Achievements of the ICP Vegetation and future work plan

Felicity Hayes, Katrina Sharps, Mike Perring

ICP Vegetation Coordination Centre, UKCEH*

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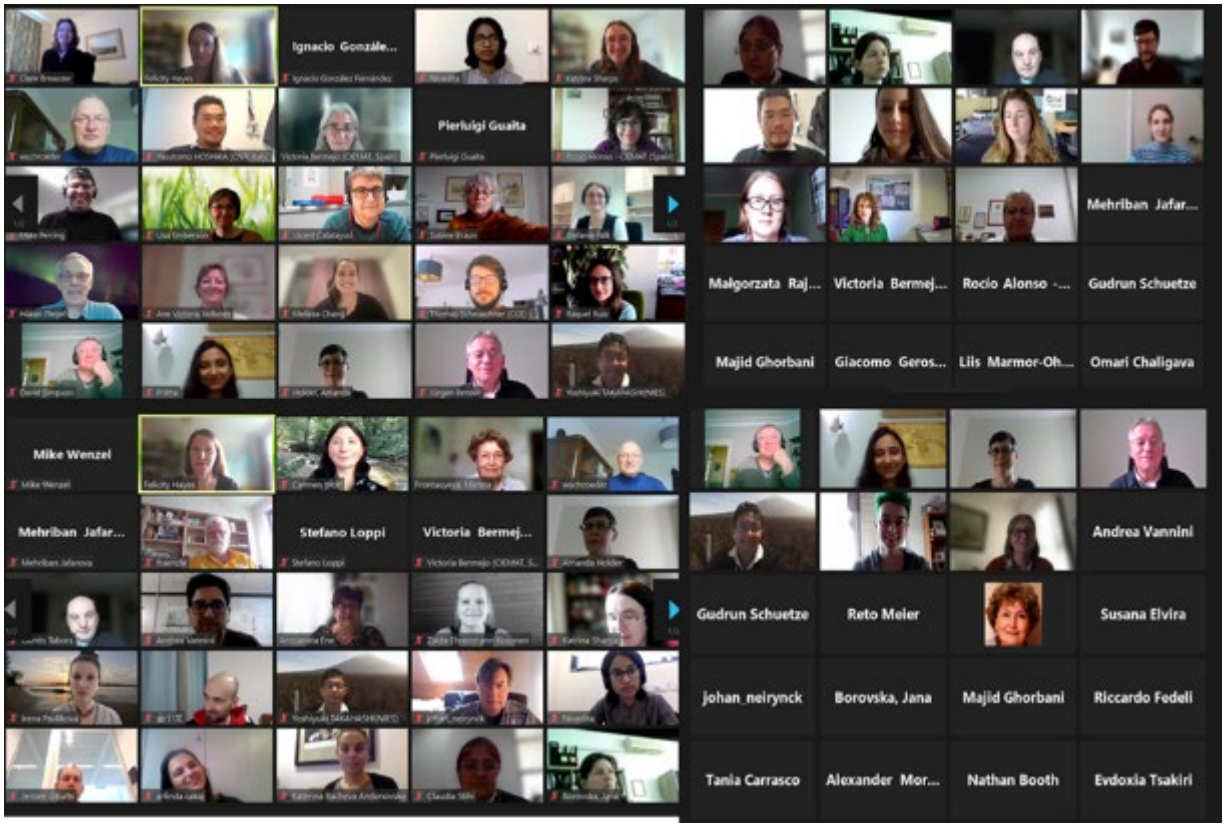
Task Force Meeting 2022



