The 1999 Multi-Pollutant Protocol: A Neglected Break-Through in Solving Europe's Air Pollution Problems?

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Introduction

On 30 November 1999 a new and innovative multi-pollutant and multi-effects protocol within the framework of the Convention on Long-Range Transboundary Air Pollution (LRTAP) was adopted in Gothenburg. In contrast to earlier LRTAP protocols, which targeted a single substance (e.g., sulphur dioxide) or one main environmental effect (e.g., acidification) at a time, the 1999 Gothenburg Protocol targets four substances—nitrogen oxides (NO_X), volatile organic compounds (VOCs), sulphur dioxide (SO_2), and ammonia (NH_3)—and three effects—acidification, tropospheric ozone formation, and eutrophication. Moreover, the ambitiousness in terms of agreed emission cuts has been increased considerably. According to the Protocol, Europe's SO_2 emissions shall be cut by 63 per cent, NO_X emissions by 41 per cent, VOC emissions by 40 per cent and NH_3 emissions by 40 per cent by 2010, compared to their 1990 levels.[1] It was open for signature until 30 May 2000. By that date it had been signed by 31 states. No ratifications by 30 April 2001.[2] Although it was given little attention by the media at the time, according to the then LRTAP Secretary, Lars Nordberg, the agreement is 'the most sophisticated environmental agreement ever negotiated and will yield great benefits, for both our environment and health.'[3] This article will seek to answer the following three main questions. First, what was the background for the start-up of negotiations on such a multi-pollutant and multi-effects protocol? Second, how did the process unfold and which were the main factors shaping the outcome? As a parallel policy process has taken place within the European Union (EU), specific attention will here be given to the interplay between the LRTAP and the EU processes. Third, what are the main prospects ahead in terms of implementation scenarios and institutional interplay between LRTAP and the EU?

Why Was a Multi-Pollutant Protocol Process Initiated?

Let us start with a quick sketch of the European air-pollution policy developments. Acidification of Scandinavian lakes alarmed researchers in the late 1960s.[4] The possibility that this acidification was caused by long-range atmospheric transport, and hence 'import' of pollutants, led Scandinavian researchers and politicians in the early 1970s to call for a co-ordinated international response. Although most countries saw little need for such a response at the time, possibilities for strengthening the general East–West detente process provided the necessary window of opportunity. Hence, rather reluctantly, a loose framework Convention on Long Range Transboundary Air Pollution (LRTAP) was established in 1979 under the auspices of the United Nations Economic Commission for Europe (ECE), with membership comprising most countries in Western and Eastern Europe.[5] Among other things, increasing scientific evidence of a serious problem affecting both lakes and forests made LRTAP into an important forum for regulatory development in the 1980s. In 1985 a protocol was adopted in Helsinki calling for 30 per cent reduction of SO_2 emissions by 1993. This was followed by the Sofia Protocol in 1988, calling for stabilization of nitrogen oxides (NO_X) emissions by 1994, based on 1987 emission levels.[6] Within the EU, directives addressing the same basic problems were also being developed.[7] With processes starting in 1983–4, the Large Combustion Plant Directive was adopted in 1988 and the Car Emissions Directive in 1990.[8] The next step within LRTAP was the 1991 Geneva Protocol on Volatile Organic Compounds (VOCs). VOCs are a group of chemicals which are precursors of ground-level ozone. The protocol called for a reduction of 30 per cent in VOC emissions between 1988 and 1999, based on 1988 levels—either at national levels or within specific 'tropospheric ozone management areas'. Following the adoption of the VOC Protocol, negotiations on a follow-up to the 1985 Sulphur Protocol were initiated and concluded by the adoption of the 1994 Sulphur Protocol. This Protocol set out individual and varying national reduction targets for the year 2000 alone for half of the countries, and additional targets for the years 2005 and 2010 for the other half—with 1980 as the base year. The Protocol sought to reduce the gap between levels of sulphur deposition and critical loads in most of Europe by

60 per cent, except for the most acid-sensitive areas.

