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Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe

Working Group on Effects

Fifth joint session
Geneva, 9–13 September 2019
Item 14 of the provisional agenda
Progress in activities in 2019 and further development of effects-oriented activities

Effects of air pollution on rivers and lakes

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

Summary

The present report is submitted for consideration by the fifth joint session of the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe and the Working Group on Effects in accordance with the 2018–2019 workplan for the implementation of the Convention (ECE/EB.AIR/140/Add.1, items 1.1.1.10, 1.1.1.11, 1.1.1.34, 1.4.1 and 1.4.3).

The report is a summary of the discussion and other results presented at the thirty-fifth meeting of the Task Force of the International Cooperative Programme on Assessment and Monitoring of the Effects of Air Pollution on Rivers and Lakes (Helsinki, 4–6 June 2019).

The thirty-fifth meeting was held jointly with the Task Force of the International Cooperative Programme on Integrated Monitoring of Air Pollution Effects on Ecosystems.

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I. Introduction

1. The present report of the International Cooperative Programme on Assessment and Monitoring of the Effects of Air Pollution on Rivers and Lakes (ICP Waters) is being submitted for consideration by the fifth joint session of the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) and the Working Group on Effects, in accordance with the 2018–2019 workplan for the implementation of the Convention (ECE/EB.AIR/140/Add.1, items 1.1.1.10, 1.1.1.11, 1.1.1.34, 1.4.1 and 1.4.3). The report is a summary of the discussion and other results presented at the thirty-fifth meeting of the Task Force of ICP Waters (Helsinki, 4–6 June 2019). The thirty-fifth meeting was held jointly with the Task Force of the International Cooperative Programme on Integrated Monitoring of Air Pollution Effects on Ecosystems (ICP Integrated Monitoring).

2. The lead country of the Task Force of ICP Waters is Norway. The Chair and the Programme Centre of the Task Force are hosted by the Norwegian Institute for Water Research. ICP Waters national focal centres contribute with data and present national results related to assessment and monitoring of air pollution effects on surface waters. ICP Waters collaborates with all the International Cooperative Programmes under the Working Group on Effects, as well as the Joint Task Force on the Health Aspects of Air Pollution.[1]

3. The thirty-fifth meeting of the Task Force of ICP Waters was attended by 55 experts from 20 Parties to the Convention. The thirty-fifth meeting was held jointly with ICP Integrated Monitoring. This was the fourth such joint meeting, the aim of which is to improve collaboration between bodies under the Working Group on Effects (ECE/EB.AIR/133/Add.1, item 1.4.2). At present, 27 countries participate in one or more of the activities of ICP Waters. The Task Force considered progress reports from the Programme Centre and the national focal centres on the results on acidification and recovery, climate change and land use, heavy metals and persistent organic pollutants, biodiversity, nitrogen, and the European Union National Emission Ceilings Directive.[2] The presentations are available from the ICP Waters homepage[3] and in the proceedings of the 2019 Task Force meeting which will be produced before September 2019,[4] and are summarized in the minutes.[5] A summary of the presentations and discussions at the meeting is presented below (section II).

II. Ongoing activities - report from the 2019 Task Force meeting

4. *Trends in surface water chemistry.* Preliminary results from the upcoming 2019 report on trends in surface water chemistry were presented. The initial analysis focused on time series for the period 1990–2016 from 231 stations sampled seasonally (lakes) or monthly (rivers/streams), and with fewer than 25 per cent of the values between 1995 and 2011 missing. Sulphate and base cations had decreased, while acid neutralizing capacity, pH and dissolved organic carbon had increased at many of the sites. Trends for nitrate were more mixed. Bayesian change point analysis had been used to find change points in the median time series. In Europe, most change points in time series for sulphate, base cations and acid neutralizing capacity had been detected just before the year 2000, while most change points in dissolved organic carbon had appeared almost a decade later. For North America, there was no clear pattern across all regions. Trends in annual medium and minimum acid neutralizing capacity and pH had been compared. Interesting contrasts between regions with

[1] The Task Force is a joint body of the World Health Organization European Centre for Environment and Health and the Executive Body for the Convention.

[2] Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC, *Official Journal of the European Union*, L 344, 2016, pp. 1–31.

[3] See www.icp-waters.no/meetings/.

[4] Øyvind Garmo, Kari Austnes and Jussi Vuorenmaa, eds., "Proceedings of the thirty-fifth Task Force meeting of the ICP Waters Programme in Helsinki, Finland" (ICP Waters report in preparation).

