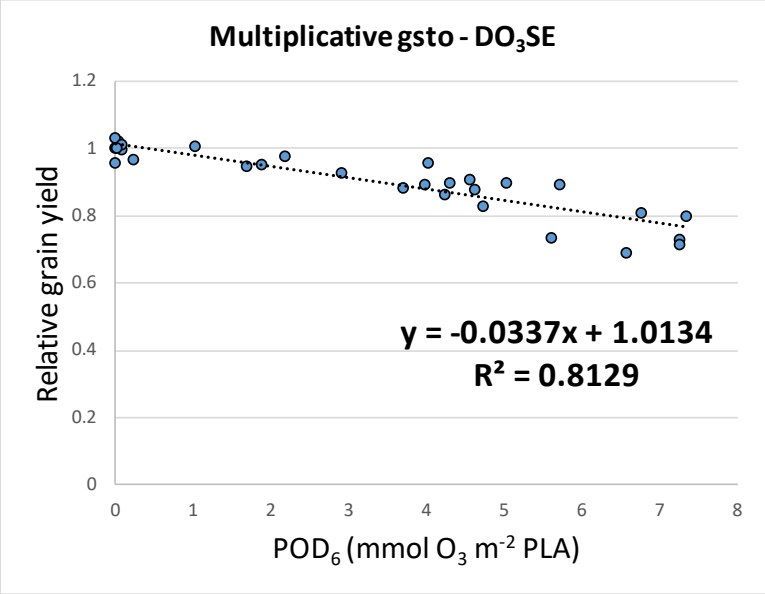
Interactions between ozone exposure and N application in crops – added
Workplan item 1.1.1.9

Preparing for the Review of the Gothenburg Protocol – parameterisations for (semi-)natural vegetation, and for upscaling to the whole canopy for large-scale modelling – *with EMEP*
Workplan item 1.4.1

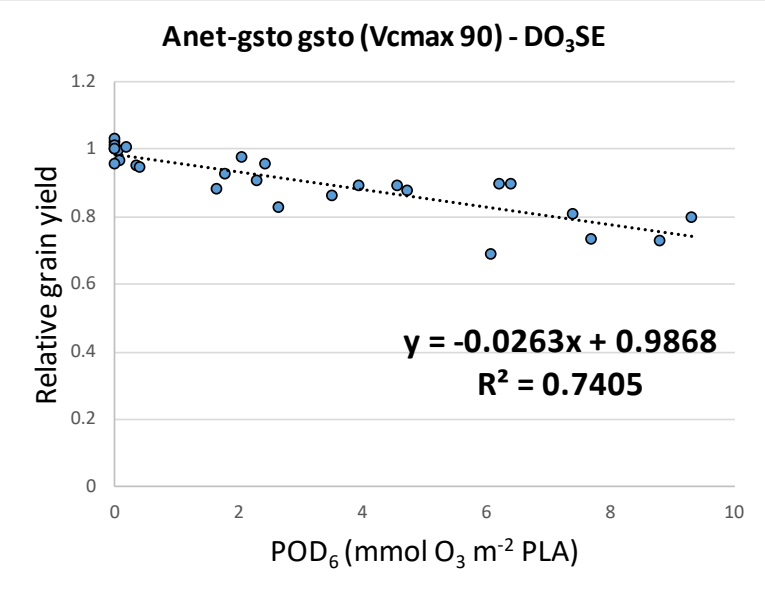
Ozone flux-based risk assessments adapted for vegetation in soil moisture limited areas – *ongoing, due for completion 2021*
Workplan item 1.4.2

Development of coupled gsto-An model

i. Multiplicative stomatal conductance (gsto) model



ii. 'New' coupled photosynthesis-stomatal conductance (Anet-gsto) model



Next steps:

- 'match' flag leaf life span with leaf leaf fhpen
- Add new datasets to flux-response relationships (Europe & India)
- Explore parameterisation according to Vcmax term (by cultivar), flux threshold and sensitivity of senescence to ozone

Relation between ozone flux and volume increment of *Fagus sylvatica* and *Picea abies*

