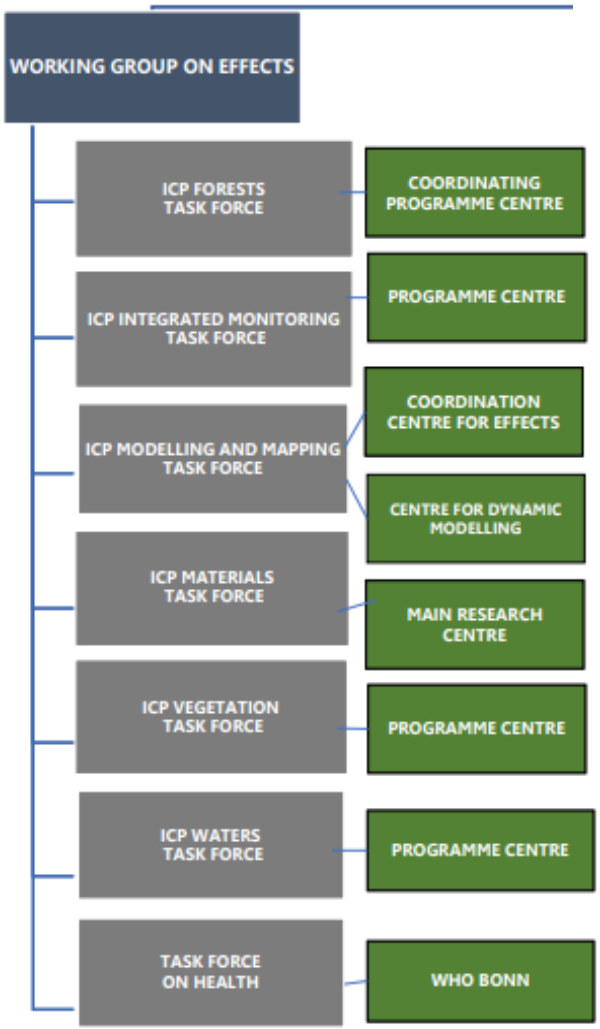
2022-2023 WGE activities

Jesper Leth Bak, Chair of the WGE
Isaura Rábago (former chair of the WGE)

43rd session Executive Body
11 – 14 December 2023

2022-2023 Workplan: WGE activities



Outputs of the 9th joint session of EMEP-SB and WGE

- 2022-2023 Workplan progress of activities
- Monitoring, Modelling and Risk Assessment Activities
- Thematic Sessions: Biodiversity, Methane, HM
- 2024-2025 Workplan activities
- Election of officers

TF - Health

https://unece.org/health

1.1.1.27. Consolidate existing evidence on health outcomes of exposure to air pollution

Report on methods for health risk/impact assessment of air pollution and cost-benefit analysis (update to HRAPIE project)

- Focus on Concentration-Response Functions: PM2.5, PM10, NO2, ozone and mortality, long-term effects, the WHO European Region
- HRAPIE-2 report expected by the end of 2023
- Continuation of HRAPIE project in 2024

TF - Health

1.1.1.27. Consolidate existing evidence on health outcomes of exposure to air pollution

Update of tools for quantification of the health impacts of air pollution, including links to climate change mitigation

AirQ+

- New interface and name: Climate Mitigation, Air Quality and Health (**CLIMAQ-H**)
- Improved calculation methods of health and economic benefits of climate mitigation actions;
- The methods used are based on evidence from epidemiological studies that show relations between average long-term air pollution concentrations and the mortality and morbidity risks of exposed populations.

