ICP Waters

International Cooperative Programme on Assessment and Monitoring Effects of Air Pollution on Rivers and Lakes

Aims

- Assess the *degree* and *geographic extent* of the impact of atmospheric pollution, in *particular acidification*, on *surface waters*
- Collect information to evaluate *dose/response relationships*
- Describe and evaluate *long-term trends and variation* in *aquatic chemistry and biota* attributable to atmospheric pollution

Progress & results

- Status participation
- Report from Task Force meeting
- Recent and planned reports
- Relevant results in light of unofficial document Gothenburg Protocol Review Group

Status participation

	Chemical data (last year with data)	Biological data (last year with data)	Participation in TF meetings 2019-2021	Participation in chemical intercomparison 2018-2020	Participation in biological intercalibration 2018-2020
Armenia	2019		•		
Austria	2018		•	•	
Belarus	2014				
Belgium				•	
Canada	2019		•	•	
Czech Rep.	2019	2017	•	•	
Estonia	2019		•	•	•
Finland	2019		•	•	
France			•	•	
Georgia			•		
Germany	2019	2019	•	•	
Ireland	2019	2016	•	•	•
Italy	2019		•	•	
Latvia	2018	2019	•		•
Lithuania			•	•	
Moldova	2017			•	
Netherlands	2014			•	
Norway	2019	2020	•	•	•
Poland	2019		•	•	
Russia	2018		•	•	
Serbia				•	
Slovakia	2019				
Spain	2013		•	•	
Sweden	2019	2019	•	•	•
Switzerland	2019	2018	•	•	
UK	2019	2015	•	•	
USA	2018		•		
Total	**21**	**8**	**21**	**21**	**5**

- Virtual Task Force meeting
  - Remote organization allowed for easier participation from other ICPs
- Stable participation overall, new focal centre in Spain

Task Force meeting

Presentation of thematic reports

- Eutrophication effects of nitrogen in boreal surface waters in natural catchments (Thrane and de Wit, to be published in 2021)
- Nitrogen in surface waters: trends, drivers and effects (Austnes et al., in preparation)
- 2022 report on biological responses to reduced acidification (Velle et al., in preparation)

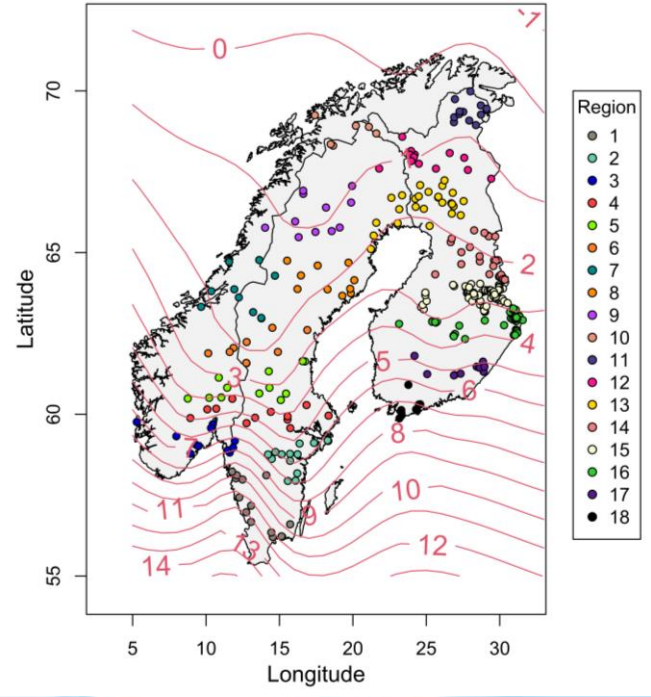
Other items

- Trends in chemical and biological recovery of surface waters
  - Climate as a confounding factor
- Monitoring networks under various policy instrumtents (CLRTAP, NECD, WFD)
- Long-term scientific strategy and review and revision of Gothenburg Protocol
- Minutes are available at www.icp-waters.no