The multi-pollutant process was initially branded as 'renegotiating the NO_X Protocol'.[9] Article 5 in the 1988 NO_X Protocol stated that regular and subsequent reviews of the commitments established in 1988 were to take place.[10] With regard to the 1991 VOC Protocol, the review and renegotiation requirements were more specific. Paragraph 6 under Article 2 called for a commencement of renegotiations no later than six months after the coming into force of the 1991 Protocol, explicitly calling for attention to the role of NO_X. Hence a *formal* basis for a more comprehensive renegotiation process was present. However, we must not forget the more substantive basis for the process. First, by the mid-1990s acidification problems were still severe. As indicated above, faithful implementation of the 1994 Sulphur Protocol would only approximately halve the gap to critical levels in the environment. Moreover, urban air-quality problems were on the increase. About 70 per cent of the population of European cities with monitoring stations were being exposed to pollution levels above EU air-quality guiding values.[11] Hence the *need* to adopt stronger regulatory measures was clearly there. In addition, and not least important, knowledge of the interplay between a variety of substances and several environmental effects was improving, and hence also the *intellectual capacity* to grasp this interplay was growing. Important tools were the concept of 'critical loads'[12] and the RAINS (Regional Acidification Information and Simulation) model. This model had been developed from the late 1980s by the International Institute for Applied Systems Analysis (IIASA) and utilized in the negotiations leading up to the 1994 Sulphur Protocol.[13] Hence by the mid 1990s both formal and substantive factors pointed towards the start-up of negotiations on a more comprehensive and stronger LRTAP regulatory protocol.

Negotiating the 1999 Gothenburg Protocol: Process, Outcome, and Main Shaping Factors

Process Overview and Related EU Developments

As indicated, as a result of several factors in the work plan launched at the 1994 August meeting of the Working Group on Strategies (WGS), a protocol addressing both *multiple effects* (acidification, tropospheric ozone formation, and eutrophication) and *multiple pollutants* (NO_X, NH_3, VOCs, and SO_2) was put on the agenda. Various studies of a scientific and technological nature involving a number of regime bodies were initiated to clarify matters. The Task Force on Integrated Assessment Modelling started working on scenarios for maximum feasible emission reductions within a multi-pollutant/multi-effects context. Several computer models were utilized, most emphasis being given to IIASA's RAINS model. The Task Force on Economic Aspects of Abatement Strategies started work on the costs of various scenarios. The Task Force on Emission Inventories pinpointed a number of problems related to official emissions data supplied by parties. The Co-ordination Centre for Effects concentrated on critical loads mapping. Reports from these various sub-bodies were discussed at the meetings of the Working Group on Strategies, which in turn produced guidelines for the further work of the bodies.

In 1995 Sweden had become member of the EU, and it launched acidification as its first major environmental policy initiative. With the 1994 LRTAP Sulphur Protocol as an important point of reference,[14] Sweden began to press early in 1995 for the development of a more comprehensive EU Acidification Strategy. This led the Council of Environment Ministers to call upon the European Commission in March 1995 to develop an integrated programme for attacking acidification.[15] Within the Commission, the Environment Directorate took on the task, and a report was presented to the Council of Ministers in December 1995. Among other things, it was concluded that, although existing and forthcoming EU legislation would reduce acidifying emissions, even within a 'strict' reduction scenario there would be a significant part of Europe where depositions would exceed critical loads. Comprehensive and cost-effective solutions were called for. On the basis of this report, the Council instructed the Commission to produce a co-ordinated strategy to deal with the problems of acidification by mid-1997 at the latest.[16]