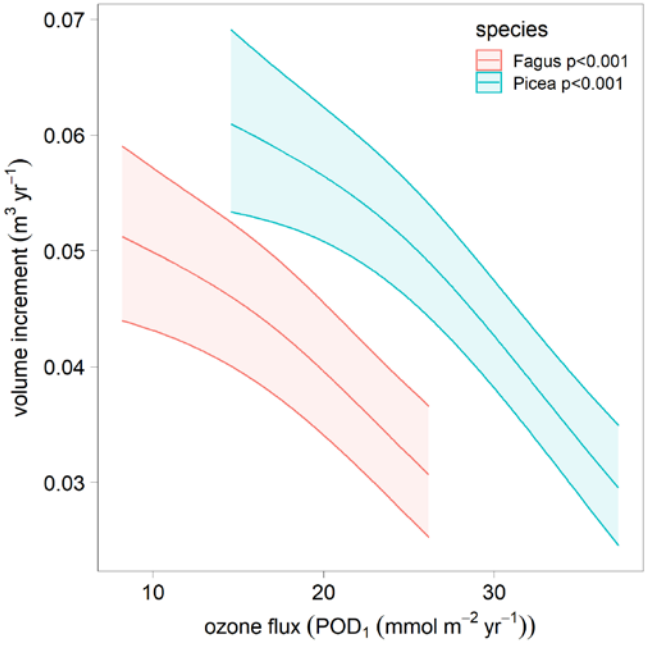
Lisa Emberson, Sabine Braun et al.

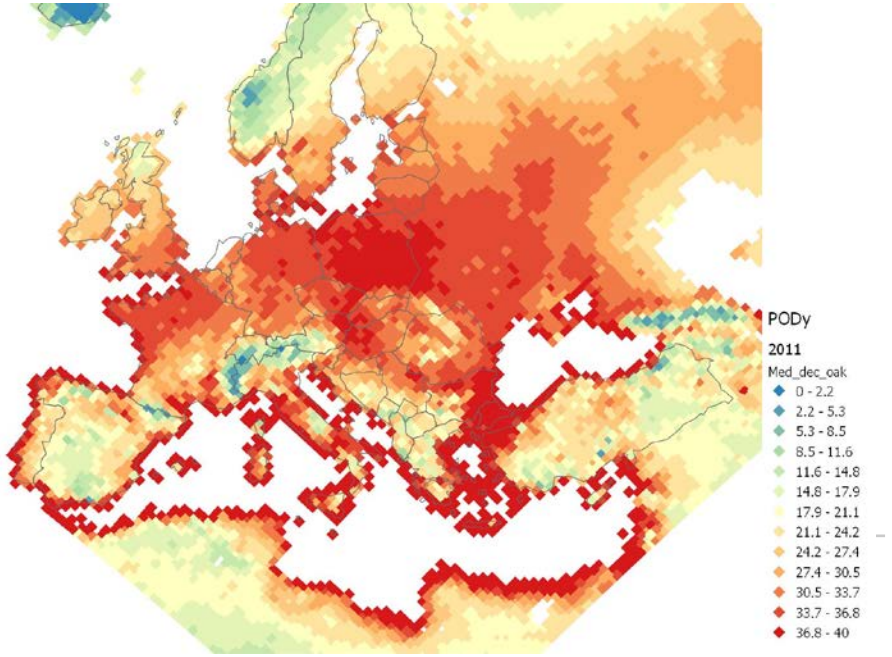
Calculation of ozone modified Net Annual stem volume Increments.

European mapping and calculations, using EMEP ozone data, flux models, harmonised landcover map, forest statistics.