[5] The minutes of the Task Force meetings, which include the agenda, the list of participants and the workplan, are available at www.icp-waters.no/meetings.

different exposure to sea salts had been displayed, indicating that change in annual minimum pH did not necessarily reflect the increase in annual median acid neutralizing capacity and pH. The report would include a chapter reviewing effects of changes in land use on recovery from acidification. A study of two neighbouring lakes in the Lake District, United Kingdom of Great Britain and Northern Ireland, highlighted the importance of buffering capacity for the recovery from acidification.

5. *Acidification and recovery and the role of climate change and land use*. A study of two neighbouring lakes in the Lake District, United Kingdom of Great Britain and Northern Ireland, highlighted the importance of buffering capacity for recovery from acidification. Intensive monitoring of both chemistry and biology, including sediment cores and sediment traps, was crucial in disentangling the different behaviour of two seemingly similar lakes. The two lakes showed different water chemistry trajectories and different responses in the diatom community. Even the diatom community in the lake that was not very acidified could indirectly be affected by sulphur deposition because of changes in the level of dissolved organic carbon. In southern Finland, long-term water chemistry trends in small boreal lakes showed diverse responses to reduced sulphur deposition for major ions such as calcium and magnesium, as well as colour and iron. There were indications that forestry had contributed to an increase in, for example, colour. However, beaver activity was also a confounding factor in those areas. In Czechia, long-term monitoring data and dynamic modelling had been used to study the combined effects of acid deposition and bark beetle attacks on soil and water acidification in a heavily acidified lake catchment for the period 1860–2100. Reduced nitrogen (N) retention increased nitrate leaching, giving reacidification of the lake for 10 years after the bark beetle attack. However, the vegetation regrowth accelerated recovery from acidification of both soil and water in the long term.

6. *Classification of acidification status.* The 2018 report on the current extent of acidification in Europe and North America (see para. 21 below) highlighted the lack of a harmonized approach to assessment of chemical acidification status, including under the European Union Water Framework Directive.[6] In a Nordic project, the classification systems in Finland, Norway and Sweden were compared. Those systems were quite different; for example, the Norwegian system was more focused on calcium-poor, clear waters, which were less common in the other countries. Classification of sites from all three countries according to the different systems revealed marked differences, especially for brown waters. The Norwegian system tended to classify fewer water bodies as “moderate” or worse than the Swedish and Finnish systems. In a parallel exercise, different physicochemical parameters had been correlated with data on benthic macrofauna to identify the most suitable indicator. Acid neutralizing capacity corrected for organic acids appeared to be the most promising individual parameter. Harmonization of national systems for assessments of surface water acidification would lead to more consistent evaluations of surface water acidification, but care must be taken to preserve the level of accuracy of the individual assessment systems.

7. *Mercury and heavy metals.* A study of a lake system in Norway looked more closely at the mechanisms behind the decline in mercury (Hg) in fish. Potential causal explanations included a decline in Hg deposition, browning of waters, declining sulphur deposition and ecological changes affecting fish populations. Hg had increased in surface sediment since the 1970s, while Hg in chironomids had showed a fivefold decrease. It had been suggested that declining Hg methylation, due to reduced availability of sulphate, and increased affinity of dissolved organic matter for Hg could explain the results. For other results on the work on mercury, see paragraph 23 below. For studies of heavy metals in the Russian Federation, see paragraph 10 below.

8. *Biodiversity.* The benthic invertebrate communities of many European freshwaters were currently recovering as a response to reduced acid deposition. The change in species composition could alter the composition of functional traits in the biological communities, which had direct consequences for ecosystem health and for ecosystem services. Data from Norwegian rivers spanning the past 30 years showed an increase in filterers and predators

[6] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, *Official Journal of the European Union*, L 327, 2000, pp. 1–72.

over time, and a decrease in shredders. An increase in filterers could be linked to water browning and could suggest increased rates of particle removal, resulting in clearer water. An increase in predators could cause increased biomass turnover, while the decrease in shredders might cause decreased rates of decomposition of organic matter. Most of the changes were correlated to acid deposition.

9. *Nitrogen*. ICP Integrated Monitoring presented the progress in their work on long-term trends of inputs and outputs of reactive nitrogen in ICP Integrated Monitoring sites. There then followed a discussion on nitrogen as a potential topic for ICP Integrated Monitoring and ICP Waters collaboration. For more on the topic, see paragraph 24 below.

