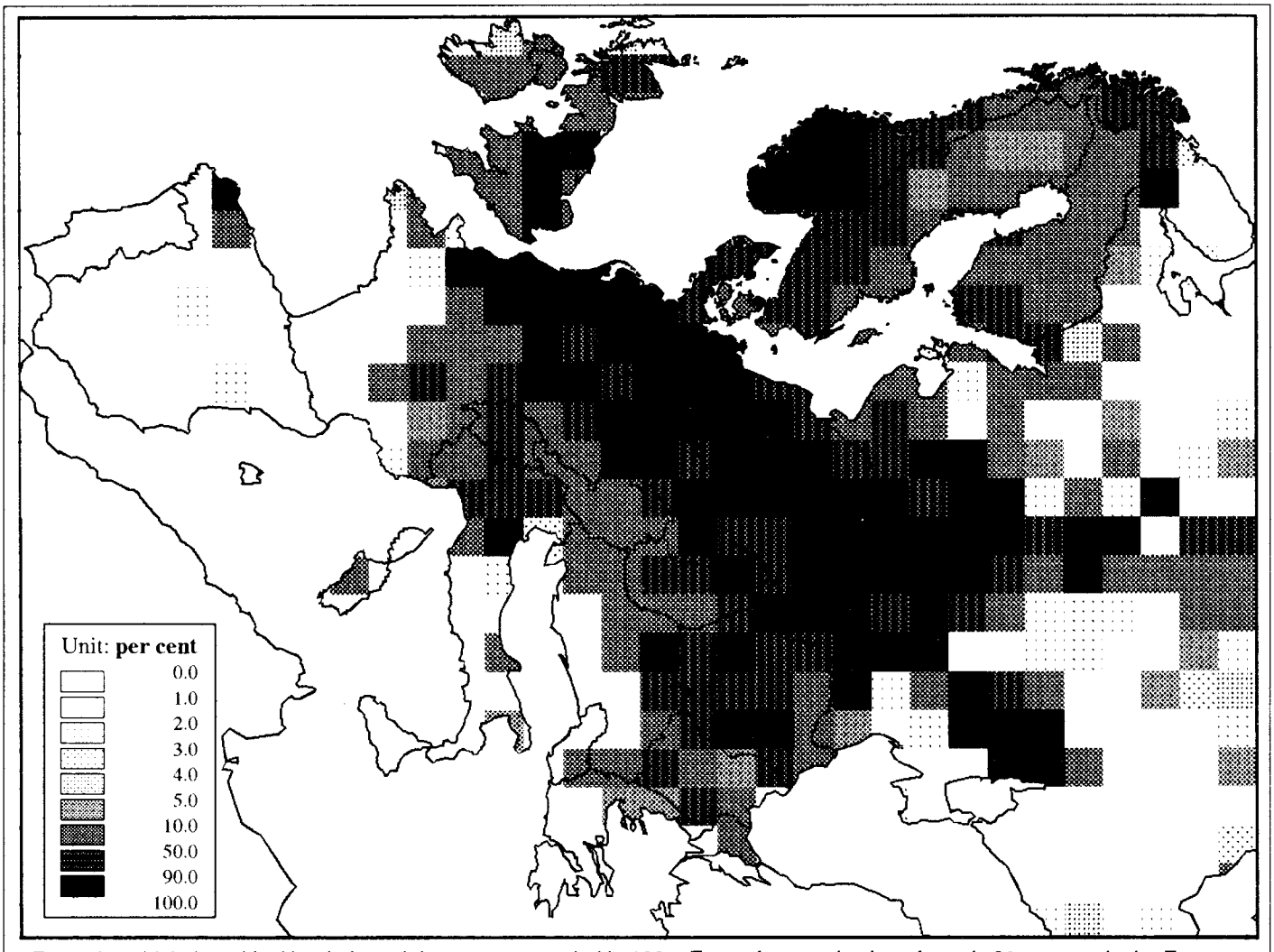
NO. 2, APRIL 1993

Acid News

A Newsletter from the Swedish and Norwegian NGO Secretariats on Acid Rain



Extent by which the critical loads for sulphur were exceeded in 1990. Even after a reduction of nearly 30 per cent in the European emissions of sulphur between 1980 and 1990, the critical loads were still being exceeded on more than a third of the ecosystems.

EUROPE

Rains to stop rain

EXACTLY HOW MUCH will it be necessary to reduce emissions if the depositions of pollutants are not to exceed the critical loads? And will it actually be possible to make such reductions? These questions will need answering because only so it will be possible to deduce the feasibility of the critical loads approach.

There is now a report showing what is likely to happen to sulphur depositions in Europe under a variety of energy scenarios. It appears from the study* that in 35 per cent of Europe the depositions of sulphur are exceeding the thresholds of ecological tolerance. In other words, they are above the critical load. The measures to reduce sulphur emissions that have so far been decided upon – the so-called current reduction plan – are altogether inadequate to put a stop to acidification. If no more is done, by the year 2000 more than a fifth of Europe's ecosystems will still be suffering from much too high depositions.

In the international negotiations for reduction of the emissions of acidifying airborne pollutants, computer models, and especially one known as RAINS, are being used to project various scenarios for future emissions. In this way strategies can be developed for allocating re-

Continued on page 4

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Acid News

A newsletter from the Swedish and Norwegian Secretariats on acid rain.

ACID NEWS is a joint publication of the two secretariats, whose aim is to provide information on the subjects of acid rain and the acidification of the environment.

Anyone interested in these problems is invited to contact the secretariats at either of the addresses below. All requests for information or material will be dealt with to the best of our ability.

In order to fullfill the purpose of Acid News, we need information from everywhere – so if you have read or heard about something that might be of general interest, please write or send a copy to:

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THE SECRETARIATS

The Swedish NGO Secretariat on Acid Rain is supported by the following environmental organizations:

- The Environmental Federation (Miljöförbundet)
- The Swedish Anglers' National Association (Sportfiskarna)
- The Swedish Society for Nature Conservation (Naturskyddsföreningen)
- The Swedish Youth Association for Environmental Studies and Conservation (Fältbiologerna)
- World Wide Fund for Nature Sweden (Världsnaturfonden WWF)

Address and telephone: see above.

The Norwegian Secretariat, "The Norwegian Clean Air Campaign," is organized by five non-governmental organizations concerned with the environment:

- Nature and Youth (Natur og Ungdom)
- The Norwegian Forestry Society (Det Norske Skogselskap)
- The Norwegian Association of Anglers and Hunters (Norges Jeger- og Fiskeförbund)
- The Norwegian Society for Conservation of Nature (Norges Naturvernforbund)
- The Norwegian Mountain Touring Association (Den Norske Turistforening)

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Odd bedfellows

AT A MEETING in Geneva at the beginning of March the countries of Europe came a little way along the road towards stopping acidification. They were there to negotiate a new agreement, a so-called protocol, under the UN ECE Convention on Long Range Transboundary Air Pollution, for reducing the emissions of sulphur (see AN 1/93, p. 2). The new agreement, which it is hoped will be ready this year, is to replace the sulphur protocol of 1985 involving a 30-per-cent reduction of the emissions. That protocol was signed by a majority of the European countries, the most notable exceptions being the United Kingdom, Spain, and Poland.

As a starting point for the negotiations at Geneva it was agreed to take targets that would reduce the gap between present levels of acid deposition and the critical loads by at least 50 per cent. According to calculations made in 1992, to achieve that aim it would be necessary to reduce the overall European emissions of sulphur by about 60 per cent, as from the 1980 levels. Rough calculations have also been made to see how great the reductions would have to be for each country, and what the necessary measures would cost. The data are however now in course of being updated, partly on account of revised information on critical loads, so it is unlikely that there will be any further moves until the next meeting of the Working Group on Strategies, which is scheduled for the last week in May.

No final decision has yet been reached as to the year in which the targets will have to be met. By far the greater majority of countries seem to be in favour of making it the year 2000 for western Europe, and 2005 for the east. (The idea is that countries in economic transition should have this extra respite of five years, in view primarily of current economic and structuring problems.) The only western European country that was against taking 2000 as the target year was Great Britain, which wanted to have more time.