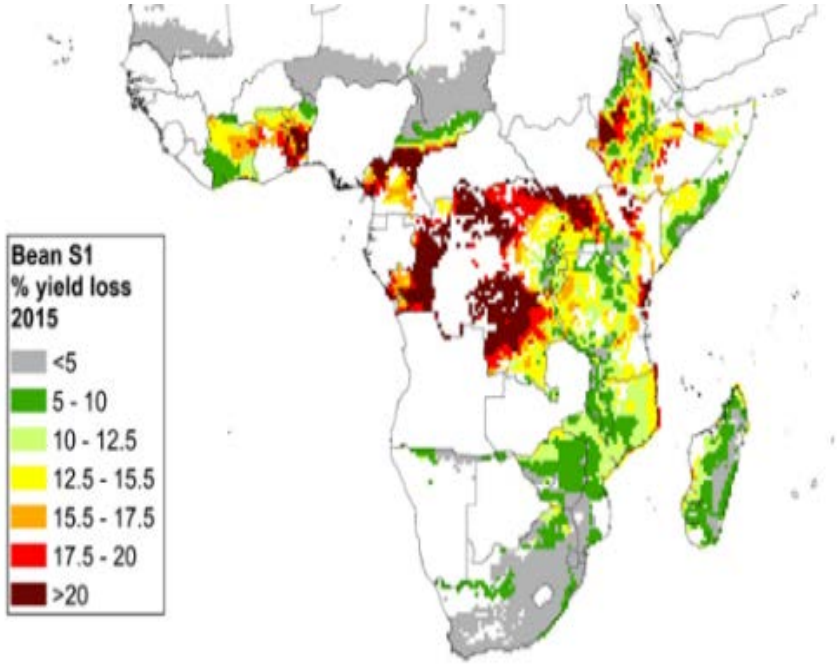
Maps for 8 tree species

Figure based on data from >12000 trees and 8 increment periods



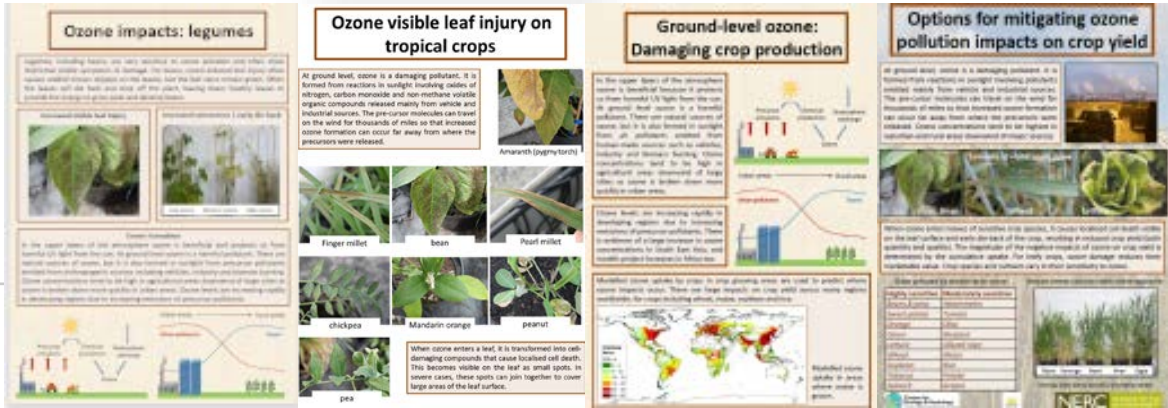


Outreach - maps of predicted impacts on yield



Sharps et al., (under review)

- % yield loss for common beans
- Modelled ozone flux data (for 2015) from EMEP MSC-W.
- >20% estimated yield loss for some areas.
- Factsheets on ozone, and ozone impacts, published on website
- Diffusion tubes are being exposed in: India, Sri Lanka, Malaysia, Ethiopia, Tanzania, Kenya, Rwanda, Uganda, DRC



UK Centre for Ecology & Hydrology

Report on yield benefit from air filtration

Crop	China (17-65 ppb)	India (33-56 ppb)	Thailand (25 ppb)	Malaysia (32 ppb)	Egypt (25-56 ppb)
Broad bean					39-41%
Cowpea					0-13%
Maize	9%	4-31%			
Mustard		7-19%			
Palak		27%			
Poplar	4%				
Rice	2%	17-22%	6-17%	0-6%	
Soybean	0-9%	30%	16-18%		51%
Wheat	2-25%	13-26%			61%

Data from a range of published studies 2004-2019

Collaborations with other groups

CCE: Contributions to Revision of Empirical Critical Loads

Many ICP Vegetation participants are involved, particularly for the Forest and Grassland groups.

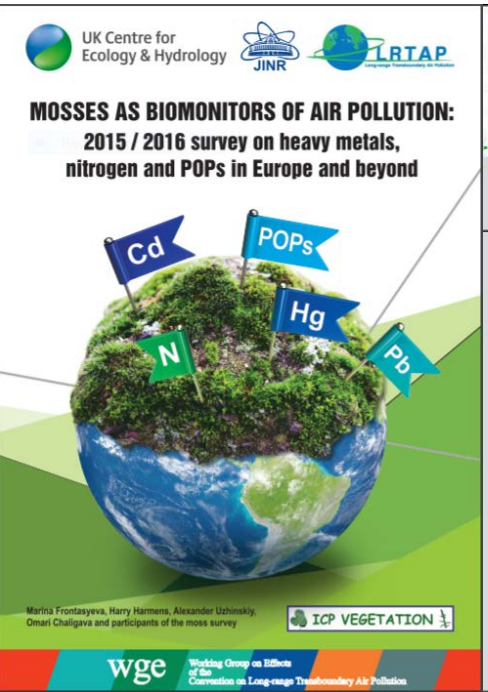
HTAP: ICP Vegetation Coordination Centre participated in a workshop (April 2020) **Workplan item 1.1.4.7**