Hosted by Zoom
21-23 February 2022
135 participants from 36 countries

2023 meeting planned to be in Kaunus, Lithuania

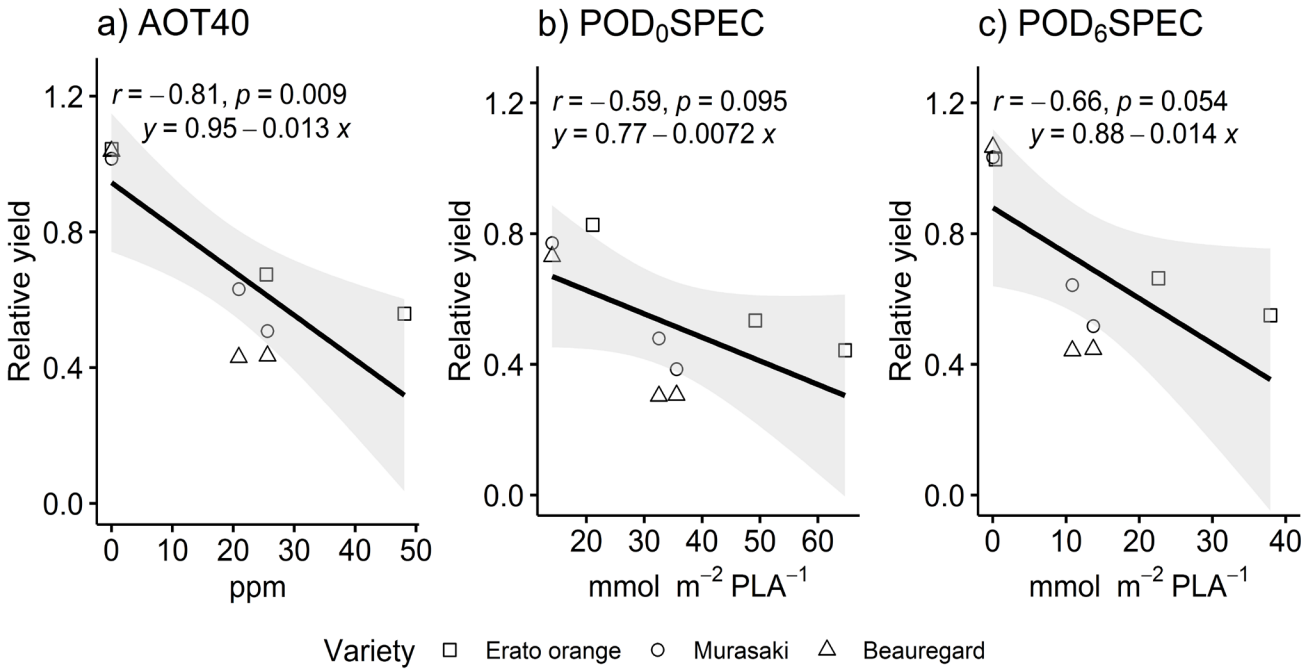
Mapping Manual - Annexes

Soon to be added to SBD-B

Parameterization of soil moisture index in the DO_3SE model for ozone risk assessment - *Ignacio González-Fernández*

Already added to SBD-B

DO_3SE parameterization and flux-effect relationship for sweet potato – *Amanda Holder and Felicity Hayes*



Ozone flux-based risk assessment

Tropical Crops

Parameterisations developed for bean, sweet potato and finger millet

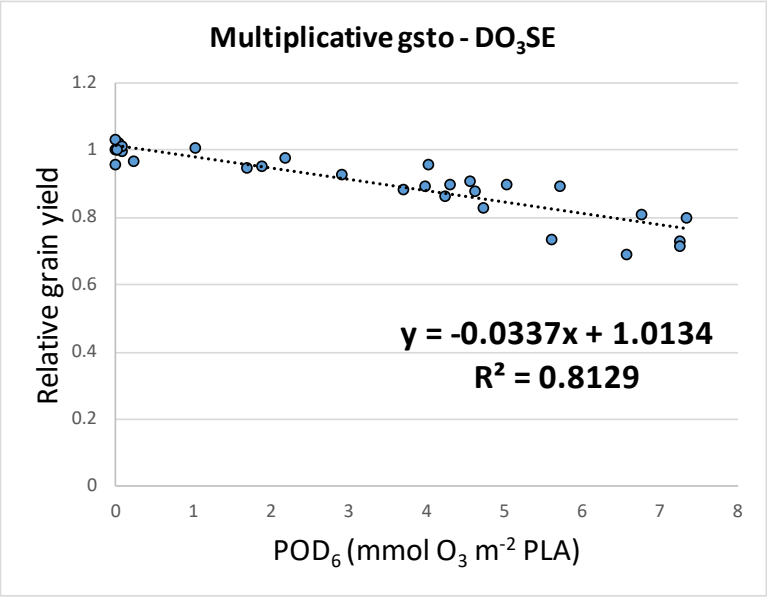
Allowing improved risk assessment in tropical areas – particularly relevant as temperate crops e.g. wheat are not commonly grown in all regions