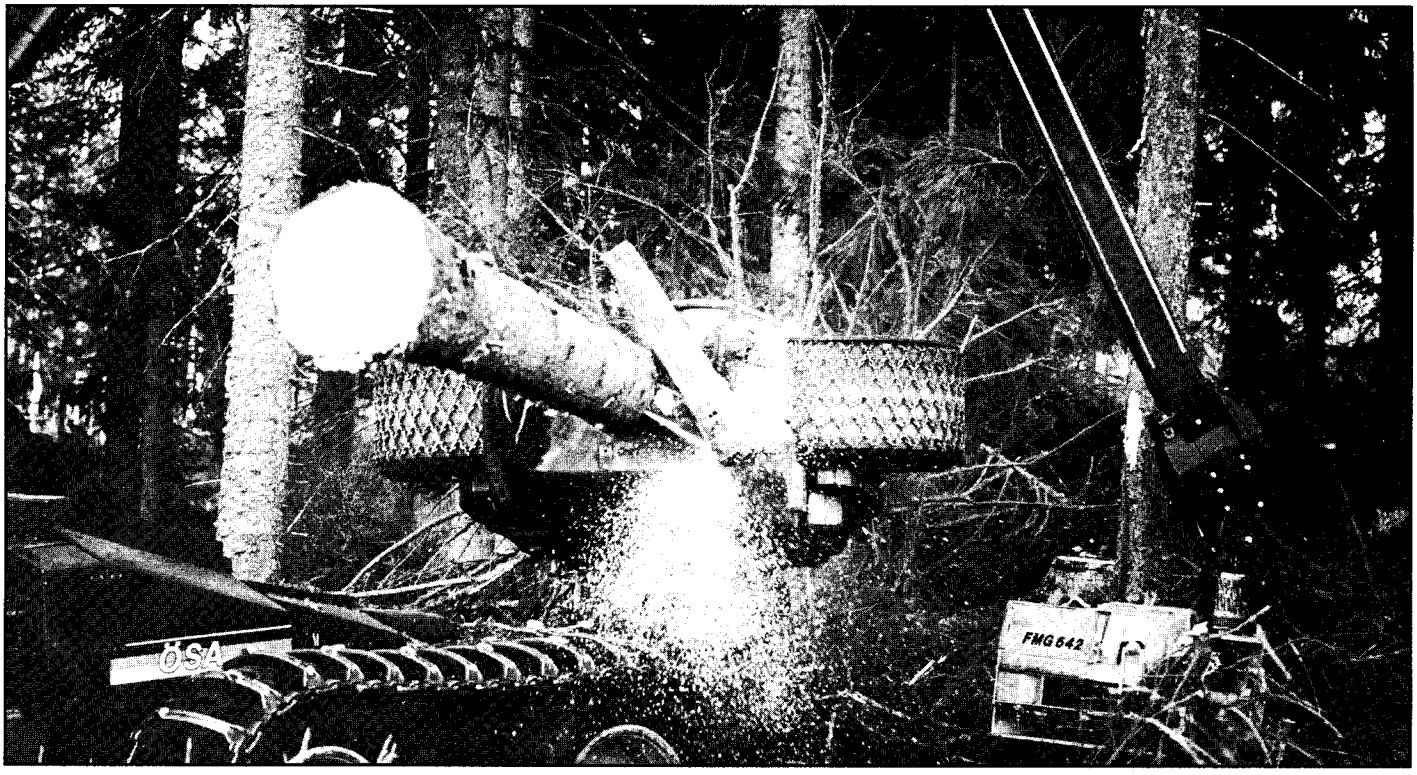
The other great item of discussion at the Geneva meeting was whether technical requirements were to be binding, or merely recommendations. This concerns chiefly the emission standards for large combustion plants and the maximum sulphur content of fuel oil. Only two countries were definitely opposed to compulsory requirements, the United Kingdom and Norway. There is a curious paradox in such an alliance, especially as Norway has been accusing Britain since the mid-seventies of holding up measures for reducing the emissions of sulphur. Now Norway, alone among European countries, is allying itself with its archenemy and thereby hindering action to deal with what is probably the country's most urgent environmental problem, namely acidification. The reason given is the cost. Concentration on what they believe to be maximum cost-efficiency appears to be the leading principle in the Norwegians' environmental policy.

The attitude of these two countries seems all the more paradoxical in view of the fact that the proposed requirements concerning new plants have already been written into law in both of them. Clearly their opposition has nothing to do with the sulphur question, but is purely a matter of principle. The main reason appears to be that both countries fear that similar compulsory, and costly, requirements will turn up in coming protocols, such as for nitrogen oxides and VOCs.

They seem unwilling to admit that it does not suffice to agree on an objective – that rules and specific measures are needed to ensure its achievement. This is also in line with the so-called cautionary principle of only allowing new plants to start up if they pass muster as regards use of the best available cleaning technology.

The emissions of sulphur can be drastically reduced in Europe, and reduced at much less cost than the official calculations would indicate. The facts have been revealed in a study that was carried out at the instigation of the Acid Rain Secretariat, and put before the delegates at the Geneva meeting. The results are also presented in this issue of Acid News, starting on page one.

CHRISTER ÅGREN



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SWEDISH FORESTS

Damage added up

A DRAMATIC INCREASE in forest damage occurred in two provinces in southwestern Sweden during the five-year period preceding 1992. If applied to the whole of Sweden, it would amount to an annual reduction in growth to the value of 3-4 billion kronor ($4-500 million).

The figures emerge from a study started in 1986 using a remote-sensing method by which the trees in sample plots are stereo-photographed with infra-red-sensitive film from a helicopter. A subsequent photographing in 1991 revealed the following changes in the proportion of damaged trees.

	Skåne		Halland	
	1986	**1991**	**1986**	**1991**
Spruce	16%	26%	26%	54%
Pine	14%	65%	43%	77%

The figures refer to trees that are more than 50 years old, those counted as damaged having at least a 20-per-cent loss of needles. Whereas there was no appreciable increase in damage in the worst affected parts between 1986 and 1991, a radical change had occurred where the damage had previously been only moderate.

Southwestern Sweden is heavily exposed to airborne pollution from Britain and the continent. A connection is suspected between the steady acidification of the soil and the reduced forest vitality, although other factors may also be involved.

Using empirical data, Swedish scientists have formulated a relation between needle loss and reduced forest increment. From this they have estimated the annual loss from reduced growth to be worth, as mentioned, 3-4 billion kronor for Sweden as a whole. If present trends continue, the loss will have amounted in thirty years, according to soil-chemistry models, to 7-10 billion a year.

The scientists add however that the monetary estimates should not be regarded as absolute certainties, but rather as a risk analysis. If the acidification of the soil is not to become still worse, the deposition of acidic substances will, according to modelling estimates, have to be reduced by something like 85 per cent.

PER ELVINGSON

Source: **Skogsskador i Skåne-Halland 1991**. Skånes samrådsgrupp mot skogsskador. (Forest damage in Skåne-Halland. Scanian group for consultation on forest damage.) In Swedish only.

On the following pages

Continued from front page

ductions among the participating countries so as to achieve the greatest possible protection of the European ecosystems at the least possible cost.

So far, however, ambitions have been set far too low. To name some of the reasons, either the acidification problem has not been taken seriously enough in some countries, or the cost of curbing emissions is considered too high. But there have also been inadequacies in the available data and in the computer models themselves. The present models have had two basic faults: they have both exaggerated the costs and underestimated the potential means for reducing emissions.

The cause is the same in both cases. The models have only taken account of technical measures, such as flue-gas desulphurization and desulphurization of the fuel. By bringing in other measures, such as switching to alternative fuels and encouraging energy efficiency and the use of energy from renewable sources, the potential for reducing emissions can be increased and the way opened for sustainable and less expensive solutions.

The aim of the study has been in part to find ways of overcoming the limitations of the existing computer models. And, as will be seen from the results, progress has been made.

The model used has been RAINS (Regional Acidification and Simulation), developed by the International Institute for Applied Systems Analysis in Austria. The bases of reference have been the situation in 1990 and the current plan for the reduction of sulphur emissions (CRP) up to the year 2000. This model has been used to construct two energy and emissions scenarios, OEP and ERR, and show the results for each for the years 2005 and 2020. The OEP scenario is based on official energy projections, which have been extrapolated from available data.