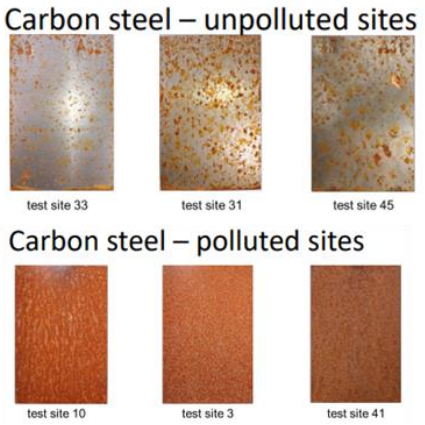
ICP - Materials

https://www.ri.se/en/icp-materials

Monitoring impacts on corrosion and soiling effects

Trends: 1987-2021

- Carbon Steel: corrosion losses have decreased except in one site
- Modern Glass: Haze is stable without clear trends in most sites



Dose Response Functions

- Zinc: The influence of SO2 has decreased, and natural factors (T, precip, humidiy) become more important for corrosion process. A revision of DRFs is needed
- Coil-coated materials: Calculations does not correlate with measured values -> More reliable PM measures are needed

ICP - Materials

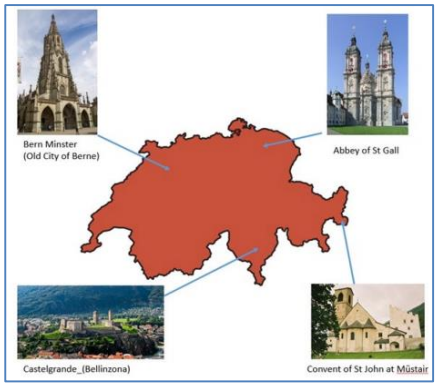
https://www.ri.se/en/icp-materials

UNESCO case studies

Study 2015-2019: Despite the decrease in emissions and concentrations of air pollutants , the materials of the cultural heritage are still partially at risk

UNESCO case studies. Part VI: Inventory and conditions of materialsl at UNESCO world heritage sites". **Report 93**

	Limestone (corrosion)	Limestone (soiling)
St. Domnius Cathedral	Low	Medium
Würzburg Residence	Medium	Medium
Royal Palace of Caserta	Very High	High/Very High



Application of AQ models with increased resolution: EMEP data vs national data

- Using a model with a resolution at urban scale it can have more realistic estimation of the effect of air pollutants on cultural objects

Part VII: Application of models with increased resolution in the study of damage at UNESCO heritage sites". – Switzerland**. Report in progress**

ICP - Forests

http://icp-forests.net/

Workplan Items
(1) Nitrogen deposition and its effects on forest ecosystem functions and services
(2) Air pollution-related cause-effect relationships in forests in a changing climate
(3) Status & trends of heavy metals
(4) Ambient Ozone its effects on forest ecosystem functions and services

Nitrogen deposition levels remain high in several European regions

- It increase the risk of leaching of base cations and nitrates into surface waters
- N deposition is becoming more ammonium dominated
- Natural recovery in acidified forests soils in Central Europe is very slow

Ozone

- Concentrations in forest sites remained high and caused frequent visible *foliar symptoms*