Hence, within both the LRTAP and the EU contexts, there followed a couple of years of producing the scientific groundwork for the multi-pollutant approach. IIASA was a leading external actor in this process. With the aid of its RAINS model it was possible to produce scenarios that were cost-optimized for given emission or deposition targets.[17] Within the EU, the Commission formally launched its Acidification Strategy in March 1997. This included the establishment of national emissions ceilings for each pollutant and each member state, co-ordinated with the parallel development of an Ozone Strategy. When the Council of Ministers debated the proposal in June, a number of member states regarded the Strategy as demanding excessively costly reductions for too small an environmental gain. This included most of the Southern countries, notably Italy. The UK and Ireland were allegedly undecided, while the Northern countries were more positive. On the basis of the critical reactions, it was decided to send the Strategy back to the Commission's drawing board.[18]

Within LRTAP, the main negotiation phase started in early 1999. At the first meeting the central item for discus-

sion was the reaching of an agreement on a key, guiding scenario for the final negotiations. The 'menu' to choose from consisted of six different scenarios, combining different levels of ambitions. At the beginning of the meeting the EU Commission and a group of Northern EU countries, including Austria, Denmark, Finland, the Netherlands, and Sweden, came forward with clear support for a 'median' ambitious scenario called G5/2. The environmental ambitiousness of this scenario corresponded closely with the EU's separate—but closely related—acidification and ozone processes. After some discussion, this 'median' scenario was accepted as the basis for the concluding negotiations. Overall, the median scenario pointed towards considerable reductions in many countries' emissions.[19] Figures were also put on the table with regard to abatement costs, environmental improvements, and related economic benefits. The total costs in 2010 for Europe under the median scenario was put at 9.7 billion ecu, with the EU countries accounting for two-thirds of the costs. Total benefits were more uncertain, with a low estimate of 35 billion and a high estimate of 56 billion ecus. Still, the central factor to note was that these estimates indicated *considerably higher benefits than costs*. Concerning environmental effects, significant improvements regarding acidification, ozone, and eutrophication were envisaged. For instance, IIASA estimates indicated that the 2010 ozone excess exposure for populations with median scenario emissions reductions would be 78 per cent lower than 1990. However, when the countries put tentative emission ceilings on the table in early June, almost all of them backed away on some points from the figures derived from the median scenario adopted as a guiding approach the previous January.[20]

At this point, in a long-awaited move, the EU Commission put forward a national emissions ceiling (NEC) proposal—hence, in effect, merging the Acidification Strategy and Ozone Strategy processes. For the first time the draft directive set individual limits on each member state's total emissions in 2010 of the four pollutants SO_2, NO_X, VOCs, and NH_3. It is interesting to note that, in comparison with the emission ceilings taking form within LRTAP, the EU ceilings were more ambitious overall.[21] The final LRTAP ceilings were discussed and adopted in early September. Given the principal decision in January to base the protocol on the median scenario, a central challenge at the final negotiation meeting was to move countries' positions closer to those implied by this scenario. Although this happened in a few cases, most countries stuck to their June proposals. Hence, the distance from the median scenario largely remained in the draft protocol agreed to in September. This spurred critical comments in journals such as *ENDS Report* and *Acid News*. *ENDS Report* stated that, 'at Geneva, most countries took a highly unambitious approach.'[22] *Acid News* reported 'strange behaviour' in Geneva, and how deplorable it was that 'most of the countries [were] unwilling to take the necessary steps to cut down emissions even to the extent required to meet the modest targets for which they themselves had voted barely half a year ago.'[23]

The final multi-pollutant protocol, the Protocol to Abate Acidification, Eutrophication, and Ground-Level Ozone, was finally adopted in Gothenburg on 30 November 1999. How, then, is the outcome to be assessed? As indicated by somewhat mixed receptions, a nuanced assessment is necessary. On the one hand, it is clearly a very advanced and sophisticated environmental agreement: if it is implemented faithfully, substantial environmental improvements are within reach. With regard to acidification, critical loads modelling indicate that critical levels were being exceeded in around 32.5 million hectares of ecosystem area in 1990.[24] Implementation of the Gothenburg Protocol and NEC Directive will reduce this area to around 4.4 million hectares by 2010. Likewise, with regard to ozone, the exceeding of the World Health Organization's (WHO) guidelines for protecting human health will be reduced by around 70 per cent between 1990 and 2010.[25] On the other hand, the commitments adopted are weaker overall than those calculated in the median scenario.[26] The other side of the coin of these figures is, of course, that some vulnerable areas will *still* suffer from acidification in 2010, and WHO guidelines will still be exceeded in many places.