Sweet potato and bean are ozone-sensitive, showing yield reductions

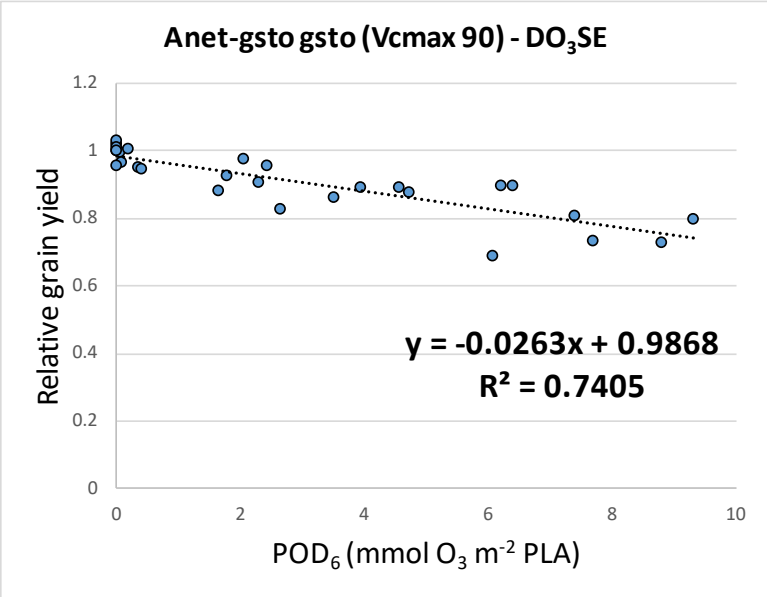
Workplan item 1.1.1.14

Development of coupled gsto-An model

i. Multiplicative stomatal conductance (gsto) model



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



The new model is working well.

This will allow flux-response relationships for wheat based on the coupled photosynthetic-stomatal conductance type of model that is often used in biogeochemical models, land-surface exchange schemes and earth system models.

Influence of climate change on ozone impacts (flux-based)

Workplan item 1.1.1.15

Preliminary findings:

For wheat, increasing air temperature due to climate change leads to earlier anthesis and shortens the grain filling phase - timing of ozone accumulation

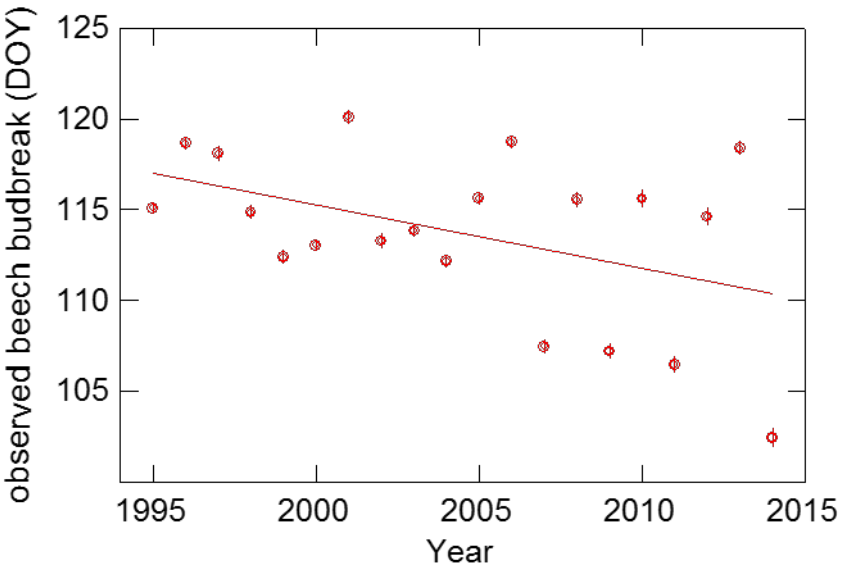
Wheat varieties bred to maximise the shorter grain filling time **may** have higher stomatal uptake (more ozone sensitive?)