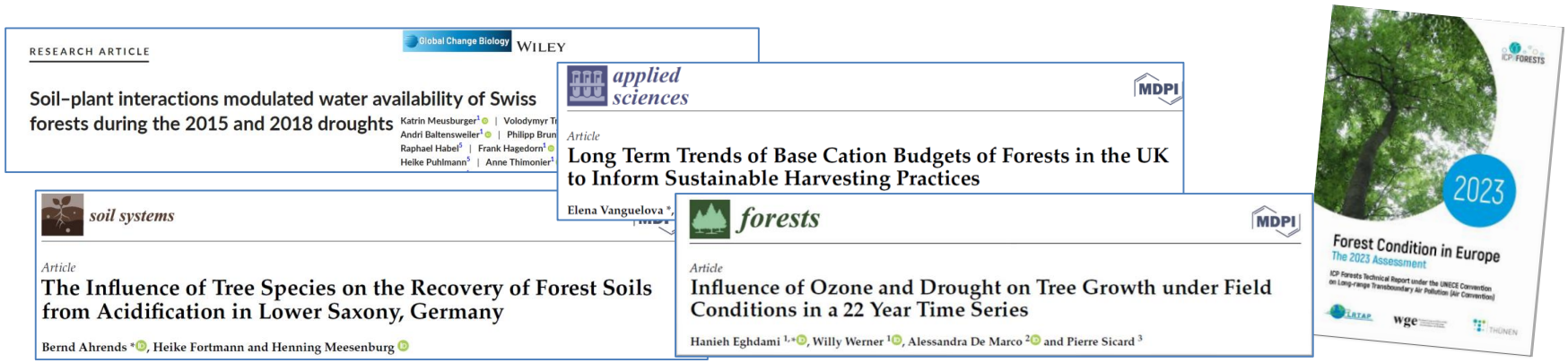
Climate

- Recurring draught caused substantial stress on forest trees and may act in combination with air pollution

ICP - Forests

Reports, national reports, scientific papers, literature review

http://icp-forests.net/



Revised ICP forests 2024-2030

- Broaden scope of monitoring
- Increase the visibility of ICP-Forests
- Enhance cooperation with other CLRTAP bodies & feed information into other bodies and programmes (FAO Forest Europe…)

  - ✓ The Commission and JRC in the frame of the new EU framework for forest monitoring and strategic Plans
  - ✓ The European National Forest Inventory Network (ENFIN)

https://icpvegetation.ceh.ac.uk/

Influence of CC on ozone impacts (Flux-based)

Changes in phenology -> Changes in timing of ozone accumulation

- For wheat, increasing air temperature 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

https://icpvegetation.ceh.ac.uk/

DO_3SE Crop Model Development

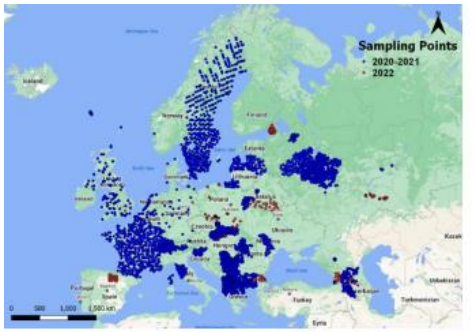
- Accelerated chlorophyll reduction due to ozone is a major contributor to yield loss.
- Chlorophyll reduction is also influenced by climate change stresses.
- Work is ongoing to incorporate the timing and extent of senescence into existing models, to allow assessment of combined ozone and climate stresses on wheat yield

ICP - Vegetation

https://icpvegetation.ceh.ac.uk/

Moss survey

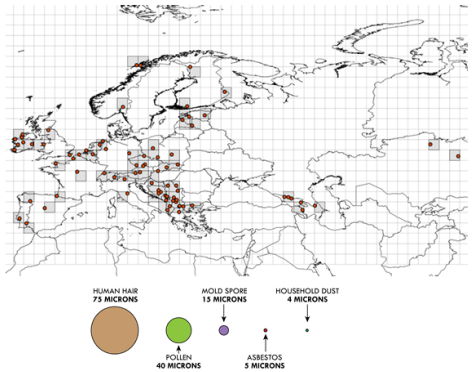
- The coordination of the Moss survey, including data analysis and writing the report on the 2020-2022 survey has been transferred back to the PCC.
- Current survey 2020-2022 (HM, N, POPs) : Final datasets arriving from participating countries



- The decline in concentration in mosses of some metals has slowed (e.g. Pb). Some metals may be increasing in concentration (e.g. Cd, Cu, Zn) (UK study)

Pilot study on mosses as biomonitors of microplastics

Microplastic Atmospheric Deposition Assessment using Moss in Europe (MADAME)



>30 countries participating

Moss sampling by participants, based on the main 'moss survey'

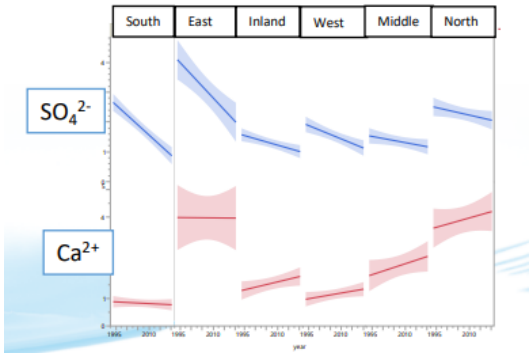
Microplastics found to date include:
Polypropylene
Polyamide
Artificial cellulose
Acrylates
Polyurethanes