10. *Parties in Eastern Europe, the Caucasus and Central Asia*. Soil water and precipitation chemistry had been studied in the Valday region of the Russian Federation, an area that was not affected by direct sources of pollution. The results showed that the pH of the forest precipitation was lower than the pH of precipitation in open areas due to the leaching of organic matter from leaves. Copper and zinc concentrations were higher in precipitation samples from the forest than those from the open area, and nickel and lead concentrations were quite variable. Studies had also been carried out on heavy metals in Lake Imandra and more than 100 small lakes of the Kola Peninsula, which were affected by emissions from smelters to varying degrees. Speciation of metals in natural waters gave important information about toxicity. A decrease in soluble forms of aluminium and iron from 1990 to 2018, as well as an uneven change in the quantity of copper and nickel complexes with organic matter, had been found in the small lakes. In Lake Imandra, the maximum concentration of labile cadmium had been found in the period 2000–2010. Georgia was expanding the lake and river monitoring network and had a new laboratory for water chemistry analysis. The main pressure on surface waters was untreated wastewater, but agriculture and industry also pose challenges to Georgian water resources. Armenia presented the network and parameters that were measured in air and gave some information about the quality assessment/quality control procedures. The network consisted of 16 main stationary active sampling and automated observation stations and 211 mobile passive sampling observation points (weekly samples). Armenia had participated in the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) since September 2008. An overview of the assessment of surface water quality in 2018 was also given.

11. *National Emission Ceilings Directive*. The progress of the implementation of the National Emission Ceilings Directive was presented briefly. The European Commission draft report reviewing the monitoring network resulting from the stations that the member States had suggested was mentioned. The problems with the template that the member States were supposed to use for data reporting to comply with the July 2019 deadline were pointed out, and related to, for example, selection and description of parameters, calculation of biological indices and simply how to fill in the template. During the discussion that followed, several national focal centres highlighted those problems. A wish to know how the European Environment Agency intended to use the reported data was also expressed. The question was also raised of whether there was a need to revise the ICP Waters Programme Manual, given that the National Emission Ceilings Directive guidance document and the reporting template both referred to the Manual. In Italy, a network of sites (National Emission Ceilings Italy) had been developed, in order to comply with the requirements of the Directive. The process of National Emission Ceilings Italy was guided by the Ministry for the Environment, Land and Sea and several government and research institutions. The monitoring sites and parameters were presented and the first implications of the application of the Directive in Italy discussed, with a focus on freshwater sites. Monitoring of chemical and biological parameters had been restarted at some sites as a response to the Directive.

12. *Chemical intercomparison*. Results from the thirty-second chemical intercomparison were reported.[7] Thirty-two laboratories from nineteen countries had participated. The overall

[7] Carlos Escudero-Oñate, *Intercomparison 1832: pH, Conductivity, Alkalinity, NO3-N, Cl, SO4, Ca, Mg, Na, K, TOC, Tot-P, Al, Fe, Mn, Cd, Pb, Cu, Ni, and Zn*, ICP Waters report No. 137/2018 (Oslo, Norwegian Institute for Water Research, 2018). Available at http://hdl.handle.net/11250/2579134.

results from 2018 had been good (acceptance rate higher than 80 per cent), but poor for total phosphorous. The chemical intercomparison was a valuable tool for quality assurance of laboratory analyses.

13. *Biological intercalibration*. Results from the twenty-first biological intercalibration of invertebrates were reported.[8] The goal had been to evaluate the quality of and harmonize the taxonomic work. Four laboratories had participated in 2018. The average quality index ranged from good to excellent. A number of laboratories had experienced problems with some of the taxonomic groups. The biological intercalibration was an important tool for maintaining high taxonomic quality.

14. *Access to data/information*. The ICP Waters database was being improved and updated. One recurring issue was the question of online availability of data. That would make it possible for the Programme Centre to download data itself and it would also be convenient to be able to refer to it when other parties requested data. It appeared that it was only in Sweden that such an approach was currently being taken. The ICP Waters data exploration page needed to be set up in a new system because Google was terminating the service that the data exploration was built on. Basic metadata for the stations would be reported to the Working Group on Effects portal (ECE/EB.AIR/140/Add.1, item 1.4.3).