For trees, increasing air temperature leads to earlier bud-break ('spring') and later leaf discolouration ('autumn') – longer growing season

Assumptions of additional carbon-sequestration due to longer growing season may by overestimated due to larger ozone impacts

Changing phenology of beech

Workplan item 1.1.1.15



Earlier observed budbreak of beech across Europe. (2-3 days per decade)

Templ et al. (2018) Pan European Phenological database (PEP725). doi: 10.1007/s00484-018-1512-8

Review of Gothenburg Protocol

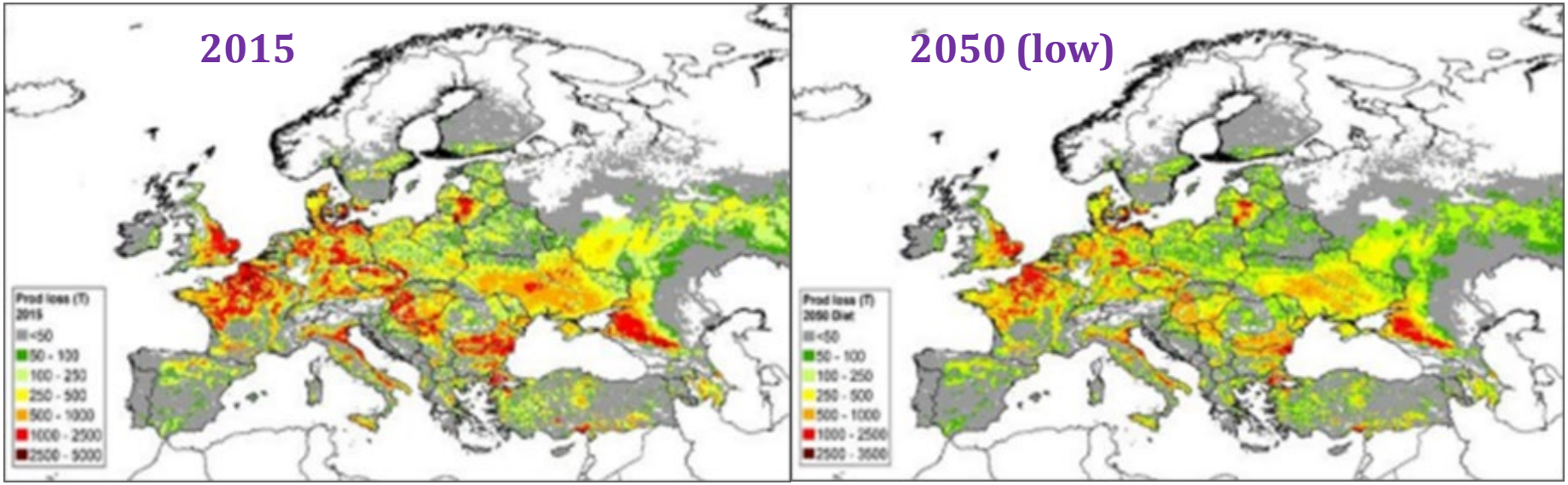
Workplan item 1.1.1.1

ICP Vegetation contributed text, and post-hoc analysis using ozone concentration and ozone flux data received from EMEP.

Analysis was carried out for wheat production and for growth of deciduous forest trees.

Reduced production loss of wheat compared to 2015 in the most stringent scenario – but significant production loss still remains

(more details in presentation by Katrina Sharps)



Outreach – leaflets, YouTube, webinars, online course

- ❑ Online course

  https://www.ceh.ac.uk/training/ozone-and-tropical-agriculture

- ❑ YouTube ozone overview

  https://youtu.be/OBEJB-60jQU

- ❑ Webinar on ozone and tropical agriculture. Q&A on ICP Vegetation website

- ❑ Leaflets/brochure on ozone impacts on vegetation

- ❑ Information for Plantwise Knowledgebank on ozone injury symptoms in crops

Measurements of ozone concentration 2020/2021

Country	Site	Ozone (ppb)		Country	Site	Ozone (ppb)
Rwanda	Mt Mugogo	40-53		Uganda	Buginyanya	30-36
Rwanda	Huye	22-31		Uganda	Rwebitaba	28-37
Tanzania	Dodoma	15-16		Uganda	Namulonge	15-27
Tanzania	Rungwe	16-19		Kenya	Kisii	18-28
India	Varanasi	26-28		India	Rajasthan	35-62
Tanzania	NM-AIST	14		Tanzania	Kilimanjaro	11-17

