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Assessment of recovery of European surface waters from acidification 1970–2000

Preface

The link between the emission of sulphur and nitrogen compounds and the acidification of surface waters was recognised by Swedish scientists in the 1950s. The realisation and acceptance of the massive spatial scale of the problem and the adverse impacts on ecosystems prompted a concerted effort to reduce air pollution, to be implemented through the signing of the Convention on Long-Range Transboundary Air Pollution under the auspices of the United Nations Economic Commission for Europe in 1979.

In the mid 1970s scientists began the process of quantifying the impacts of pollution on ecosystems and of understanding the mechanisms that promote acidification. As this research continued, international agreements to abate pollution came into effect and a rapid decrease in the deposition of sulphur was achieved through to the late 1990s. During this time numerous pioneering studies were initiated whereby whole ecosystems were subjected to decreased acidic inputs by experimental manipulation and these confirmed that chemical recovery from acidification was possible. Further evidence for this finding is now being provided through the accumulating wealth of time-series data collected from across Europe. However, it does not hold true for all sites and very long data records are required to deal with the slow responses of catchments to change.

Research on recovery of freshwaters from acidification began in earnest in the early 1980s at the time when acid deposition was at its peak in many parts of Europe and eastern North America. This research was in part driven by the on-going international negotiations under the UN-ECE to reduce emissions of acidifying compounds to the atmosphere. The question was, if emissions are reduced, will that solve the acidification problem, and if so, by how much must emissions be reduced and how long will it take for the system to recover? In 1980, the only evidence of reversibility of acidification of freshwaters came from lakes near the large metal smelters at Sudbury, Ontario, Canada. Here the emissions of S peaked in the late 1960s and declined by about 80% during the 1970s in response to emission control orders: surface water chemistry responded rapidly.

By mid-1986 there had been sufficient work to warrant an international workshop on reversibility of acidification, hosted by the Commission of the European Communities. The primary focus was on water chemistry changes following reductions in acid deposition in both Europe and eastern North America. A further milestone came in 1992 with the Dahlem Conference on the acidification of freshwater ecosystems, at which a major topic was chemical and biological recovery. Since then, the monitoring programmes initiated by the UN-ECE Working Group on Effects and under national monitoring programmes have produced a considerable body of data. In 1999 a Workshop sponsored by the European Science Foundation emphasised the need for a more detailed European-scale assessment and laid the ground for what has become the RECOVER:2010 project as part of the European Commission's Environment and Sustainable Development Programme.

The RECOVER:2010 project involves a unique assessment of the longest available water chemistry datasets from acidified regions of Europe. This analysis is a key first step to assess the likely benefits of the international agreements already in place and sets the context for the prediction of future recovery using dynamic models. It also provides timely information on the current and changing chemical status of freshwaters across Europe for the implementation of the EU Water Framework Directive.

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