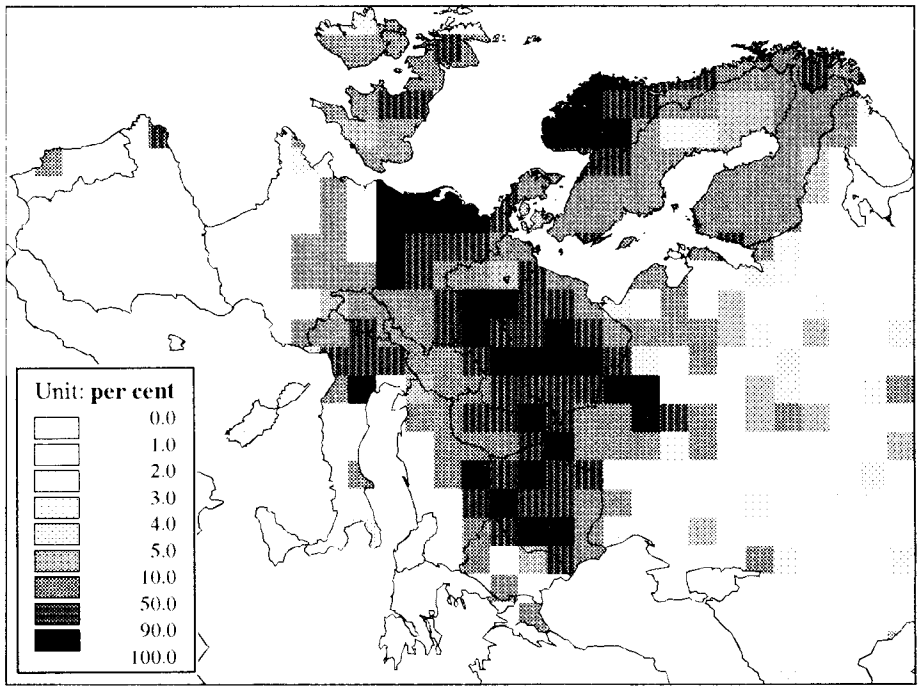


Figure 1. Extent by which the critical loads for sulphur will still be exceeded under CRP, the current reduction plan. If emissions are reduced as expected by 30 per cent between 1990 and 2000, it can also be expected that by 2000 the critical loads will be exceeded on 22 per cent of Europe's ecosystems, as compared with 35 per cent in 1990.

The other scenario, ERR (after Earth Resources Research, the consultants who made the study), also springs from official energy projections, but with the insertion of various measures to curtail the growth of energy use and of a change in the mix of energy sources. The essential aim of the ERR scenario is to depict a probably realistic alternative showing the extent of the potential for improved energy efficiency and a greater use of renewable fuels. Each of these scenarios presupposes an application of abatement technologies in accordance with the so-called "maximum feasible emission reductions" of the model. The principal results from the two scenarios are presented in the table.

It appears, if the official energy projections are correct, that acid depositions cannot be reduced to acceptable levels through the application of abatement technologies alone, nor low deposition levels maintained in the long term. Even if, by the year 2020, DM61 billion were being expended per annum throughout Europe on such technologies, the critical loads for sulphur would still be exceeded over nearly 5 per cent of Europe's ecosystems.

According to the study, the only way to bring the depositions of sulphur down to below the critical loads is to employ a combination of measures that would include changes in the energy and transportation systems so as to make them more efficient and include a larger element of energy from renewable sources. Energy abatement technologies would also have to be applied. Provided the necessary commitment is to hand, it should be possible to reduce the de-

Summary of principal results

Scenario	Year	Energy use (PJ)	CO_2 emissions (bt CO_2 pa)	Unabated SO_2 emissions (kt SO_2 pa)	Abated SO_2 emissions (kt SO_2 pa)	Cost (bill DM pa)	No. of infeasible receptors	Average deposition (g S/m^2 pa)	Average ecosystem exceedence (per cent)
CRP	1990	103399	11.75	N/A	46942	N/A	N/A	1.16	35.2
	2000	N/A	N/A	N/A	33522	N/A	N/A	0.85	22.0
OEP	2005	123325	13.05	49340	6899	71.1	61	0.23	4.4
	2020	143762	14.66	50970	9849	61.1	65	0.30	4.8
ERR	2005	85445	7.63	24346	6803	26.5	46	0.22	3.8
	2020	95264	6.37	13869	3195	21.7	42	0.14	3.4

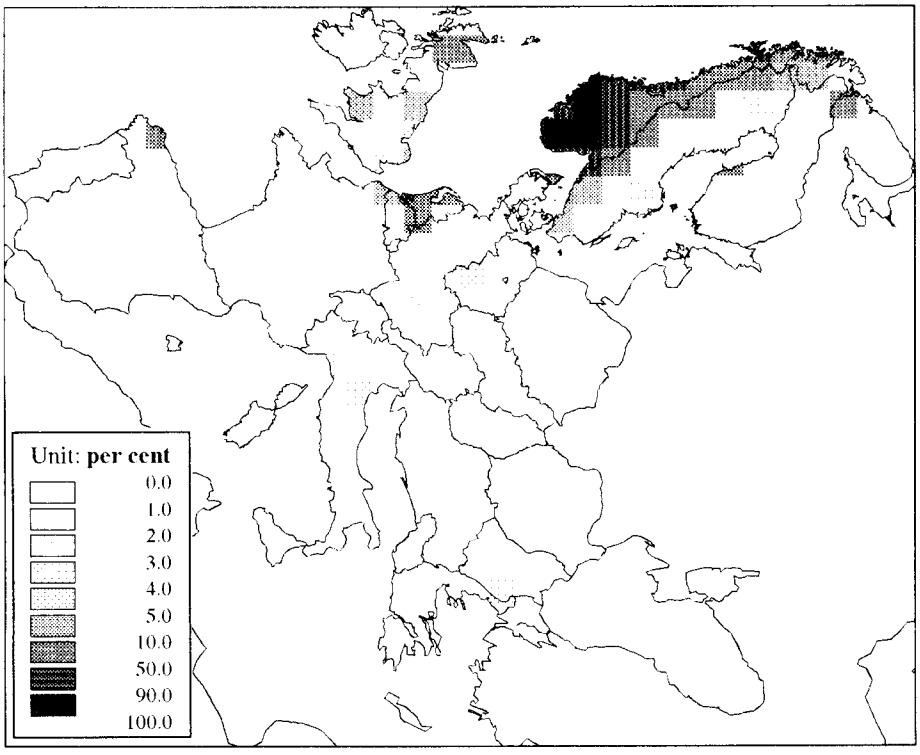


Figure 2. Where and by how much the critical loads would still be exceeded according to the ERR scenario. With sulphur emissions reduced by 86 per cent between 1990 and 2005, by the latter year the critical loads can be expected to be exceeded on less than 4 per cent of the European ecosystems.

gree of acidification to such an extent that by 2020 the critical loads would be exceeded only in the most sensitive areas of Europe.

With the alternative energy scenario, ERR, there would not only be greater protection for ecosystems. Considerably less money – about a third of that for the OEP scenario – would have to be spent on abatement technologies. There have been a number of studies showing that many of the measures to promote energy efficiency are relatively cheap, and may even have a net negative cost (in other words, would be profitable in themselves). Such measures are in any case much cheaper than the traditional technologies for the abatement of sulphur emissions.

There are, furthermore, other distinct benefits from turning to renewables and improving energy efficiency, as compared with abatement technologies. The emissions of NO_x and CO_2 are also reduced. The OEP scenario implies a rise of almost 25 per cent in the emissions of CO_2 from the combustion of fossil fuels by 2020, from present levels (see table). On the other hand, through the use of renewables, energy efficiency, and fuel switching, the emissions of CO_2 could fall by 46 per cent over the same period of time.

The study concludes that strong policy measures will be needed to ensure the development and application of renewable-energy technologies and increasing energy efficiency. Among such measures should be the introduction of minimum efficiency standards, tax credits, and support for research and development in renewables and cogeneration, and carbon/energy taxes.

It also emphasizes the need for international financial mechanisms to ensure that reduction strategies will be the best possible. Particularly needed is a fund to enable the countries of central and eastern Europe to achieve the necessary reductions of their emissions.

The release of the report of the study coincided with a meeting of the Working Group on Strategies of the UN ECE Convention on Long Range Transboundary Air Pollution which took place in Geneva at the beginning of March, to continue negotiations for a new protocol to reduce the emissions of sulphur. (See comment in editorial.)

CHRISTER ÅGREN

*** Meeting Critical Loads for Sulphur: A Study of Energy Use and Emission Reduction Strategies in Europe.** By Jim Sweet, Earth Resources Research consultants, London. A study jointly financed by WWF International, Greenpeace International, and the Swedish NGO Secretariat on Acid Rain. Copies can be obtained from WWF International, Pollution Policy Unit, CH-1196 Gland, Switzerland (fax: +41-22-3648307).

Recent publications

Energy for a future (1992)
Report, prepared by Simon Roberts for Friends of the Earth, discussing and criticizing the British government's energy policy and giving the FoE proposals for an energy policy for a sustainable future.

£5.00. 36 pp. Obtainable from Friends of the Earth Ltd, 26-28 Underwood Street, London, England N1 7JQ.