ICP - Waters

https://www.icp-waters.no/

Base cations Report 2023

- Essential for acid-buffering capacity of surface waters. Have shown some surprising increases recently
- Understanding changes in base cations is necessary to predict recovery from acidification
- Analysis of Trends and variability



de Wit et al. (2023)

Preliminary conclusions:

Unexpected increases in Ca, a “new” mechanism?

- The increases in calcium appear to be limited to less acidified sites. Time will show if more acidified sites show the same patterns
- This phenomenon is important to understand in the era of low S deposition
- Report will be finished in 2023

ICP - Waters

https://www.icp-waters.no/

ICP Waters and ICP-IM Task Force Meeting (Austria, May 2023)

- Chemical and **biological recovery is ongoing**, but there are more variable trends for nitrogen and biota than for sulphate
- **Climate change** impacts are increasingly important as deposition declines
- **Understanding recovery processes is vital** for dynamic modelling and predictions
- **Long-term monitoring is of great value** to the effects work
- **Open data policy** is supported and work towards increased openness is continued

www.icp-waters.no\publications

ICP - Integrated Monitoring

Continue work on Hg and other HM

https://www.slu.se/en/icp-im

On-going collaboration with Environment and Climate Change Canada and the University of Toronto to install passive samples for gaseous Hg

Trends in HM concentrations (water courses)

Hg: No significant trends in concentrations during 2000-2020. Significant decreasing trends of Hg were mainly observed during 2000-2005.

Pb and **Cd** concentrations decreased in 35% and 70%. The trends in concentration of these elements have flattened out after 2005.

- Causes? Declining deposition of heavy metals over Europe, although catchment recovery is suggested to be a rather slow process
- Trends of heavy metals also coincide well with the recovery from acidification.

ICP - Integrated Monitoring

https://www.slu.se/en/icp-im

Modelling and assessment of biodiversity and ecosystem impacts (recovery from acidification)

- Dynamic geochemical soil model (VSD+) coupled to a plant response model (PROPS) to investigate recovery patterns in plant diversity after acidification.
- Investigate role of confounding factors at sites where we have excellent background knowledge
- ICP IM has excellent data in-depth but geographical coverage is limited.

Co-operation with e-LTER and WGE

- Spatial coverage gap analysis, to identify where ICP sites that are not also eLTER sites may be able to fill critical gaps in the eLTER network, or vice versa
- Expert group will be formed for each SO to develop a draft protocol – input from WGE/ICPs obviously welcomed -> Harmonisation of ICP manuals

ICP-IM: Need to revise Manual

ICP - Modelling and Mapping

https://www.umweltbundesamt.de/en/Coordination_Centre_for_Effects
https://www.ivl.se/projektwebbar/centre-for-dynamic-modelling.html

Ongoing activities on Critical Loads (CCE)

CCE Status Report 2022

- Overview of NFC national CL data
- CCE Background Database
- Summary of ICP M&M contribution to the review of the Gothenburg Protocol
- Critical Atmospheric Inputs for marine ecosystems

- Call for data 2023: ask NFC to apply on national territories and send data for a combined European dataset
- Many countries are applying revised 2022 **CL_{empN}** already, in a heterogeneous way, e.g. using lower end of the range or middle point of the range (or expert judgement, etc.)
- Update of the mapping manual

ICP - Modelling and Mapping

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Input data

- Important input data for e.g. background database and the EMEP/MSC-W model
- Update of the receptor map is completed and is available upon request cce@uba.de

Harmonization of the Receptor map for Europe – nearly completed

CORINE Land Cover 2018

European Environment Agency. 2018. "Corine Land Cover (CLC) 2018, Version 2020_20u1." European Environment Agency (EEA) under the framework of the Copernicus programme. https://land.copernicus.eu/pan-european/corine-land-cover/clc2018.