Eutrophication effects of N deposition in nutrient-poor natural surface waters

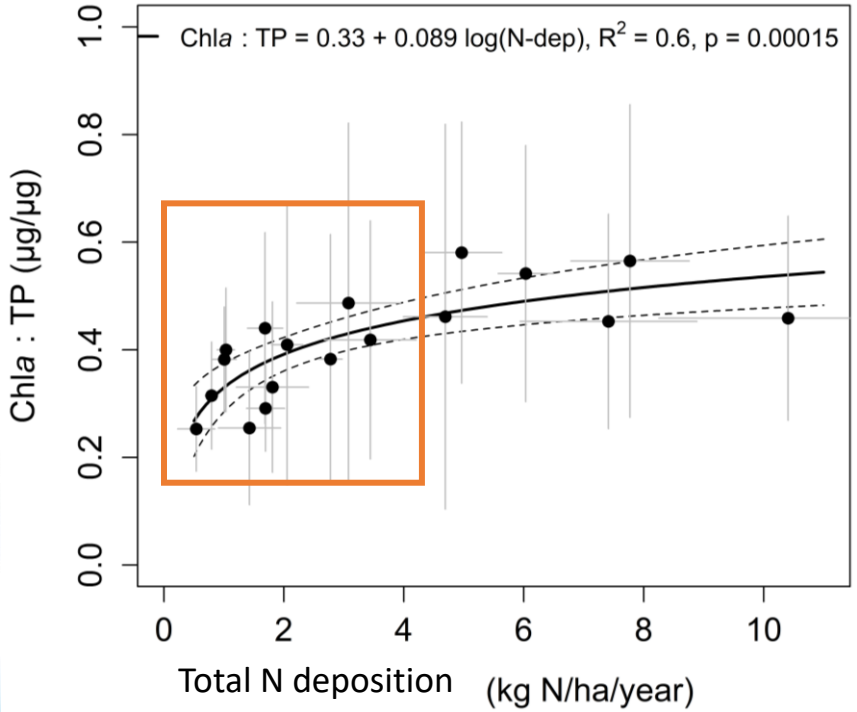
- Algal growth in freshwaters is strongly related to availability of phosphorus (P limitation)
- Does N deposition contribute to algal growth?
  - Chlorophyll-a (Chl-a) is a proxy for algal biomass

- Does extra nitrogen contribute to more algal biomass per unit P?
- Data analysis of >300 lakes in Sweden, Norway and Finland, grouped into 18 regions with contrasting N deposition levels

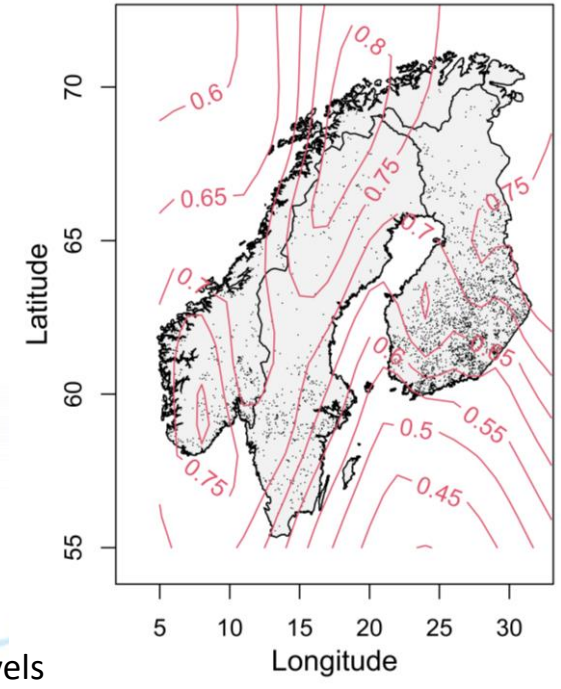


N deposition in kg N/ha/yr

Algal biomass per unit P increases with total N deposition below ca 4 kg N ha/yr



Wet N deposition is ca 70% of total N deposition



>300 lakes, grouped in 18 regions with contrasting N deposition levels

Ratio of algal biomass per g P ('chlorophyll-a to totP) increases with N deposition