The Netherlands' memorandum on climate change (1992)
The United Nations Framework Convention on Climate Change, adopted in June 1992, requires countries to adopt policies for reducing their emissions of greenhouse gases. As one of only a few countries the Netherlands has adopted targets with respect to all such gases. The policy decisions, which were debated in parliament in May 1992, are presented in this memorandum, which integrates climate policy with existing national environmental strategies and describes policy measures to achieve the proposed targets.

Available from Ministry of Housing, Physical Planning and the Environment, Climate Change Division, P.O. Box 450, NL-2260 MB Leidschendam, The Netherlands.

1993 NSCA pollution handbook
Edited by Loveday Murley. Published by the National Society for Clean Air and Environmental Protection. Covers the whole of British and European pollution legislation concerning air, water, waste, and noise in an updated and accessible form.

£19.95. 464 pp. Can be ordered from NSCA, 136 North Street, Brighton, England BN1 1RG.

Down to Earth
Down to Earth is a fairly new fortnightly newsmagazine, published in New Dehli, India, by the Society for Environmental Communications. Deals with matters of the environment and development from a Third World point of view.

More information available from Down to Earth, Marketing Manager, F-6, Kailash Colony, New Delhi 110 048, India.

World directory of environmental organizations (4th edition, 1992)
Edited by Thaddeus C. Trzyna. A comprehensive global guide to over 2600 organizations in more than 200 countries, including national and international, governmental, and non-governmental organizations.

£35.00. 200 pp. Published by Europa Publications Ltd, 18 Bedford Square, London, England WC1B 3JN.

Coal versus clean air

EVEN AFTER THE YEAR 2005 acid depositions will be exceeding the critical loads for almost half of Britain's soils, according to a report prepared for Friends of the Earth by the environmental consultants Earth Resources Research. It is claimed that the official figures underestimate the damage that will ensue from acid rain by a factor of six.

Maps to show what the critical loads will be for various soils and areas, and where they will be exceeded, are being made in a number of European countries. The resulting information will be used in the coming negotiations for a new international agreement for a reduction of the emissions of sulphur in Europe.

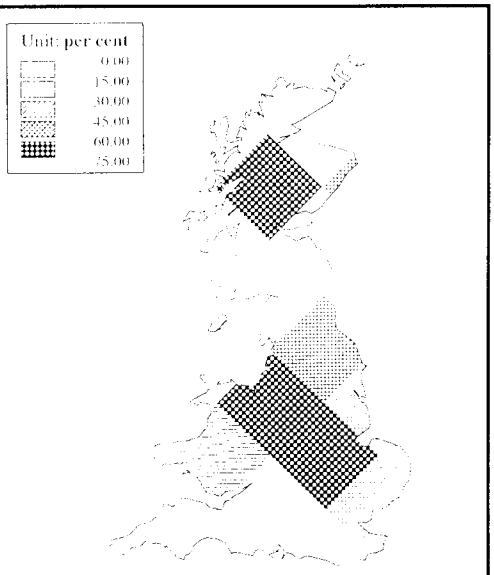
A critical load is the total amount of pollution that any environment can tolerate without there being adverse effects. The aim of the critical loads approach, as adopted for the work of the UN ECE Convention on Long Range Transboundary Air Pollution, is quite simply to protect areas that are sensitive to acidification. (See also the factsheet in this issue.)

The official maps, produced for Britain by the Department of the Environment's Critical Loads Advisory Group, show 50 per cent of the country's soils to be receiving acid inputs that are higher than the critical loads. The supposition is however that as a result of the emission reductions that Britain has agreed to make, by 2005 only 8 per cent will be so affected.

Being critical of the methods used by the Department in preparing its maps, the FoE commissioned Earth Resources Research to make fresh calculations and produce new maps based on the methods of other European countries. Their calculations, along with the predicted depositions of sulphur, show that by 2005 at least 47 per cent of UK soils will still be at risk from acidification.

Even 47 per cent, it is said, may be an underestimate, because the five critical-load classes are referred to by the upper limit of the deposition range for each class. Some of the more sensitive soils may thus have been overlooked.

It should be noted, however, that owing to difficulty in gaining access to data used in the official calculations, the ERR maps had to be made with a lower resolution – with squares of 150 x 150 kilometres, as against 10 x 10 in the official maps. This may have contributed to an overestimation of the areas at risk.



Percentage of land area in which critical loads for soils will be exceeded in 2005, according to Friends of the Earth study.

The British emissions policy is also criticized in the FoE report, which notes that "Despite the UK Government's promise to cut emissions where the reductions will be most beneficial to the environment, no explicit mechanism has been set up to achieve this aim." The FoE maintains that to protect the greater part of the country from acidification, emissions will have to be reduced by 90 per cent.

The present official aim is however only to meet the requirements of the EC Large Combustion Plants Directive, which lays down that emissions from such plants shall be reduced by 60 per cent from 1980 to 2003. That would amount to a reduction of the country's total emissions of sulphur by only 50 per cent.

Just now there is no indication that Britain has any intention of markedly increasing its commitment to reducing sulphur emissions – despite persuasive evidence of the widespread damage that these emissions are causing to ecosystems in the United Kingdom as well as abroad. The only chance of an improvement seems to lie in a sharpening of the requirements of the Large Combustion Plants Directive after revision in 1994-95.

At present two-thirds of the UK electricity is generated in coal-fired plants, which are also the main source of sulphur emissions. In 1990 75 per cent of the country's emissions of sulphur dioxide, totalling 3.8 million tons, were a result of coal burning. Although the present dominance of coal is set to be very markedly reduced, it will still, according to Friends of the Earth, be likely to be used to generate a considerable proportion of the country's electricity during the next decade. If there is to be any substantial recovery in the ecosystem, many more of the large coal-fired stations will have to be retrofitted for flue-gas desulphurization than are at present scheduled.

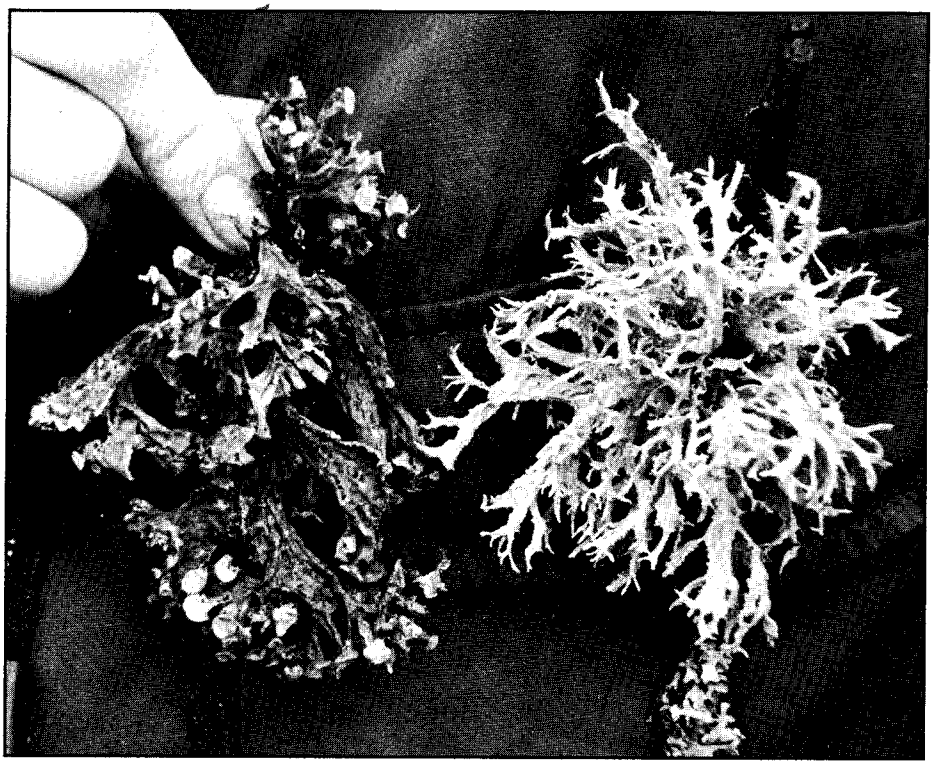
But, says the report, other changes in the energy system, such as energy efficiency programs, cogeneration, and switching to renewable forms of energy, represent much lower-cost, or even negative-cost methods for SO_2 and NO_x abatement. And they can be carried out far more quickly than can be done merely through the application of flue-gas desulphurization.

Despite the clear benefits to be gained from such least-cost approaches, the British government is, according to Friends of the Earth, neither including energy efficiency in its current plans for reducing emissions, nor placing acid-emission controls within the wider context of a coherent and sustainable energy policy.