EEA Ecosystem Type Map v3.1

European Environment Agency. 2012. "Ecosystem Types of Europe - Version 3.1." European Environment Agency. https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search#/metadata/faff2281-1fca-4548-89d8-c8ec0c507bc7.

Copernicus Global Land Cover

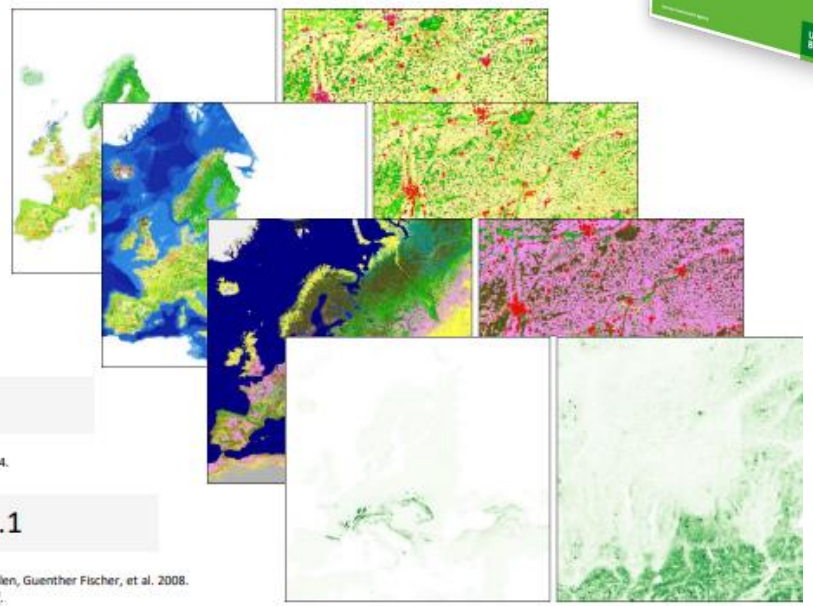
Buchhorn, Smets, Bertels, Lesiv, Tsendbazar, Herold, and Fritz. 2019. "Copernicus Global Land Service: Land Cover 100m: Collection 3: Epoch 2019: Globe." https://land.copernicus.eu/global/products/lc.

Global Potential Natural Vegetation Maps

Hengl, Tomislav. 2018. "Global Maps of Potential Natural Vegetation at 1 Km Resolution." Harvard Dataverse, V4. https://doi.org/10.7910/DVN/QQHCIK.

Harmonized World Soil Database Version 1.1

Nachtergaele, FO, Harrij van Velthuizen, Luc Verelst, NH Batjes, JA Dijkshoorn, VWP van Engelen, Guenther Fischer, et al. 2008. "Harmonized World Soil Database (Version 1.0)." https://www.fao.org/3/aq361e/aq361e.pdf.



ICP - Modelling and Mapping

Dynamic Modelling Activities (CDM)

https://www.umweltbundesamt.de/en/Coordination_Centre_for_Effects
https://www.ivl.se/projektwebbar/centre-for-dynamic-modelling.html