Relevant activity for ICP Vegetation is 'estimation of the environmental benefits of decreasing ozone through mitigation of methane emissions'

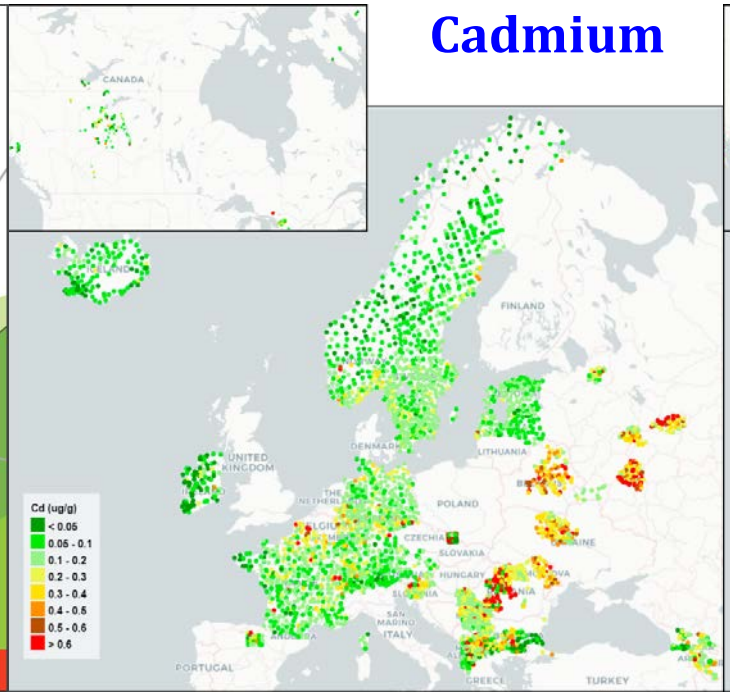
HTAP are working on scenarios, when these are finalised we can use these to model the impact on global wheat production, and possibly an additional crop relevant for tropical regions.

Moss survey 2015/16

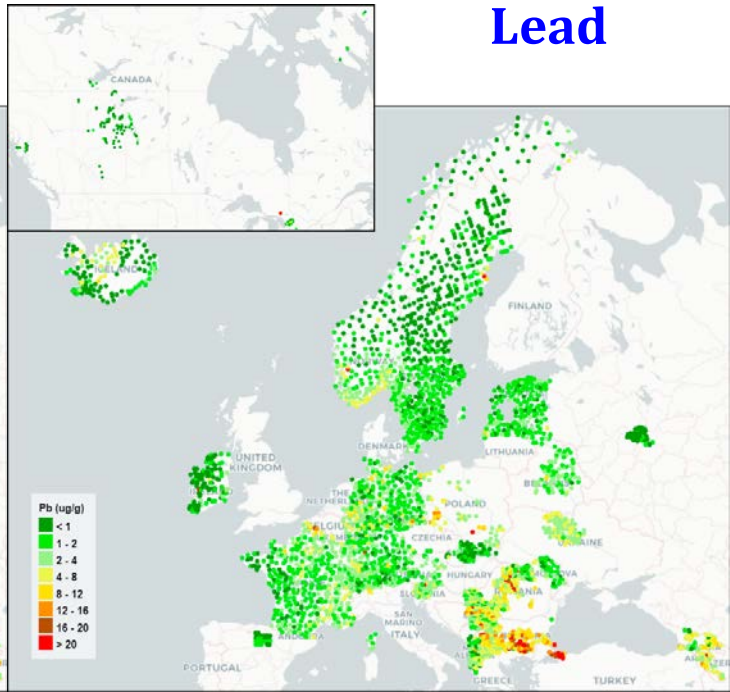
- North-West to South-East gradient in Europe
- High concentrations in (south-)east due to anthropogenic sources and high wind-resuspension?
- Final report for 2015/2016 now available