The adoption of the Gothenburg Protocol has had the short-term effect of strengthening the significant forces within the EU who were not willing to adopt more ambitious commitments than those within the LRTAP context. Still, the draft directive and its more ambitious targets received full support in the first reading by the European Parliament in March 2000. Hence there are conflicting positions and trends, and experienced observers are very hesitant to predict the final outcome.[27]

In sum, although there is still a substantial gap to critical levels in the environment, the adoption of the Gothenburg Protocol means that the regulatory strength of the European air-pollution regime has increased considerably. If the NEC Directive is adopted in its present form, with overall lower emission ceilings than in the LRTAP Protocol, even further emission reductions can be envisaged.

Important Factors Shaping the Outcome

As space does not allow us to go particularly deeply into the central factors shaping the outcome, the following section briefly reviews some of the more important ones.[28] Previous research has shown the fruitfulness of focusing

on institutional factors, process leadership, and, not least, constellation of national interests and positions.[29]

Starting on the institutional side, although the NO_X process in the 1980s was also heavily science-driven, the multi-pollutant process was marked by a unique and close interplay between scientific bodies and negotiating bodies.[30] As one element in this, for the first time in LRTAP negotiating history, there was an explicit scrutiny of abatement costs.[31] Moreover, the multi-pollutant and multi-effects approach driving the process gave the negotiations a different institutional flavour from that of the 1980s. In principle, such a comprehensive approach could both facilitate and complicate positions and negotiations. Facilitating effects could stem from possibilities of linkage between positions and the establishment of integrative package deals. If states offered higher reductions and lower ceilings on emissions of particular transboundary importance, they could be 'rewarded' by being allowed higher ceilings in relation to other substances.[32] Complicating effects could arise from the complexity resulting from such a comprehensive approach. Conflicts of interest and lack of headway on one issue could easily stall the very progress of the negotiations. In practice, complicating effects seem to have been few. Occasional instances of possible linking can be noted (particularly where Denmark accepted considerably lower sulphur and NO_X ceilings in return for a higher VOC ceiling in the final negotiation rounds), but overall these effects do not seem to have been very strong either.[33] Hence the fundamental logic of the multi-pollutant negotiations do not seem to have been much influenced by such formal differences in approach. However, the LRTAP agenda in the latter half of the 1990s was comprehensive in more senses than one. From 1994 to 1998 parallel negotiations on protocols on two brand-new substances within the LRTAP system—heavy metals and persistent organic pollutants (POPs)—took place. Especially in the concluding phases in 1997 and the first half of 1998, these processes slowed down the progress of the multi-pollutant protocol negotiations. But, given the complexity of the multi-pollutant approach, this 'break' in the negotiations may not have been a bad thing.