15. *Participation in other groups under the Convention*. Representatives of the ICP Waters Programme Centre had participated in the fourth joint session of the Steering Body to EMEP and the Working Group on Effects (Geneva, 10–14 September 2018), the Bureaux meeting of those two bodies (Laxenburg, Austria, 19–21 March 2019) and the thirty-fifth meeting of the Task Force of the International Cooperative Programme on Modelling and Mapping of Critical Levels and Loads and Air Pollution Effects, Risks and Trends (ICP Modelling and Mapping) (Madrid, 2–4 April 2019).

16. *Exploration of ways to combine activities of ICPs*. ICP Waters and ICP Integrated Monitoring had organized a fourth joint Task Force meeting (Helsinki, 4–6 June 2019). A fifth joint meeting was planned for 2020. Possibilities for joint work on thematic reports had been discussed during the Task Force meetings. The work on the report and the publication on mercury referred to in paragraphs 19 and 23 below, respectively, was a good example of such collaboration. Nitrogen was also seen as an obvious topic for collaboration, given the combination of intensive monitoring at the ICP Integrated Monitoring sites and the large geographic extent of the ICP Waters monitoring sites.

III. Items related to the mandate of the International Cooperative Programme on Assessment and Monitoring of the Effects of Air Pollution on Rivers and Lakes

A. Further implementation of the Guidelines for Reporting on the Monitoring and Modelling of Air Pollution Effects

17. An overview of the monitoring effects reported by ICP Waters, according to the Guidelines for Reporting on the Monitoring and Modelling of Air Pollution Effects (ECE/EB.AIR/2008/11–ECE/EB.AIR/WG.1/2008/16/Rev.1) was provided (ECE/EB.AIR/GE.1/2018/12–ECE/EB.AIR/WG.1/2018/5).

[8] Gaute Velle, Arne Johannessen and Torunn Svanevik Landås, *Biological intercalibration: Invertebrates 2018*, ICP Waters report No. 138/2018 (Bergen, Norwegian Institute for Water Research, 2018). Available at http://hdl.handle.net/11250/2579124.

B. Enhanced involvement of countries in Eastern and South-Eastern Europe, the Caucasus and Central Asia and cooperation with activities outside the Convention

18. With regards to the involvement of countries in Eastern and South-Eastern Europe, the Caucasus and Central Asia in ICP Waters work, Armenia, Belarus, the Republic of Moldova and the Russian Federation all participated in ICP Waters activities or had been active in recent years. From 2019, Georgia had joined as a new country. Armenia, Georgia and the Russian Federation had all been present at the fourth joint Task Force meeting (Helsinki, 4–6 June 2019) and had presented their work. Armenia and Georgia appeared to have some monitoring sites that were relevant, i.e. in remote areas.

C. Cooperation with programmes and activities outside the Convention

19. Results from the 2017 ICP Waters report on mercury in fish[9] had been presented at the Second Meeting of the Conference of the Parties to the Minamata Convention on Mercury (Geneva, 19–23 November 2018), an event at which ICP Waters had been present, and had been used in chapter 8 of the Global Mercury Assessment 2018 on understanding trends in mercury in aquatic biota.[10] The report had also served as a basis for input to the effectiveness evaluation of the Minamata Convention. The Programme Centre had been represented at the meetings of the National Emission Ceilings Directive Ecosystem Monitoring Subgroup, held in Brussels on 30 November 2018 and 2 April 2019, as had the Working Group on Effects and the other ICPs. ICP Waters had contributed feedback to the European Commission draft report reviewing the monitoring network, as well as the reporting template.

D. Contribution to the joint annual report to the Working Group on Effects

20. ICP Waters had contributed to the 2018 joint progress report on policy-relevant scientific findings (ECE/EB.AIR/GE.1/2018/3−ECE/EB.AIR/WG.1/2018/3) to the Working Group on Effects and to the Executive Body.

IV. Workplan items specific to the International Cooperative Programme on Assessment and Monitoring of the Effects of Air Pollution on Rivers and Lakes

A. The 2018 International Cooperative Programme on Assessment and Monitoring of the Effects of Air Pollution on Rivers and Lakes Waters report on current extent of surface water acidification (2018–2019 workplan, item 1.1.10)

21. A report entitled "Regional assessment of the current extent of acidification of surface waters in Europe and North America" had been published in October 2018.[11] A summary of the draft version of the report had been provided as an official document for the fourth joint session of the Steering Body to EMEP and the Working Group on Effects (Geneva, 10–14 September 2018) (ECE/EB.AIR/GE.1/2018/20–ECE/EB.AIR/WG.1/2018/13). The

[9] Hans Fredrik Veiteberg Braaten and others, *Spatial and temporal trends of mercury in freshwater fish in Fennoscandia (1965–2015)*, ICP Waters report No. 132/2017 (Oslo, Norwegian Institute for Water Research, 2017). Available at http://hdl.handle.net/11250/2467116.