Diffusion tubes are also being exposed in: Malawi, Zambia, Ghana, Ethiopia, DRC, Ecuador

Review of Critical Levels for NOx

- First workshop was held online, 24th May 2022
- An online meeting 15th November 2022 to update findings and plan the writing of the update (37 participants from 12 countries).
- Reporting back to the ICP Vegetation TFM in 2023

Participation welcome

Contact Mike Perring (MikPer@ceh.ac.uk)



Moss survey 2020-2022

Workplan item 1.1.1.13

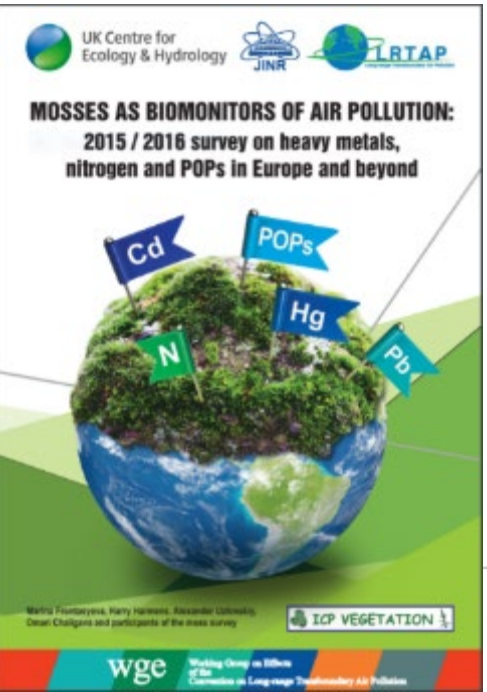
- **Current survey 2020-2022:**
  Call for data issued (HM, N, POPs)

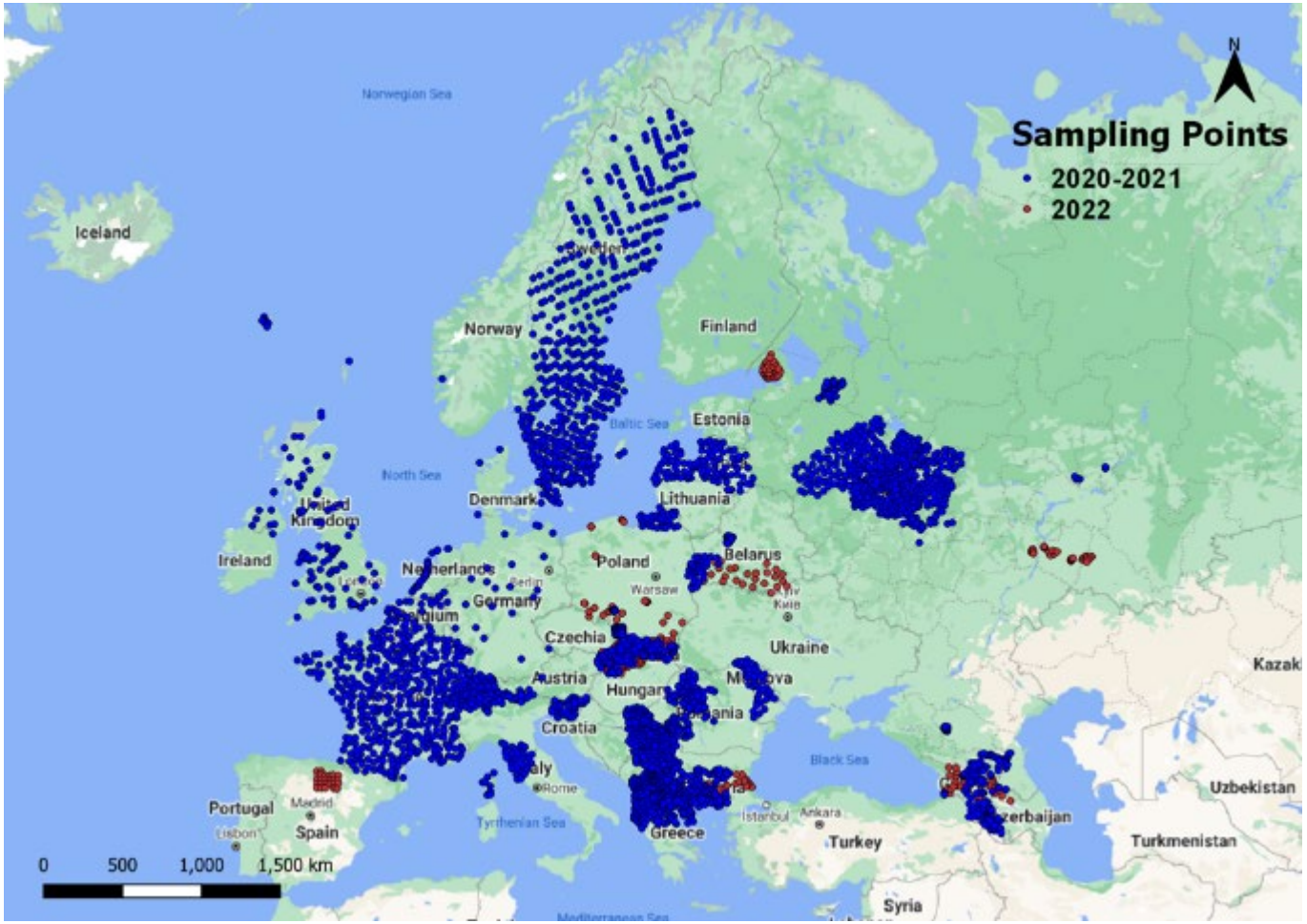
- Include pilot study on mosses as biomonitors of microplastics as indication of atmospheric deposition rates