CHRISTER ÅGREN

Critical loads and UK air pollution. By A. Tickle and J. Sweet. £6. Available from Friends of the Earth, 26-28 Underwood Street, London, England N1 7JQ.

Changes in lichens



© PER ELVINGSON

Ramalina fraxinea and Evernia prunastri. Well developed examples such as these are only to be found in rural areas.

ALTHOUGH the last few years there have seen an improvement of the lichen flora in built-up areas in south-western Sweden, it seems that the concentrations of nitrogen dioxide in the air that were thought to be just critical are still too high for the most sensitive species.

Usually sulphur dioxide has been regarded as mainly responsible for the absence of many lichen species in urban environments. But in Sweden the emissions of sulphur have markedly declined since the early seventies, which probably explains the increase of species such as *Hypogymnia physodes, Pseudevernia furfuracea, Parmelia sulcata, Usnea spp.* and *Bryoria spp.*

There has on the other hand been no appreciable change in nitrogen-oxide levels. Species that are favoured by nitrogen, such as *Physcia tenella* and *Pleurococcus viridis*, are extremely common on trees in polluted urban surroundings, and the proportion of nitrogen-loving species in general has remained constant since 1986, when the present study* was started.

The levels of nitrogen dioxide that were recorded while the mapping of lichens was in progress were around 5 micrograms per cubic metre in rural areas, and between 10 and 25 micrograms in built-up parts. There was a markedly greater proportion of nitrogen-loving species on the trees in the latter than out in the countryside.

Clear evidence of the effects of nitrogen could be seen on the lichen flora that was studied on 600 or so trees in urban environments, despite the fact that the levels of NO_2 usually lie between 10 and 25 $\mu g/m^3$ and only exceptionally exceed 30 micrograms – which is the critical level that has been set by the European Commission for Europe as a monthly average for protecting vegetation. It would seem from the Naturcentrum study that if the more sensitive species of lichen are to be protected as well, the critical levels for NO_2 should be lowered.

MATS-OLA LARSSON

*** Lavarna och luften på Dal och i Trestad samt i Ulricehamn. Lavflorans utveckling från 1986-1992.** By S. Hultengren and M-O. Larsson, Naturcentrum, for the County Council in Älvsborgs län. Swedish only.

Further publications

The potential role of market mechanisms in the control of acid rain (1992)
Report commissioned by the UK Department of the Environment, as a contribution to the debate about the potential for using economic instruments as a means of pollution control.

£11.50, 124 pp. Available from HMSO Publications Centre, PO Box 276, London, England SW8 5DT.

Nordic transport and environment (1992)
A summary of a policy study made for the Nordic Council of Ministers. The report argues the need for seeing the transport sector in a life-cycle perspective, while pointing out that the existing literature, statistics, and research do not provide a satisfactory coverage of the environmental problems in question. Also contains a review of the literature concerning the effects of various measures for mitigating those problems. Thirdly it presents policy instruments that might facilitate a better use of technology, and make for improved decision-making in relation to environmental problems, especially in the field of urban transportation.

Summary in English, Nord 1992:29. 26 pp. Full report, 232 pp, in Norwegian, entitled Nordisk trafikk og miljö, Nord 1992:28. Published by the Nordic Council of Ministers. Can be ordered from Allmänna förlaget, S-106 47 Stockholm, Sweden.

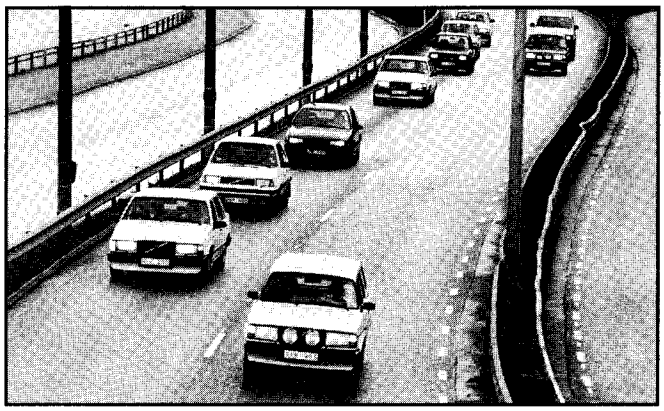
Interrelations between pH and other physio-chemical factors of Dutch soft waters (1992)
By R. S. E. W. Leuven et al. Describes the results of a program aimed at obtaining a general picture of the hydrochemistry of lentic soft waters in the Netherlands. The paper was published in Arch. Hydrobiol. 126:1, p. 27-51.

Characteristics of the road transport in Hungary, and the attack of western capital interested in motorization (1992)
By experts of the Clean Air Action Group at Talento Foundation in Budapest. Edited by Károly Kiss. Part of a survey by Greenpeace International on how western capital with interest in motorization is looking eastwards. Covers the infrastructure of motorized transport and motor vehicle manufacturing, and takes account of the present transport situation as well as of the damage to health and the environment caused by road traffic.

100 pp. Obtainable from Talento Foundation, Budaörs, Pf. 102, H-2041, Hungary.

Classifying cars and fuels

SYSTEMS of classification, combined with the use of financial incentives to favour environmentally sounder products, has in the past been mooted in various countries. They are a way of facilitating and hastening the introduction of such products without having to impose compulsory requirements – which moves towards greater international harmonization are now making ever more difficult. Classification can of itself help to force the pace of technical innovation.



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Now, starting with the 1993 year models, all new cars in Sweden are to be subject to classification for environmental effect. Those in Class 3, the lowest, must meet the emission requirements that have been in force in Sweden since 1989 and correspond to the US 87 standards. There will be an extra excise tax of 2000 kronor on such cars.

To qualify for Class 2, cars have to fulfill the requirements scheduled in the United States for 1994-96. No extra excise tax will have to be paid. There will on the other hand be a reduction of 4000 kronor on the normal tax for cars attaining Class 1 – such as can meet standards similar to the Californian low emission vehicle requirements. Both for Classes 2 and 1 the length of the guarantee for long-term performance has been increased from 5 years or 80,000 kilometres to 10 years or 160,000 kilometres.

At the start of the year, no car model had yet qualified for Class 1. Ten or so had attained Class 2, among the makes that did so being Volvo, Saab, Renault, Mitsubishi, and Fiat. Estimates suggest that 20-40 per cent of 1993 year models sold in Sweden will range in Class 2, and that as from the 1994 models there will also be cars in Class 1.

Sweden has a similar classification system for light trucks, and one for heavy vehicles is due for introduction in 1994. Since 1991, too, diesel fuels have been classified according to environmental effect, with limits for instance for sulphur and aromatic hydrocarbons. Thus the sulphur content for Class 3 may not exceed 0.2 per cent, for Class 2 0.005 per cent, and for Class 1 0.0001 per cent. The Class 2 and 1 types have already captured a considerable share of the market.

A proposal for classifying petrol as well has recently been put forward by the Environmental Protection Agency. Here there would be four classes, with a Class 4 for leaded petrol. The Agency further proposes that such petrol should be entirely banned in Sweden as from July 1994 – a ban that might however be difficult to uphold if Sweden should become a member of the European Community.

The requirements for Class 3 would be the same as the present ones for unleaded petrol. For Class 2 the sulphur content would have to be 90 per cent lower, benzene almost 50 per cent lower, and aromatic hydrocarbons also lower. The requirements for Class 1 have, for the time being, been left open. As in the case of the other systems for environmental classification, a mixture of taxes and subsidies would provide the incentive for change.

It still remains to be seen, however, whether Sweden will be able to retain and develop classification systems of this kind. For some years the country has been seeking a closer relationship with the European Community – on the one hand through the EEA treaty between the EFTA countries and the Community, which is expected to come into force already this year, and on the other through direct application for membership. There is a considerable risk of Sweden's environmental classification system for motor vehicles coming into conflict with EC rules for harmonization. The European association of automobile manufacturers was protesting already a year ago against the Swedish system, which, it claimed, discriminated against Community-made vehicles.

There can be problems on other accounts, too. One is that the Swedish classifications, and so the financial incentives, are tied to US standards. Economic incentives are permitted under EC rules, but only as a means of hastening the introduction of EC requirements.

The level of the incentives is another possible source of difficulty. The Community directive on exhaust emissions states that incentives must be "of a value, for each type of vehicle, substantially lower than the actual cost of the equipment fitted to meet the values set and of its fitting to the vehicle."