A more significant institutional factor has to do with parallel policy processes within LRTAP and the EU. As indicated in section two, the LRTAP NO_X negotiations in the 1980s were accompanied by related policy developments within the EU. The Motor Vehicles Directive negotiations had clear implications for NO_X emissions, and the negotiations on a Large Combustion Plants Directive circled around both SO_2 and NO_X emission limits. However, the relationship was far closer in the 1990s. First, both institutions relied heavily on modelling and scientific input produced at IIASA. Moreover, from the moment the EU's work on acidification and ozone strategies began to be specified by the development of a directive on National Emission Ceilings, the similarity between the processes became striking. What did this similarity, then, mean in practice? As was noted in the discussion above on comprehensiveness and package deals, links between processes may in principle result both in an integrative potential and in a deadlock and impeding potential. From the LRTAP point of view, the fact that the EU financed IIASA's modelling work from 1996 on was a clear, positive interplay effect. Without the EU financial contribution to IIASA's work, the progress of the LRTAP process could have been seriously slowed down. Moreover, LRTAP discussions on technical annexes, etc. were able to benefit from existing policies and guidelines within the EU context. Did LRTAP then benefit, more particularly, from parallel, stronger policies and positions developed within the less comprehensive and more homogenous EU context? Seemingly, not very much. Countries did not automatically copy 'progressive' EU positions within the LRTAP context. Take, for instance, the question of SO_2. Although some EU countries supported the same emission ceilings in Geneva as they had in Brussels, important countries such as France, Germany, and the UK took far more 'progressive' stands within the EU than within the LRTAP context.[34] But there is little evidence to suggest that EU policy dynamics in any way impeded LRTAP progress. Hence, although the EU influenced LRTAP policy making in a positive way, the two contexts primarily functioned according to their own, internal dynamics. Summing up, although the basic functioning of LRTAP as an institution was similar at the end of the 1990s to what it had been at the end of the 1980s, several interesting differences can be noted. First, there was a uniquely close interplay between scientific and political bodies; second, the multi-pollutant approach offered a moderately utilized potential for integrative package dealing; and, finally, parallel policy development within the EU and related EU financing of shared modelling work carried out at IIASA facilitated progress.

Process leadership is important in complex negotiation processes. Turning first to entrepreneurial leadership of a more personal kind, LRTAP negotiators emphasize the important role of a relatively small and stable group of key people in the regime, within both the scientific and the political 'camps'. In this respect, the regime has been in a fortunate situation.[35] Moving on to the national dimension of entrepreneurial leadership, in the multi-pollutant process, the overall impression is that Germany played a less forceful and clear-cut leadership role than in the NO_X negotiations in the 1980s.[36] Was the more low-key position of Germany balanced by overall higher concern about air-pollution problems and a more pro-environmental

constellation of national positions? As a result principally of a well-structured, LRTAP-organized process, knowledge concerning various aspects of transboundary air-pollution problems improved considerably during the 1990s. Country concern was overall fairly stable, but a shift in focus took place. Acidification received less attention, while urban smog and health problems gained a more prominent position on the agenda. This would point towards a *fairly* similar constellation of positions in the 1990s as in the 1980s but also towards certain adjustments. Within the multi-pollutant protocol process, this was reflected in the fact that most of the 'progressive' countries from the 1980s adopted 'progressive' positions in this follow-up process. However, an important change took place in the 1990s. Partly related to increasing domestic concern over air pollution, *an earlier laggard and big emitter, the UK, joined the 'progressive' camp*.[37] Especially in the concluding rounds of the negotiations, the UK was one of the countries which showed greatest negotiating flexibility.[38] The role of the East European countries, including Russia, was not much more constructive in the multi-pollutant process than in the earlier NO_X negotiations.[39] The general East–West atmosphere was, of course, much more open and relaxed in the post-Cold War 1990s. Given the enlargement process within the EU, one could have expected greater negotiating flexibility and more progressive positions in primary EU candidates such as Poland and Hungary, but, at least with regard to Poland, this does not seem to hold true. Hence, overall, changes in the character of (transboundary) air pollution problems and a related more benign constellation of interests may have mattered for the strengthening of LRTAP in the form of the multi-pollutant protocol. However, the institutional influence on this development has been substantial, not least in the field of knowledge improvement. Hence, an interplay between several factors has taken place.

What, then, are the implications of the foregoing for future prospects in terms of implementation of the closely related LRTAP and EU commitments and the relationship and interplay between the LRTAP and EU contexts?

Looking Ahead: Implementation Scenarios and Institutional Prospects

Implementation: 'Piece of Cake' or 'Tall Order'?