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

Participants of the moss survey 2020-2022				
Albania	Faroe Islands	Kosovo	Romania	Sweden
Armenia	France	Latvia	Russia	Switzerland
Belarus	Georgia	Moldova	Serbia	UK
Belgium	Germany	Netherlands	Slovakia	
Bulgaria	Greece	North Macedonia	Slovenia	Kazakhstan
Czechia	Italy	Poland	Spain	Vietnam

Moss survey – sites already sampled





Moss survey for airborne microplastics

Samples collected from >26 countries (2-3 sites per country)

Subsamples from each site will be analysed using 3 different techniques (Germany, Ireland, Italy, UK – as in kind contributions to the ICP Vegetation)

Microplastics found to date include polypropylene, polyamide, artificial cellulose, acrylates and polyureathanes

ICP Vegetation Workplan (ozone)

2022/2023 delivery:

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

Applications of ozone modified photosynthesis-based flux-response models (with EMEP/MSC-West)

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

Review of critical levels for Nox

Additional contributions to the review of the Gothenburg Protocol

ICP Vegetation Workplan (ozone)

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

2023/2024. State of knowledge report: Impacts of ozone on carbon sequestration in Europe

ICP Vegetation Workplan (moss)

2022 delivery: Call for data for moss survey 2020-22

Additional (unofficial) items
Survey of microplastic content of mosses in 2022 (>26 countries) and short report on pilot studies on use of mosses as bioindicators of airborne microplastics

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

Review metals and pollutants of focus
→ *are there metals that should be prioritised (e.g. mercury still important)?*
→ *what should be recommended items (e.g. nitrogen) or emerging pollutants to focus on?*

Additional Recommendations: *Encourage studies on impact of deposition on plant/moss growth and physiology (with a focus on air deposition rather than soil contamination).*

Thank you

Notes for minutes:

ICP Vegetation have completed some post-hoc analysis for the review of the Gothenburg Protocol using ozone concentration and ozone flux data received from EMEP. Analysis was carried out for wheat production and for growth of forest trees.

Additional information and parameterisations to improve and extend ozone risk assessment to vegetation have been added to the background document of Chapter 3 of the Modelling and Mapping Manual.

Heavy metals in mosses 2020/21 survey is underway (extended to 2022). Approximately 3500 samples collected already. The survey includes a pilot study on microplastics content of mosses. Additional moss samples are being collected in 2022 for an additional, centrally analysed study on microplastic content.

Outreach activities continue, to raise awareness and to share skills and expertise.