CHRISTER ÅGREN

Emission limit values for passenger cars in Sweden (grams/kilometre)

Pollutant	Environmental class 3	2	1
Carbon monoxide	2.1	2.1	2.1
Carbon monoxide (cold start)	–	–	6.2
Hydrocarbons (measured as methane)	0.25	0.25	0.25
Hydrocarbons (others than methane, NMHC)	–	0.16	0.078
Nitrogen oxides (as NO_2)	0.62	0.25	0.25
Nitrogen oxides (highway)	–	0.33	0.33
Particulates	0.124	0.05	0.05

Environmental Factsheet No. 3, April 1993

Previous factsheets in the series:
No.1 Forest damage in Europe (December 1992)
No.2 Critical loads (February 1993)

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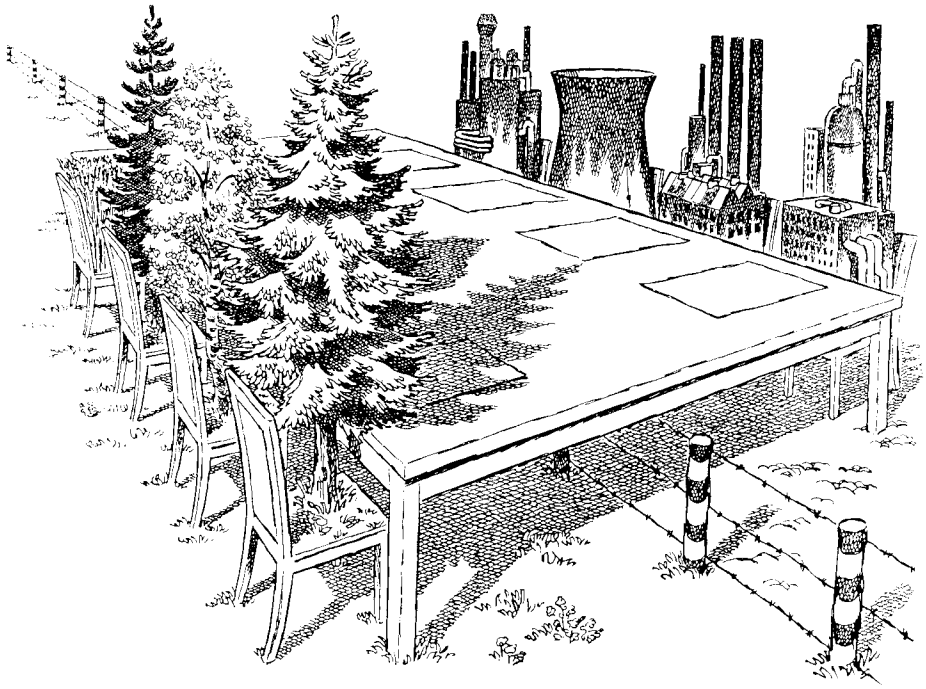
THE UN ECE CONVENTION



Air pollution treaty

IT IS ESTIMATED that the countries of the United Nations Economic Commission for Europe (ECE) emit about 70 million tons of sulphur dioxide and 45 million tons of nitrogen oxides, which is more than 40 per cent of the global anthropogenic emissions of these pollutants. They are furthermore responsible for at least one half to two-thirds of all the manmade emissions of carbon dioxide.

Although the ECE is mainly concerned with trade, transportation, and statistics, the fact that it includes the countries both of eastern and western Europe, as well as the USA and Canada, puts it in a good position to deal also with environmental problems such as air pollution.

The 1979 Convention on Long Range Transboundary Air Pollution was the first multilateral treaty concerning air pollutants. Initially the focus was on reducing the effects of acid rain through the control of sulphur emissions. Later, however, activities were widened to include nitrogen pollutants, volatile organic compounds and photochemical oxidants. And in the last few years heavy metals and persistent organic pollutants have also been made part of the work program.

Exports and imports

Already in the mid-1970s it had been clearly demonstrated that air pollutants can be transported over hundreds and even thousands of kilometres, and thus be "exported" and "imported" from one country to another.

Since 1977 the monitoring of transboundary air pollution has been carried out under a European-wide program known under the abbreviation of EMEP. The EMEP network now comprises about 100 monitoring stations in some twenty-five countries. It provides data on sulphur and nitrogen emissions (in the form of oxides of nitrogen, NO_x, as well as ammonia, NH_3), on their atmospheric transformation, transport, and subsequent deposition, and since 1989 emissions of volatile organic compounds (VOCs) and the formation of photochemical oxidants, such as ozone, have also been included. Further the EMEP maps

the transboundary fluxes of these pollutants, thus providing information as to "who does what to whom."

The Convention

At the beginning of 1977, Norway proposed the adoption by the ECE of an international convention on long range transboundary air pollution. Then, referring to the declaration of the 1972 UN Conference on the Human Environment in Stockholm, which says that states have an obligation to ensure that activities carried out in one country do not give rise to environmental damage in others (principle No. 21), the Scandinavian countries made a joint presentation of a draft text for a convention. After some hard negotiating – the most reluctant country at that time was the Federal Republic of Germany – the Convention on Long Range Transboundary Air Pollution (CLRTAP), hereafter called the Convention, was signed in Geneva on November 13, 1979, by all of the (by then) thirty-five members of the ECE (see Figure 1). After ratification by twenty-four of them, it entered into force in March, 1983.

The Convention does not in itself call for any binding commitments for the reduction of emissions. The text only says that countries shall "endeavour to limit and, as far as possible, gradually reduce and prevent air pollution, including long range transboundary air pollution," and that, in order to achieve this, they shall "use the best available technology that is economically feasible." The signatories were also to cooperate in the development of plans for the control of emissions. This vagueness naturally displeased many countries, in particular the Scandinavian.

One of the first significant decisions made by the parties to the Convention, after its coming into force, was to take over the financial responsibility for the EMEP monitoring program. To this end, in September 1984 the Executive Body of the Convention adopted a protocol concerning the long-term financing of the EMEP.

Figure 1. Status of the UN ECE Convention on Long Range Transboundary Air Pollution and its related Protocols (as of December 1992).

	Convention (a)		EMEP Prot. (b)		SO_2 Prot. (c)		NOx Prot. (d)		VOC Prot. (e)
	Sign.	Rat.	Sign.	Rat.	Sign.	Rat.	Sign.	Rat.	Sign.
Austria	1979	1982	–	1987	1985	1987	1988	1990	1991
Belgium	1979	1982	1985	1987	1985	1989	1988	–	1991
Bulgaria	1979	1981	1985	1986	1985	1986	1988	1989	1991
Byelorussia	1979	1980	1984	1985	1985	1986	1988	1989	–
Canada	1979	1981	1984	1985	1985	1985	1988	1991	1991
Cyprus	–	1991	–	1991	–	–	–	–	–
CSFR	1979	1983	–	1986	1985	1986	1988	1990	–
Denmark	1979	1982	1984	1986	1985	1986	1988	–	1991
Finland	1979	1981	1984	1986	1985	1986	1988	1990	1991
France	1979	1981	1985	1987	1985	1986	1988	1989	1991
Germany	1979	1982	1985	1986	1985	1987	1988	1990	1991
Greece	1979	1983	–	1988	–	–	1988	–	1991
Holy See	1979	–	–	–	–	–	–	–	–
Hungary	1979	1980	1985	1985	1985	1986	1989	1991	1991
Iceland	1979	1983	–	–	–	–	–	–	–
Ireland	1979	1982	1985	1987	–	–	1989	–	–
Italy	1979	1982	1984	1989	1985	1990	1988	1992	1991
Liechtenstein	1979	1983	–	1985	1985	1986	1988	–	1991
Luxembourg	1979	1982	1984	1987	1985	1987	1988	1990	1991
Netherlands	1979	1982	1984	1985	1985	1986	1988	1989	1991
Norway	1979	1981	1984	1985	1985	1986	1988	1989	1991
Poland	1979	1985	–	1988	–	–	1988	–	–
Portugal	1979	1980	–	1989	–	–	–	–	1992
Romania	1979	1991	–	–	–	–	–	–	–
Russian Fed.	1979	1980	1984	1985	1985	1986	1988	1989	–
San Marino	1979	–	–	–	–	–	–	–	–
Slovenia	–	1992	–	1992	–	–	–	–	–
Spain	1979	1982	–	1987	–	–	1988	1990	1991
Sweden	1979	1981	1984	1985	1985	1986	1988	1990	1991
Switzerland	1979	1983	1984	1985	1985	1987	1988	1990	1991
Turkey	1979	1983	1984	1985	–	–	–	–	–
Ukraine	1979	1980	1984	1985	1985	1986	1988	1989	1991
United Kingdom	1979	1982	1984	1985	–	–	1988	1990	1991
USA	1979	1981	1984	1984	–	–	1988	1989	1991
Yugoslavia	1979	1987	–	1987	–	–	–	–	–
Eur. Community	1979	1982	1984	1986	–	–	–	–	1992
Total	34	34	22	32	20	20	26	20	23

(a) Convention on Long-range Transboundary Air Pollution, adopted 13.11.1979, entry into force 16.3.1983.