Modelling interactions between AP and CC N and C: Expert workshop

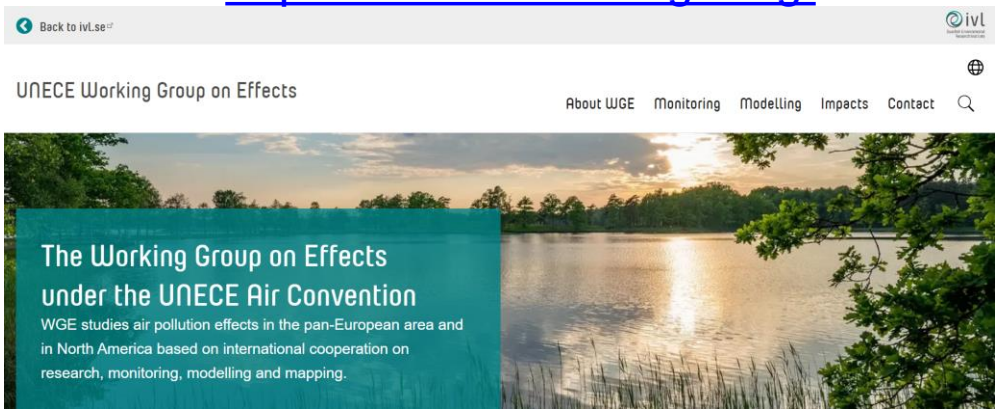
- ✓ Models are increasingly capable, increasingly complex and data demanding. Data availability is all increasing. On outstanding issue is modelling of N cycling in ecosystems.
- ✓ Modelling biodiversity has several additional challenges when the biogeochemistry is "solved". Including data availability, definition of targets, confounding factors (CC, LU).
- ✓ More efforts to cooperate with CC and BD communities (e.g. connecting C and N reporting, on BD indicators).
- ✓ Do we really need more exact answers, when 68% of Europe has CL for N exceeded? More science may not be the only solution. Communication? Else?

- ✓ What can DM do for CLRTAP**? To describe future effects. Including timing/delays**. (Agreement on what needs to be shown is dependent on dialogue between "modellers" and "policy makers".)

Common WGE Portal

https://www.unece-wge.org/

- Inputs from all ICPs and the secretariat
- Links to ICPs/TFs
- Webpage centered around three themes:



Monitoring: Air, Biota, Materials, Soil, Water

Modelling: Biota, Materials Soil, Water

Impact Indicators: Critical Loads and Levels (Acidification, eutrophication, O3, Biodiversity

Election of officers

- New WGE chair: Jesper Leth Bak jlb@ecos.au.dk
- Vice-chairs: Alessandra de Marco (IT) and Zita Ferenczi (Hungary)

Thematic session on Biodiversity (9th Joint session EMEP & WGE)

Impacts of Air Pollution on Biodiversity

- Convention on Biological Diversity & Global Framework on Biodiversity
- O_3 impacts on Biodiversity
- Chemistry and biology in aquatic ecosystems
- N deposition and impacts on ecosystems and plant biodiversity. Empirical CL
- Conclusions, recommendations and actions.

Thematic session on Biodiversity (9th Joint session EMEP & WGE)

CBD & GBF

- **Target**: Reduce pollution risks and impact by 2030, (including reducing excess nutrients lost through more efficient nutrient cycling and use)
- **Monitoring Framework:** Includes indicators for tracking national, regional and global progress (Decision 15/5)
- **Cooperation** with other conventions and international organizations (Decision 15/13)

Information documents from CLRTAP for CBD SBSTTA 26 (May 2024), to provide further information on CLRTAP work and linkages to biodiversity to CBD delegates

Thematic session on Biodiversity (9th Joint session EMEP & WGE)

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O_3 impacts on Biodiversity

- There are many effects of ozone identified on plants: ↓ **growth** including roots, ↓ **nitrogen-fixation**, altered decomposition/soil cycling, changes in **flower number**, timing, **pollinator signalling**.
- Effects are difficult and expensive to detect in natural systems
- There is increasing evidence of effects on insects that are mediated via effects on plants
- **Critical Levels** of O_3

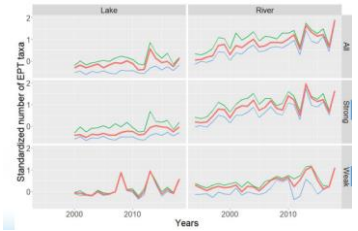
Thematic session on Biodiversity (9th Joint session EMEP & WGE)

N deposition and impacts on ecosystems and plant biodiversity.