[10] United Nations Environment Programme, *Global Mercury Assessment 2018* (Geneva, 2019), pp. 44–51.

[11] Kari Austnes and others, *Regional assessment of the current extent of acidification of surface waters in Europe and North America*, ICP Waters report No. 135/2018 (Oslo, Norwegian Institute for Water Research, 2018). Available at http://hdl.handle.net/11250/2573488.

current status of surface water acidification related to air pollution in Europe and North America had been assessed using country reports, monitoring data, critical loads and exceedance data, acid sensitivity and deposition maps and data reported under the European Union Water Framework Directive. Acidification was still observed in many countries, but the extent and severity varied. Acid sensitivity and deposition maps suggested that surface water acidification was present in regions and countries for which no data or reports had been delivered for the current assessment. Existing national monitoring varied in terms of the ability to assess the spatial extent of acidification and the recovery responses of acidified sites. The monitoring requirements under the National Emission Ceilings Directive were expected to reverse the recent decline in the number of monitoring sites observed in some countries. The information reported under the Water Framework Directive was currently of limited value in assessing the extent of acidification of surface waters in Europe. Chemical recovery in response to reductions in acid deposition could be slow, and biological recovery could severely lag behind. Despite large-scale and effective efforts across Europe and North America to reduce surface water acidification, air pollution still constituted a threat to freshwater ecosystems.

B. Trend analysis of water chemistry (2018–2019 workplan, item 1.1.11)

22. Progress on the thematic report on surface water chemistry trends was reported under paragraph 4 above. The final report would be delivered for the consideration of the Executive Body at its thirty-ninth session.

C. Further exploration of the fish mercury database (2018–2019 workplan, item 1.1.34)

23. The fish mercury (Hg) database collated under ICP Waters was a valuable source of information for continued monitoring of impacts of Hg in the environment. In particular, lakes that were primarily impacted by atmospheric sources of Hg would be relevant for documentation of effects of reduced air pollution on fish Hg. Temporally (1965–2015) and spatially (55°–70°N) extensive records of total mercury (Hg) in freshwater fish showed consistent declines in boreal and subarctic Fennoscandia. The database contains 54,560 fish entries (n: pike > perch ≫ brown trout > roach ≈ Arctic charr) from 3,132 lakes across Finland, Norway, Sweden and the Murmansk region (Russian Federation). Lake-specific records were mostly for one year, but 22 per cent of the lakes contained three years or more of observations. Seventy-four per cent of the lakes did not meet the 0.5 parts per million (ppm) limit to protect human health. However, after 2000, only 25 per cent of the lakes had exceeded that level, indicating improved environmental status. In lakes where local pollution sources had been identified, pike and perch Hg concentrations had been significantly higher between 1965 and 1990 compared to values after 1995, likely an effect of implemented reduction measures. In lakes where Hg had originated mainly from long-range transboundary air pollution, consistent Hg declines (3–7 per mille per year) had been found for perch and pike in both boreal and sub-Arctic Fennoscandia, suggesting common environmental controls. Hg in perch and pike in those lakes had shown minimal declines with latitude, suggesting that drivers affected by temperature, such as growth dilution, counteracted Hg loading and food web exposure. Future fish Hg monitoring sampling design should include repeated sampling and collection of pollution history, water chemistry, fish age, and stable isotopes to enable evaluation of emission reduction policies. The results of the analysis had been published in *Environmental Science and Technology*.[12]

[12] Hans Fredrik Veiteberg Braaten and others, "Improved Environmental Status: 50 Years of Declining Fish Mercury Levels in Boreal and Subarctic Fennoscandia", *Environmental Science & Technology*, vol. 53, No. 4 (February 2019), pp. 1834–1843.