Revision of empirical critical loads of N

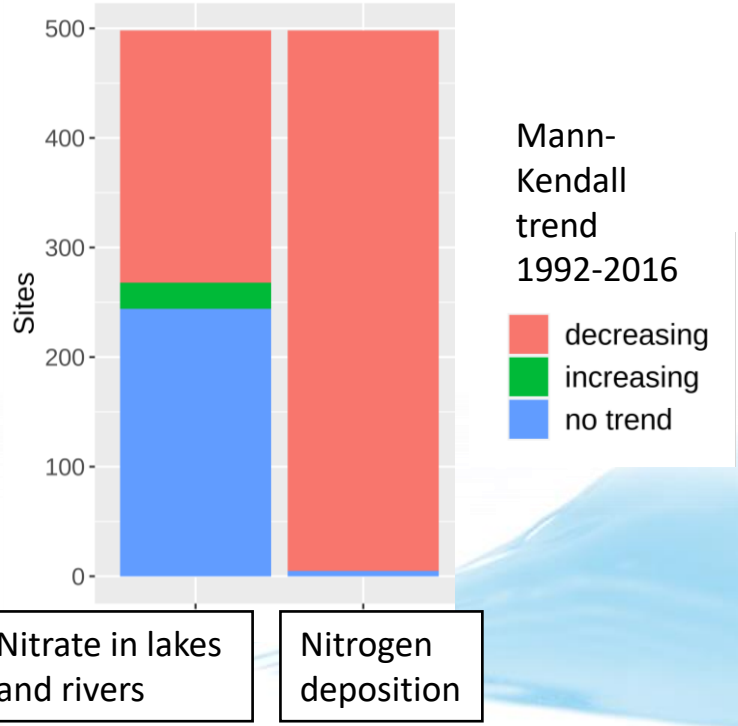
- Consider
  - Catchment retention capacity to retain atmospheric N
  - Water color (light limitation affects response to increased N)
- Sensitivity increases in the following order:
  - Clearwater alpine and subarctic lakes > boreal lakes from forested regions > humic (dystrophic) water bodies

Proposed, to be discussed at expert workshop

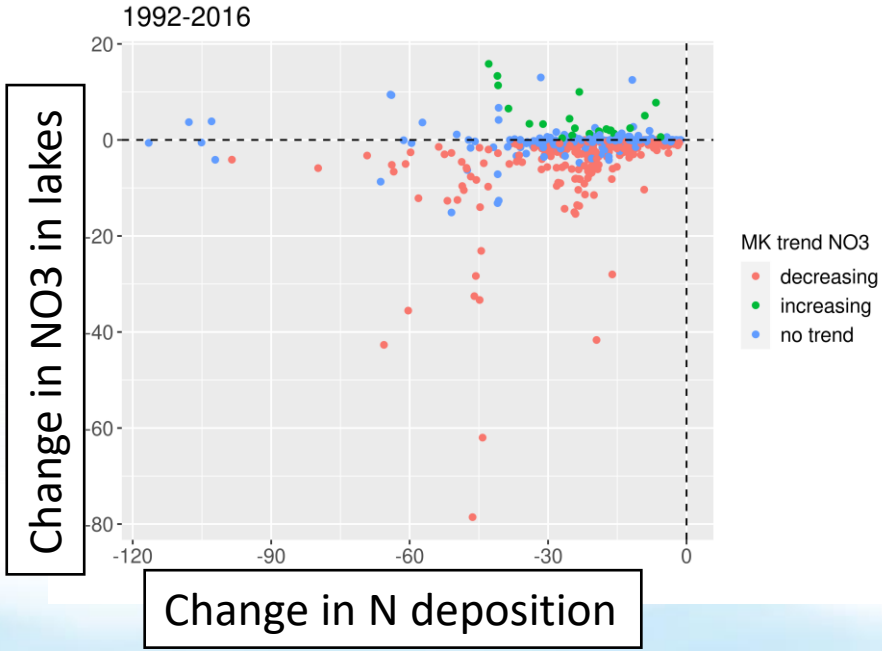
Ecosystem type	EUNIS code	kg N ha^{-1} yr^{-1}
Permanent oligotrophic lakes, ponds and pools (including soft-water lakes)	C1.1[a]	2-6 (old: lower end of 3-10)
Dune slack pools (permanent oligotrophic waters)	C1.16	10-20
Permanent dystrophic lakes, ponds and pools	C1.4[b]	5-10 (old: 3-10)