With regard to the four main substances SO_2, NO_X, VOCs, and NH_3, there are certain countries that play a key role in terms of the size of their emissions and their contributions to transboundary effects—and hence also a number of countries whose performance matters only marginally. Looking more closely at the groups of high emitters, the UK, Germany, Italy, and France stand out.[40] A first, tentative analysis of the implementation prospects of these key countries indicates the necessity of thinking in terms of at least two main scenarios seen from the perspective of cost-sensitive implementors: 'piece of cake' and 'tall order'. In the first scenario, the ambitiousness of the final EU NEC Directive is adjusted down to the ambitiousness and targets found in the Gothenburg Protocol. IIASA has indicated that the Gothenburg targets point to very moderate additional reduction costs for the key countries—as considerable emission reductions are already in the pipeline as a result of other international commitments and planned national policies. If the implementation of these other commitments progresses smoothly, relatively low additional and particular Gothenburg/NEC implementation costs could mean a smooth, 'piece of cake' implementation processes. However, a more troubling 'tall order' scenario can also be envisaged. If, for instance, the final EU NEC Directive is adopted in line with the Commission's more ambitious proposal of June 1999, and the implementation of other international and national measures progresses slowly, then the more particular NEC implementation costs could become more important. Analyses have indicated that these costs, seen in isolation, could in fact be significant. In an overview of the total implementation costs for each of the EU countries, Germany came out clearly at the top, with 2.15 billion euro per year. This was almost twice as much as the number two on the list, the UK.[41] A growing perception of high implementation costs could turn this process into a tall order to fulfil for several of the key countries.

Institutional Prospects: Will the EU 'Take Over' and LRTAP 'Fade Away'?

This article has described increasing interplay and parallel policy-making in the wider LRTAP and more narrow EU contexts. As witnessed by the potentially higher policy ambitiousness within the EU NEC context, it is quite possible that the institutionally more advanced EU context—not least with its capacity for majority decisions—has the general potential for becoming the front-runner in European air-pollution politics. Hence, as the EU also expands eastwards, will there be a rationale left for upholding the LRTAP forum? Within the community of policy makers the view is clearly that such a rationale exists.[42] First of all, it is positive that problems are 'attacked' by several and different institutions—with differences in membership. Countries such as Russia and Ukraine will not become members of the EU in the foreseeable future. Moreover, the EU expansion process is probably going to take a while, and in the meantime it will become necessary both to broaden the LRTAP regulatory scope to include new substances (such as particles) and to renegotiate the

Gothenburg Protocol.[43] In the scientific process underpinning such a renegotiation process, it is possible that a similar fruitful collaboration as witnessed recently between LRTAP and the EU could take place—with the 'richer' EU financing IIASA and LRTAP modelling work, and in return taking advantage of the modelling results in EU policy development. In the long run, it is possible that LRTAP might develop into a forum devoted primarily to inter-regional harmonization of policies, leaving an expanded EU to handle more specific European matters.

In conclusion, given faithful implementation, the Gothenburg Protocol and the possible adoption of a parallel and even more ambitious NEC Directive within the EU context will mean a substantial reduction of transboundary air pollution in Europe. But these developments are not sufficient conditions for 'solving' these problems in the form of bringing emissions and effects below 'critical levels'. A further strengthening of policies is necessary, and the EU and LRTAP each have a role to play in this process.