(b) Protocol to the 1979 LRTAP Convention on Long-term Financing of the Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP), adopted 28.9.1984, entry into force 28.1.1988.

(c) Protocol to the 1979 LRTAP Convention on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent, adopted 8.7.1985, entry into force 2.9.1987.

(d) Protocol to the 1979 LRTAP Convention concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes, adopted 31.10.1988, entry into force 14.2.1991.

(e) Protocol to the 1979 LRTAP Convention concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes, adopted 18.11.1991.

The Sulphur Protocol

Proceeding from the outcome of the 1982 Stockholm Conference on Acidification of the Environment, the Scandinavian countries put forward a concrete proposal to reduce sulphur emissions by at least 30 per cent between 1980 and 1993. The 30-per-cent criterion was to be regarded as a first step in a long-term project for reducing emissions. The proposal was supported by the Federal Republic of Germany, Switzerland, Austria, and Canada, forming, together with the Scandinavians, what has come to be known as the Thirty Per Cent Club.

At a meeting in Munich in the

summer of 1984, ministers representing all the signatories to the Convention decided it was necessary to have an international agreement to reduce sulphur emissions that would be legally binding.

The signing of a protocol on sulphur took place in Helsinki, Finland, on July 8, 1985. Originally signed by twenty-one parties to the Convention, it came into force in September, 1987. It requires the signatories to reduce their national annual emissions of sulphur, or their transboundary fluxes, by at least 30 per cent as soon as possible and at the latest by 1993, using 1980 levels as the basis for calculation.

It was this agreement that first brought the Convention to public attention, making it to be seen as a viable means towards an international abatement of air pollution.

Some of the largest polluting nations such as the United States, Poland, the United Kingdom, and Spain have still not signed the protocol, despite the fact that governmental adherence has become something of a test, in the public mind, of environmental commitment.

Many countries have however decided on more far-reaching reductions than the 30 per cent. Today, some ten nations are aiming at halving, or more than halving, their sulphur emissions by the mid-1990s. Three countries – Finland, the Netherlands and Sweden – have declared the reduction of sulphur emissions by 80 per cent between 1980 and 2000 to be a national target. According to EMEP data, too, the European emissions of sulphur decreased by 26 per cent between 1980 and 1990 (Figure 2).

Table 2. Total European emissions of sulphur and nitrogen oxides.

	Sulphur (1000 tons)	Nitrogen oxides (1000 tons as NO_2)
1980	27523	21781
1990	20330	22875
Change	–26%	+5%

Source: EMEP/MSC-W Report 1/92.

The NO_X Protocol

On November 1, 1988, an agreement to limit the emissions of nitrogen oxides was signed in Sofia, Bulgaria. Specifically, the NO_X protocol stipulates that, after 1994, emissions shall not exceed their 1987 level. In other words, it does not call for any actual reduction, but only a freezing of emissions. It does however lay down a second step involving measures to reduce emissions, and requiring them to take account of internationally accepted critical loads. Negotiations to this end were to start no later than six months after the protocol had come into force. Actual measures aimed at reducing emissions should begin to be introduced no later than 1996. The NO_X protocol has been signed by 26 parties to the Convention, and after having been ratified by a sufficient number of states, entered into force in February, 1991.

Twelve of the countries that had signed the NO_X protocol showed their displeasure at its weakness by binding themselves in a joint declaration to actually reduce their emissions of nitrogen oxides. They are to bring about a reduction of 30 per cent at the latest by 1998, using the level of any year between 1980 and 1986 as their base year. The declaration was signed by Austria, Belgium, Denmark, the FRG, Finland, France, Italy, Liechtenstein, the Netherlands, Norway, Sweden, and Switzerland.

In November 1988, a new working group was appointed to develop a common understanding of the critical loads approach (see Environmental Factsheet No.2) and to evolve abatement strategies based on that approach. In 1989 its mandate was further extended, to prepare a new protocol for bringing about a further reduction of sulphur emissions after 1993, when the relevant Helsinki protocol expires.

The VOC Protocol

Negotiations aimed at reducing the emissions of volatile organic compounds (also called hydrocarbons), and thereby the formation of photochemical oxidants, primarily ozone, were started in November 1988, and after almost three years a protocol on volatile organic compounds (VOCs) was signed by twenty-one countries (on November 19, 1991) in Geneva. Later, two more parties have joined this protocol. The prime aim is to reduce the magnitude and the number of episodes with high concentrations of ozone.

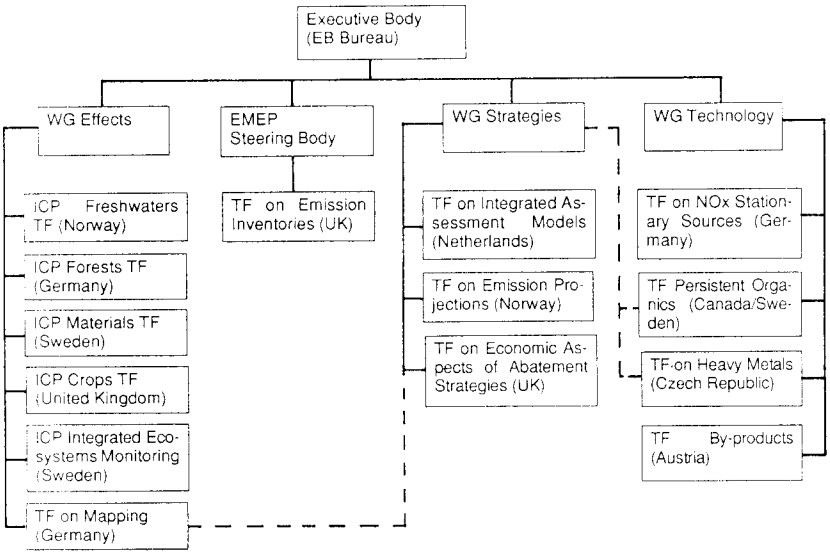
Most of the signatory countries have committed themselves to reducing their emissions of VOCs by at least 30 per cent by 1999, with 1988 as the base year. Some have however elected to take the alternative of any year between 1984 and 1990 as their base year. Three countries (Norway, Canada, and the Ukraine) are confining their 30-percent reduction to certain specified areas – so-called Tropospheric Ozone Management Areas (TOMAs). This is allowable if it is only from these areas that the emissions of VOCs contribute to the concentrations of ozone in other countries. Emissions in the other, exempted, areas can increase so long as the total national emissions do not.

Certain so-called small emitter countries were given the possibility of signing the protocol while undertaking only to freeze emissions, i.e. ensuring that at latest by 1999 their annual emissions did not exceed the 1988 levels. This would apply only to countries whose annual emissions in 1988 were less than 500,000 tons, and 20 kilograms per capita, and 5 tons per square kilometre. The following countries coming under this category have signed the protocol accordingly: Bulgaria, Greece, and Hungary.

The critical loads approach

It has been agreed that the critical loads concept provides an acceptable, effects-based scientific approach by which to devise strategies for the abatement of air pollution. The essence of the critical-loads approach is that reductions of emissions are to be negotiated on the basis of the effects of air pollutants, rather than on an equal percentage of reduction for every country. The goal is to reduce, in a cost-effective manner, the emissions of air pollutants to levels where, ultimately, the critical loads will not be exceeded.

Figure 3. The UN ECE Convention on Long Range Transboundary Air Pollution.



The Executive Body (EB), which meets annually, is the supreme policy-making assembly on which all parties to the Convention are represented. Subsidiary to the EB are a number of Working Groups (WGs), which deal with specific sectors of the Convention's workplan and are open to all parties. Assisting them are various Task Forces (TFs), either of an ad hoc nature (e.g. to produce a specific report), or to supervise a current program. Responsibility for each TF rests with a designated lead country. Five International Co-operative Programmes (ICPs) are working on effects on forests, surface waters, crops, and materials, as well as on the integrated monitoring of the effects of air pollution on ecosystems. The Co-ordination Centre for Effects (CCE) in the Netherlands serves the Convention by producing European maps of critical loads.

It is further said that because of economic, technological, and other constraints, the reductions may not be attainable everywhere, or in one step, and therefore an approach involving several steps is likely to be needed.

Here follows a rough outline of how the critical-loads approach is likely to be used in working out new agreements.