V. Expected outcomes and deliverables over the next period and the longer term

24. ICP Waters would continue to deliver policy-relevant reports to the Working Group on Effects that addressed the long-term strategy and the 2018–2019 workplan. The suggested topic for the 2020 report was reactive nitrogen in surface waters, a topic that had been supported by the Task Force meeting. Nitrogen was a relevant topic for the Convention, the European Union Water Framework Directive and, possibly, the Marine Strategy Framework Directive,[13] because contribution of nitrogen deposition was not well understood. Nitrogen was also a suitable topic for collaboration between ICP Waters and ICP Integrated Monitoring. Special attention would be given to nitrogen saturation and influences of nitrogen downstream of headwaters. Other topics that were likely to be covered were nitrogen trends, stoichiometry and effects of disturbances. Eutrophication effects might also be considered. The proposed topic for the 2021 report was biological recovery. Further details would be discussed at the Task Force meeting in 2020.

VI. Policy relevant issues, findings and recommendations

25. *Policy developments regarding air pollution: The European Union National Emission Ceilings Directive.* Under the updated National Emission Ceilings Directive, the monitoring of the effects of air pollution on freshwaters, semi-natural habitats and forest ecosystems had been made mandatory (article 9). International Cooperative Programmes under the Working Group on Effects had contributed to a guidance document on ecosystem monitoring, along with experts from the Ecosystem Monitoring Subgroup, under the Ambient Air Quality Expert Group of the Directive. National focal centres that currently contribute to ICP Waters had acquainted themselves with national activities for implementation of the National Emission Ceilings Directive. ICP Waters would continue to be active in contributing expertise and activities from groups under the Working Group on Effects in the work to implement the National Emission Ceilings Directive. One example of ICP Waters contributions was the assessment of the regional extent of lakes impacted by acidification.

26. *Mercury.* Emissions of the pollutant mercury were regulated and included in old and new international conventions and agreements (for example, the Convention, the Minamata Convention on Mercury and the Water Framework Directive). Documentation of levels of mercury in freshwater fish, recipients of mercury pollution, would be important in evaluating whether regulations of emissions had their intended effect. Results presented in the ICP Waters report on mercury in fish had been presented to the Second Meeting of the Conference of the Parties to the Minamata Convention on Mercury (Geneva, 19–23 November 2018) (see para. 19 above). A general recommendation for monitoring of mercury in freshwater fish was to focus on repeated sampling of the same water body.

27. *Current status of ICP Waters Monitoring network.* The ICP Waters Monitoring network was tailored to document responses in water chemistry to changes in atmospheric loads of air pollution. New countries had begun to contribute (Republic of Moldova), while several other countries had reinitiated their participation (Ireland, Poland and Spain). Collaboration within the Convention had intensified through the organization of joint meetings with ICP Integrated Monitoring. Reports and results that were delivered continue to be of relevance both under the Convention and other instruments, such as the Minamata Convention and the National Emission Ceilings Directive.

[13] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for Community action in the field of marine environmental policy, *Official Journal of the European Union*, L 164, 2008, pp. 19–40.

VII. Issues for the attention and advice of other groups, task forces or subsidiary bodies, notably with regard to synergies and possible joint approaches or activities

28. The ICP Waters monitoring network was tailored to monitor effects of air pollution on surface waters and currently consisted of more than 500 sites in acid-sensitive areas in more than 20 countries in Europe and North America. The rivers and lakes were sampled regularly under national monitoring programmes. The length of the data series was mostly between 15 and 25 years. Some sites had over 30 years' worth of data. The data were frequently used in trend assessments. Effects-related work under the Convention could benefit from joint activities on trends in ecosystem responses between various bodies and groups under the Working Group on Effects. Monitoring of air pollution effects was mandatory under article 9 of the National Emission Ceilings Directive. ICP Waters had contributed to the preparation of guidelines for monitoring effects on surface waters under the Directive, had nominated an expert to serve on the Ecosystem Monitoring Subgroup of the Directive, and would continue to highlight the relevance and value of the ICP Waters network and expertise developed since the 1980s.

29. *Exploration of ways to combine activities of ICPs*. The Task Force meeting had been held jointly with ICP Integrated Monitoring in four subsequent years, from 2016 onwards. A fifth joined meeting was planned for 2020. There was regular collaboration on thematic reports with ICP Integrated Monitoring and with other bodies under the Convention.

VIII. Relevant scientific findings: highlights

30. Highlights of recent scientific findings of ICP Waters are summarized in chapters II and VI above.

IX. Publications

31. For a list of ICP Waters publications and references for the present report, please refer to the ICP Waters website.[14]

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[14] See www.icp-waters.no/publications/.