Cadmium

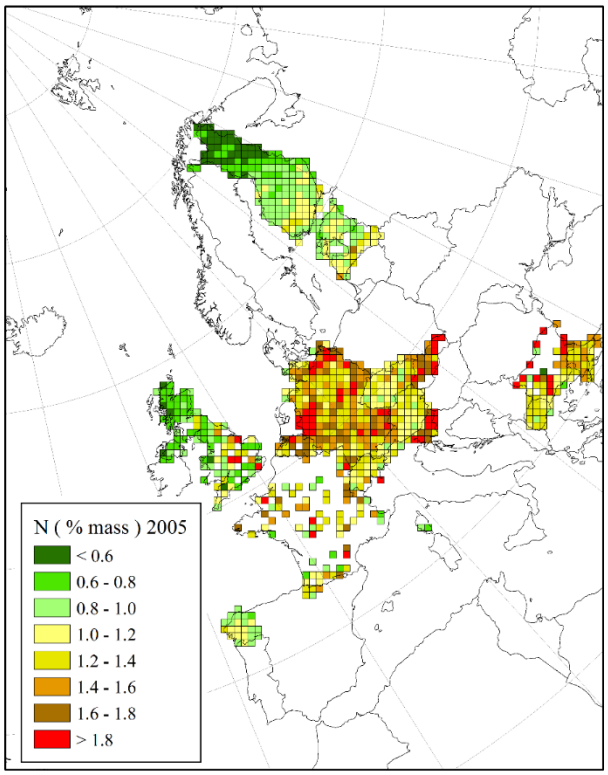


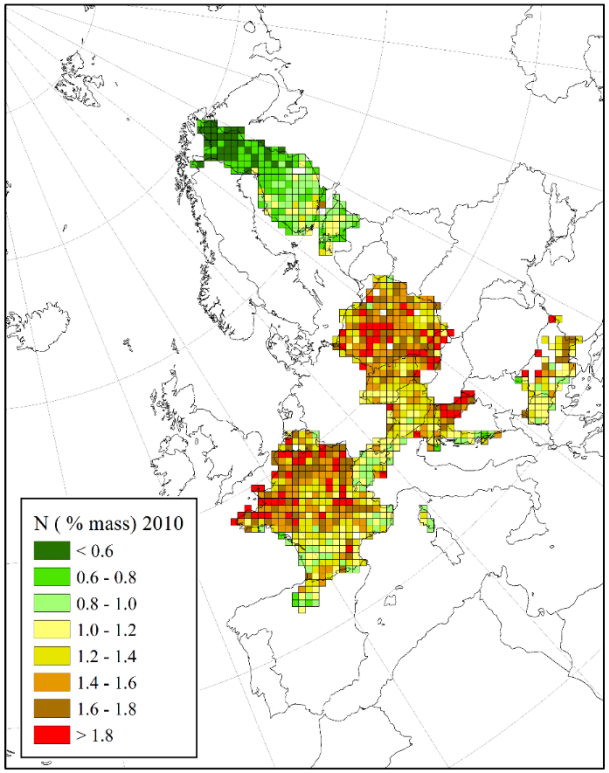
Lead

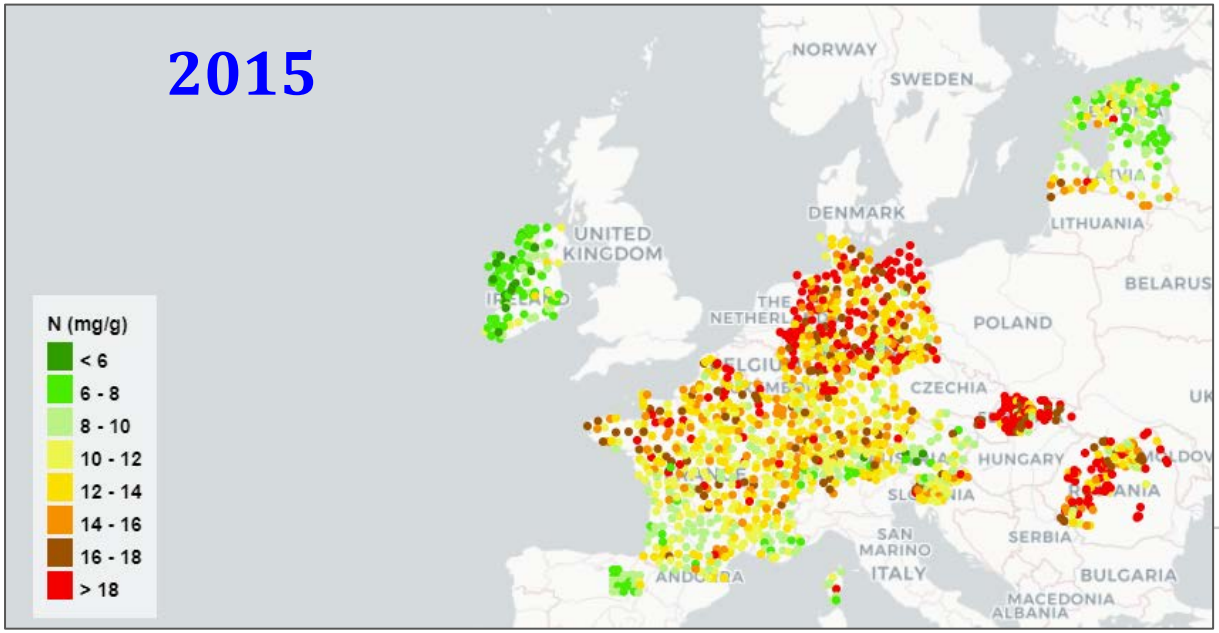


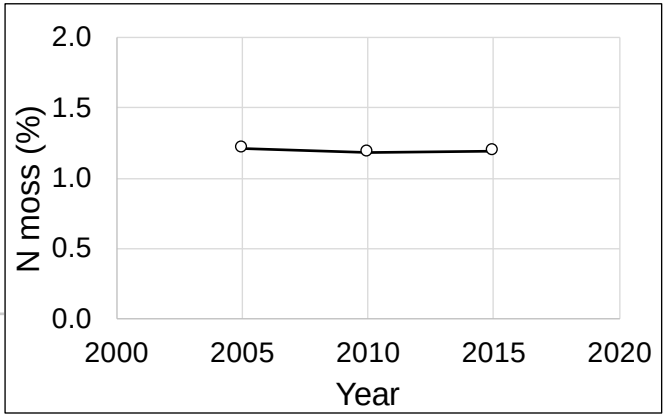
N in moss

- Every 5 years since 2005
- Concentrations lowest in northern/western Europe, highest in Central Europe
- No significant decline between 2005 - 2015









Moss survey 2020-2022

Workplan item 1.1.1.21

- **Next survey 2020-2022:**
  Call for data issued (HM, N, POPs) (approximately 1500 sites sampled already)

- Include pilot study on mosses as biomonitors of microplastics as indication of atmospheric deposition rates

- Monitoring manual: **English and Russian**
  https://icpvegetation.ceh.ac.uk/get-involved/manuals/moss-survey

Countries already participating in moss survey 2020-2022				
Albania	Germany	Kazakhstan	Russia	Vietnam
Armenia	Greece	Latvia	Slovakia	Switzerland
Georgia	Italy	North Macedonia	Sweden	UK
Netherlands				

Current ICP Vegetation Workplan

2021 delivery:
Call for data for moss survey 2020-22 (collection extended due to Coronavirus)

Ozone flux-based risk maps for soil moisture limited areas (with EMEP/MSC-West)

Ozone flux-based risk assessment for vegetation at various air pollution scenarios (with EMEP/MSC-West, TFIAM, CIAM)

Test development and applications of photosynthesis-based flux-response models (with EMEP/MSC-West)

Contribution to validation and revision of empirical critical loads for N (with CCE, ICP Modelling and Mapping)

ICP Vegetation - Draft Future Workplan