Notes and References

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1. The Protocol was adopted on 30 November 1999. For general information on the Protocol, see UN/ECE Press Release ECE/ENV/99/11, 24 November 1999.
2. According to the LRTAP website <http://www.unece.org/env/lrtap>. A complete list of parties can be found here.
3. See UN/ECE Press Release ECE/ENV/99/11, 24 November 1999.
4. The classic reference here is Svante Oden (1968), 'The Acidification of Air and Precipitation and its Consequences in the Natural Environment', *Ecology Committee Bulletin*, 1 (Stockholm: Swedish National Science Research Council).
5. The current number of LRTAP parties is 48 (30 April 2001). The 'classic' reference with regard to the regime-formation process is Evgeny M. Chossudovsky (1989), *East–West Diplomacy for Environment in the United Nations* (New York: UNITAR). See also Thomas Gehring (1994), *Dynamic International Regimes—Institutions for International Environmental Governance* (Berlin: Peter Lang).
6. See Marc Levy (1993), 'European Acid Rain: The Power of Tote Board Diplomacy', in Haas, Keohane, and Levy (eds.), *Institutions for the Earth* (Cambridge, MA: MIT Press), 75–133, and (1995), 'International Co-operation to Combat Acid Rain', in Helge Ole Bergesen and Georg Parmann (eds.) (1995), *Green Globe Yearbook 1995* (Oxford: Oxford University Press), 59–69; Gehring (1994), *Dynamic International Regimes*; and Jørgen Wettestad (1996), 'Acid Lessons? Assessing and Explaining LRTAP Implementation and Effectiveness', WP-96-18, March 1996, IIASA Working Paper, and (1999), 'More "Discursive Diplomacy" than "Dashing Design"? The Convention on Long-Range Transboundary Air Pollution (LRTAP)', ch. 4 in *Designing Effective Environmental Regimes—The Key Conditions* (Cheltenham: Edward Elgar), 85–125.
7. However, given the EU context, trade harmonization was also an important ingredient in the policy making on these directives.
8. Central references here are Johan G. Lammers (1988), 'The European Approach to Acid Rain', in D. B. Magraw, *International Law and Pollution* (Philadelphia: University of Pennsylvania Press), 265–309; Sonia Boehmer-Christiansen and Jim Skea (1991), *Acid Politics: Environmental and Energy Policies in Britain and Germany* (London: Belhaven Press); Sonia Boehmer-Christiansen and Helmut Weidner (1995), *The Politics of Reducing Vehicle Emissions in Britain and Germany* (London: Pinter); and Duncan Liefferink (1996), *Environment and the Nation State—The Netherlands, the European Union and Acid Rain* (Manchester: Manchester University Press).
9. At least in meeting notes produced by the Norwegian Ministry of the Environment (NME).
10. See Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes, adopted in Sofia on 31 October 1988, ECE/EB.AIR/21.
11. See 'Targets and Trends', *Acid News*, 3 (October 1997), 11.
12. A 'critical load' is defined as 'a quantitative estimate of an exposure to one or more pollutants below which significantly harmful effects on specified sensitive elements of the environment do not occur according to present knowledge'. See, e.g., Levy (1993), 'European Acid Rain'; 24.
13. See W. Tuinstra, L. Hordijk, and M. Ammann (1999), 'Using Computer Models in International Negotiations—The Case of Acidification in Europe', *Environment*, 41: 9, 33–42.
14. According to *ENDS Report*, 34, the acidification strategy was 'designed to underpin the pan-European SO_2 targets agreed under a recently revised UN Economic Commission for Europe protocol'. See 'Commission Throws SO_2 Policy Back in Melting Pot', *ENDS Report*, 246 (1995), 33–4.
15. 'Action Should Mean It', *Acid News* (June 1995), 3, 2.
16. 'The Situation Laid Bare', *Acid News* (February 1996), 1, 4.
17. 'Protocols in the Making', *Acid News* (April 1996), 2, 5–6.
18. 'New Drinking Water Rules Agreed, but Trouble for UK on Landfills', *ENDS Report*, 273 (1997), 37; 'Environment Ministers Tackle Pollution from Cars and Vans', *Europe Environment*, 509 (1997), 12–13.
19. See table in'Towards a Protocol', *Acid News* (March 1999), 1, 4.
20. This section draws heavily on NME WGS-30 meeting note, dated June 8 1999. It also draws upon EB.AIR/WG.5/62, dated 16 June 1999.
21. See 'New Emissions Protocol Falls Far Short of EC Proposals', *ENDS Report*, 296 (1999), 44, for a systematic comparative effort.
22. Ibid., 4.
23. 'New Protocol on the Way', *Acid News* (October 1999), 3, 2.
24. See the presentation of IIASA's assessments in the Commission's Communication 'A European Strategy to Combat Acidification', reprinted as a supplement to *Europe Environment* (8 April 1997), 497.
25. 'Commission Suggests Umbrella Strategy for Clean Air', *ENDS Report*, 288 (1999), 46–7. See also various trend data summed up in 'Acidification: Advancing Plans for a Strategy', *Acid News* (April 1997), 1, 6.
26. 'New Protocol on the Way', *Acid News* (October 1999), 3, 4.
27. Interview with Christer Ågren, Swedish NGO Secretariat on Acid Rain, 15 February, 2000.
28. Both the LRTAP and EU processes will be discussed in far more detail in Jørgen Wettestad (forthcoming 2001), *Clearing the Air—European Advances in Tackling Acid Rain and Atmospheric Pollution* (Lysaker: Fridtjof Nansen Institute).
29. These perspectives form the explanatory backbone of the regime effectiveness project led by Ed Miles and Arild Underdal (Ed Miles *et.al.*, forthcoming, *Explaining Regime Effectiveness: The*