Nitrogen report 2: Controls on trends in nitrate in lakes

- N deposition is mostly decreasing
- Nitrate concentration in 50% of all lakes and rivers is constant
  - Ca 40% upward trend, and ca 10% downward



Nitrogen report - 2



- Nitrate in surface waters does not show a simple response to deposition
  - Climate, land use and land cover all determine how surface waters react to changing N deposition
- Changes in nitrogen can impact algal biomass, productivity *(topic of Nitrogen report 1)*

Nitrogen report 2: Preliminary results of statistical analysis

Lake NO_3 decline most likely in

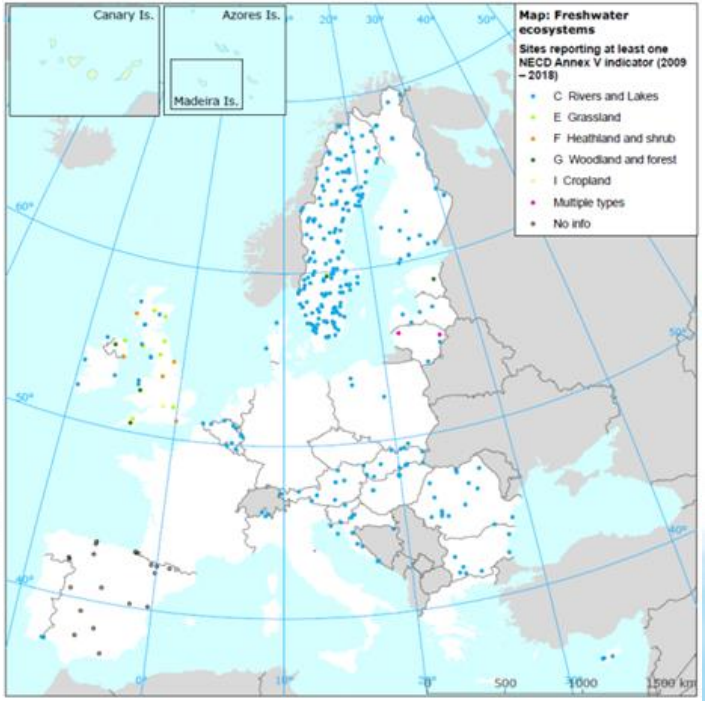
- Regions with intermediate-high N deposition level (>7 kg N/ha) and intermediate decline in N deposition
- Clearwater lakes with intermediate NO_3 concentration (250-800 µg N/l)
- High elevation lakes with little (deciduous/mixed) forest

Nitrogen report 2: Other analyses

- Present state analysis: What controls spatial variability in lake nitrate?
  - Legacy effects of nitrogen deposition are important! Historial N-enrichment controls present-day nitrate, also when current N deposition is low
- Analysis of trends in the CN ratio of dissolved organic matter (DOM)
  - CN ratios in soils are related to nitrogen enrichment
  - Hypothesis: CN ratios of DOM are also related to N-enrichment

NEC Directive - ecosystem monitoring

- EC and contractors work to improve reporting on sites and data for the next reporting cycle (2022/2023)
- The EC plan three webinars for discussion of key issues
- The first was held on June 24 and was about parameters and protocols



Data delivery NEC Directive,
also from countries not reporting to ICP Waters
Analysis of Ecosystem Monitoring Data under Article 9 of Directive (EU) 2016/2284» (July 2020))

Workplan 2021-2023

- ICP Waters specific
  - Contribution to empirical critical loads for nitrogen
  - Nitrogen report (2020+2021)
  - 2022: Thematic report on biological recovery and responses to changing water chemistry
  - 2023: Thematic report on trends in base cations, potential drivers and implications for acidification status and biological recovery (to be discussed at TF meeting 2022)
- WGE joint items
  - Review and revision of the Gothenburg protocol
  - Inputs to the Scientific Strategy
  - Joint report? (instead of ICP Waters-specific report)