2022 delivery:
Review of air pollution and climate change impacts on vegetation – focus on implications for calculation and application of flux-based Critical Levels and risk assessment

Joint workshop with ecosystem and crop modellers on inclusion of ozone impacts

Further development and applications of ozone modified photosynthesis-based flux-response models (with EMEP/MSC-West)

2022/2023. Ozone flux-based risk assessment for vegetation at various air pollution scenarios (GP, also methane precursors) (with EMEP/MSC-West, HTAP)

Longer term:
2023/2024. State of knowledge report: Genetics of crop resilience to ozone and potential for improved crop breeding.

2023/2024. Review critical levels for NOx

ICP Vegetation Workplan – other items

Ongoing Annual Activities
Review and update Scientific Background Document B for Chapter 3 of Modelling and Mapping Manual

Outreach and networking activities in developing regions (e.g. ICP Vegetation-Asia); linking with other networks

Additional (unofficial) items

2021 delivery:
Comparison of spatial patterns and temporal trends of heavy metals in mosses and EMEP-modelled deposition (with EMEP/MSC-East)

2021 delivery: *Joint workshop with other working groups (e.g. ICP Waters) on latest developments in analysis of environmental microplastics*

2022 delivery: *Review metals and pollutants of focus, including emerging pollutants*

2022 delivery*: Pilot studies on use of mosses as bioindicators of airborne microplastics*

Thank you