Interplay of Problem Type and Response Capacity (Cambridge, MA: MIT Press). See also Steinar Andresen and Jørgen Wettestad (1995), 'International Problem-Solving Effectiveness: The Oslo Project Story So Far', *International Environmental Affairs*, 7: 2, 127–50.

30. For an overview of the process leading up to the 1988 NO_X Protocol, see, e.g., Gehring (1994), *Dynamic International Regimes*; and Jørgen Wettestad (1998), 'Participation in NO_X Policy-Making and Implementation in the Netherlands, UK, and Norway: Different Approaches, but Similar Results?', ch. 9 in Victor, Raustiala, and Skolnikoff (eds.), *The Implementation and Effectiveness of International Environmental Commitments* (Cambridge, MA: MIT Press), 381–431. The uniqueness of the multi-pollutant process was emphasized by several LRTAP process participants interviewed during the autumn of 1999.
31. According to one interviewee, this did not matter very much for the outcome of the negotiations.
32. For discussions of negotiation package deals and the pros and cons of 'comprehensiveness', see, e.g., James Sebenius (1990), 'Negotiating a Regime to Control Global Warming', Discussion paper G-90-10 (Boston: Harvard University); Arild Underdal (1990), 'Negotiating Effective Solutions: The Art and Science of Political Engineering', Unpublished paper (Oslo: University of Oslo); and Jørgen Wettestad (1999), *Designing Effective Environmental Regimes—The Key Conditions* (Cheltenham: Edward Elgar).
33. As one negotiator remarked, 'such flexibility was generally constrained'. Interviews, autumn 1999.
34. See comparative table in 'New Emissions Protocol Falls Far Short of EC Proposals', *ENDS Report*, 296 (1999), 44.
35. Interviews, autumn 1999.
36. Ibid.
37. A fundamental factor here is of course the 'dash-for-gas' process, with energy production switching from coal to natural gas. This has resulted in considerably lower emissions of air pollutants and greenhouse gases. See, for instance, Ute Collier (1997), 'Windfall Emission Reductions in the UK', ch. 6 in Collier and Løfstedt (eds.), *Cases in Climate Change Change Policy: Political Reality in the European Union* (London: Earthscan), 87–108.
38. Ibid.
39. Ibid.
40. See Jørgen Wettestad (2000), 'Implementing Stronger European Air Pollution Commitments—Will High Hopes in Brussels and Geneva Be Dashed in London?', Paper presented at the 41st Annual ISA Convention, Los Angeles, 14–18 March 2000.
41. 'European Union—Commission Proposes National Ceilings for Sulfur Dioxide, NO_X, VOCs, Ammonia', *International Environment Reporter*, 22: 13 (1999), 519.
42. This is based on interviews with policy makers in Sweden, Denmark, and the UK in the autumn of 1999.
43. Article 10 in the Gothenburg Protocol states that the first review shall start no later than one year after its entry into force.