- **Large-scale monitoring** data find shifts in understory community composition in response to high levels of Ndep but do not show clear responses to decreasing Ndep.
- The recovery of understory vegetation from high N inputs is possible but long time-lags (decades) are expected.
- **Critical Loads**: Limits for N and S deposition to prevent plants species from being lost
- **Dynamic Modelling**: recovery of soil chemistry conditions. No immediate (<20 years) change in biodiversity with reduced deposition. Predictions have to take CC into consideration

Chemistry and biology in aquatic ecosystems

- Widespread evidence for increases in species diversity from 90s, related to chemical recovery: ⇒ positive **biological response to reduced acid deposition**
- Integrated biological and water chemical **monitoring programs are essential** for documentation of biological responses to air pollution
- Climate can also impact changes in species richness



Thematic session on Biodiversity (9th Joint session EMEP & WGE)

Empirical CL for Nitrogen (CLempN)

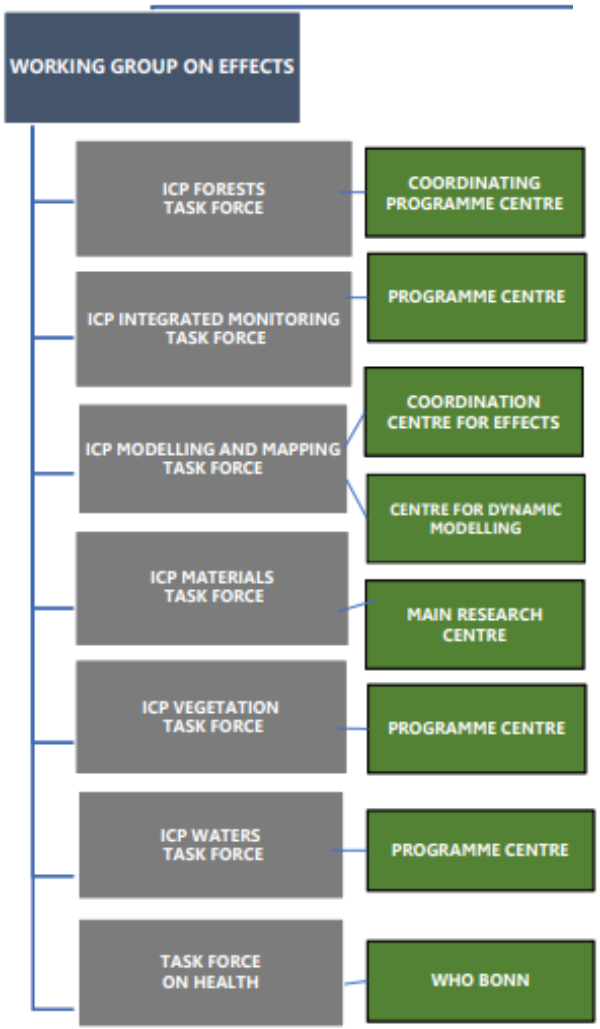
Exceedance of the recommended CLempN value is related to biodiversity:

- Change in plant species richness
- Change in plant species composition
- Decrease in oligotrophic species
- Increase in productivity species
- Decline of typical species
- Decline in diversity

Conclusions and recommendations

- Large-scale **monitoring programmes** data are essential for documentation on biological response and scientific evidences of AP impacts and recovery
- **Critical Loads** and dynamic modelling are **useful tools** to support policy decisions
- Nutrient and carbon balances needs to be included in models, and effects of CC needs to be included also in scenario assesment.
- WGE recommend to formally endorse the GBF.

2022-2023 Workplan: WGE activities



- All activities are on schedule
- Critical Loads and Levels and Dynamic Modelling are important tools for supporting policy decisions
- Long term monitoring programmes are essential for effects assessment (impacts, recovery, trends, response to AP and CC)
- Climate change is increasingly important in Air Pollution risks analysis
- Increase cooperation with BD and CC conventions

Clean Air 40 YEARS

wge Working Group on Effects of the Convention on Long-range Transboundary Air Pollution

Thank you for your attention

More information @

9th joint session of EMEP & WGE webpage

https://unece.org/info/Environmental-Policy/Air-Pollution/events/371556

ICPs and TF Annual Reports (UNECE website)

ICPs and TF Technical Reports (at TF and Programme Centers websites)

UNECE

Convention on Long-range Transboundary Air Pollution

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