Based on current and projected emissions, and on monitoring data, national assessments of current and projected loads and levels of various pollutants will be made. Such projections can be made by using computer models, such as RAINS (developed by IIASA, the International Institute for Applied Systems Analysis).

Each country is to make maps depicting the critical loads and levels for various areas, receptors, and pollutants in its own territory, and to provide guidance as to how it should done, a manual has been produced. Mapping is steadily proceeding, and by early 1993 more than fifteen countries had made and submitted critical-load maps for sulphur and/or total acidity. The resulting data is being assembled by the Coordination Centre for Effects (CCE), and used in the production of Europe-wide maps for critical loads. Taking data on the current depositions of pollutants, the CCE is making further maps to show where and by how much the critical loads are being exceeded over various parts of Europe.

Countries will also be setting target loads. Reflecting a necessary step-wise approach, these may be regarded as intermediate objectives, on the way towards bringing depositions down to levels corresponding to the critical loads. Furthermore, countries are expected to develop national strategies for the abatement of emissions.

Computer models for integrated assessment, such as RAINS, will enable comparisons to be made of the cost and effectiveness of various strategies for reaching the abatement neccessary to achieve the target loads.

In order to arrive at new agreements on the reduction of emissions, there are to be international negotiations on target loads and strategies for abatement. Such agreements are likely to result in the setting of varying (intermediate) emission ceilings for each country, under which it must get by a specified year.

New protocols

A new sulphur protocol based on the critical loads concept is presently being negotiated by the Working Group on Strategies, and a draft is expected to be ready for signing by the autumn of 1993.

During the last year or so, several countries have proposed that future agreements (subsequent to the new sulphur protocol) should be related more to effects and therefore cover several pollutants. For example, the NO_x protocol could be replaced by an "acidification protocol," covering both sulphur and nitrogen oxides as well as ammonia. Alternatively, for controlling photochemical oxidants, there could be an "ozone protocol," including VOCs and nitrogen oxides.

Further reading

- **(1982) Acidification Today and Tomorrow**. Swedish Ministry of Agriculture/Environment '82 Committee. Stockholm, Sweden.

- (1992) **Impacts of Long-Range Transboundary Air Pollution**. Air Pollution Studies No.8. United Nations Economic Commission for Europe. New York, USA.

Sandnes, H. & Styve, H.Iversen. (1992) **Calculated Budgets for Airborne Acidifying Components in Europe, 1985, 1987, 1988, 1989, 1990 and 1991.** EMEP/MSC-W Report 1/92. The Norwegian Meteorological Institute. Oslo, Norway.

Wetstone, G. & Rosencranz, A. (1983) **Acid Rain in Europe and North America – National Responses to an International problem.** Environmental Law Institute. Washington, USA.

Proposing new limits for car emissions

AT THE END of last year, on December 23, the EC Commission released a proposal for new emission limits for cars (COM/92/572). This represents a follow-up of the previous directive, from 1991, which had already raised the requirements to such an extent that in practice from 1993 all new petrol-driven cars are having to be equipped with three-way catalyzers.

It is proposed that the new requirements (see table), which are said to be as stringent as those that are up for application in the United States in 1994-1996, shall be compulsory for all new models as from January 1996, and for all new cars from January 1997. Should the directive be adopted in the course of this year, car manufacturers could voluntarily comply with its requirements as from July 1994.

The EC proposal does however differ from the US standards in a number of important aspects. In the first place direct comparisons are difficult, because the various requirements are based on different test methods. Then there is the great difference in that the American standard includes requirements for after-sales monitoring and a manufacturer's guarantee for the durability of the equipment. It had been expected that this would also be included in the Commission's proposal, but it has not been. This is a serious omission, since the long-term performance of the emission-control system is of vital importance.

The bundling together of the emissions of hydrocarbons (HC) and nitrogen oxides (NO_x), as the Commission proposes, also amounts to a lowering, to some extent, of the requirements. If these requirements are kept separate, cars have to meet the one for each type of pollutant with a certain margin of safety.

A further lack is that there is no test for cold starting. As more and more cars become equipped with catalyzers, the relative proportion of emissions from cold starts, while the catalyzers have still not become warmed up, will increase.

The Commission is also proposing a change in the rules from 1989, whereby member countries are permitted to use economic incentives to promote sales of cleaner cars ahead of the deadline laid down by EC legislation. Noting the members have not always respected the requirement that they shall notify the Commission before applying such incentives, the Commission is now proposing that notification shall be made "in good time," and that the explicit consent of the Commission must be obtained before any such measure is introduced. The Commission would pay special attention to the possible effect of such incentives on the functioning of the internal market and to the risks of distortion of competition.

It was also expected that the Commission would propose quantitative target standards for car emissions beyond the year 2000. But instead it is proposing to investigate a broader, multifaceted approach in order to achieve further reductions of emissions in the future. Among the things that would be taken into account are the need for compliance with the EC air-quality criteria and measures such as the programs for enhanced inspection and maintenance, improvements in the test procedure and in fuel quality, and the use of tax incentives.

CHRISTER ÅGREN

Emissions limits for passenger cars in the EC (grams/kilometre)

	CO	HC+NOx	Particulates
1991 Directive	2.72	0.97	0.14 (diesels)
New proposal:			
Petrol engines	2.2	0.5	–
Indirect injection diesels	1.0	0.7	0.08
Direct injection diesels	1.0	0.9	0.10

IN BRIEF

Road tunnels questioned

The concentrations of exhaust gases can be up to ten times higher in road tunnels than in ordinary urban atmospheres. Since the concentrations will be about the same inside a vehicle as outside, this means that riders' exposure to air pollutants, already very high, will become still greater as a result of driving through tunnels.

In the view of two Swedish scientists who have recently made a study* of the matter, even ordinary car users have, on account of the health risks, every reason to oppose further schemes for road tunnels – not to mention truck drivers who are even more exposed to polluted air. Asthmatics, children, and pregnant women are pointed out as being especially at risk.

"New investments in urban road tunnels cannot be justified if the health effects are to be considered," say the researchers.

* **Volatile hazardous hydrocarbons in a Scandinavian urban road tunnel.** By Gunnar Barrefors and Göran Petersson, Chalmers University of Technology, S-412 96 Göteborg, Sweden. Published in Chemosphere, Vol. 25, No. 5, pp 691-696, 1992.

Perhaps not so cheap

Four years ago the ferries on the Stockholm-Helsinki route began using diesel fuel with a sulphur content of only 0.5 per cent – as a concession to environmental opinion which had been highly critical of these huge vessels rampaging in the narrow passages of the Swedish and Finnish archipelagoes.

Lately, after it had come to light that one of the operators, Silja Line, had stopped using the more expensive low-sulphur oil, public concern was again aroused. The Swedish and Finnish societies for the protection of nature threatened with a joint boycott, and the Stockholm port authority declared that it would raise harbour dues for the Silja Line if it did not immediately revert to using low-sulphur oil.

After hardly more than a day of this flaying, the ferry operator announced that it would go back to using the cleaner fuel no later than at the beginning of April. It remains to be seen whether the bad publicity did not cause it to lose much more than it saved from the use of the cheaper oil. □

IN BRIEF

Power blueprint

Thailand has adopted a multi-million program for energy conservation as a means of forestalling extensive blackouts of the kind that has been plaguing other Far Eastern countries. American energy efficiency specialists who have been working with the Thai government claim that the campaign, which is expected to cost as much as $456 million during the 1990s, can provide a blueprint for the rest of the Third World.

The package of measures that has now been introduced is based on calculations that show it to be cheaper to improve the efficiency with which energy is used than to build new power stations. The plan includes setting up a $60 million energy conservation fund to stimulate consumer demand for energy efficient products. The money will be used to try and convince consumers of the advantages of buying household goods that are economical of energy.

A second part of the program is a five-year scheme for introducing the means to enable generating companies to supply electricity at the lowest economic and environmental cost. The Thai Electricity Generating Authority estimates that to meet the expected demand in 2010 it may be necessary to more than triple the present generating capacity. But according both to the authority and the American specialists, the new plan has the potential to cut the growth in the electricity supply by a quarter over the next decade.

Source: **New Scientist,** October 3, 1993.

Vapour recovery

Germany is the first member of the European Community to have passed a law making it obligatory for all new filling stations to have vapour-recovery sleeves on the nozzles of the pump hoses. For new service stations the law is applicable as from January 1 this year, while existing ones will be granted dispensation during three to five years.

Fitting tightly around the vehicle's filler mouthpiece, the sleeves capture any escaping vapours – thus making for an improvement both of the local and general environments. At present 2 per cent of the annual emissions of volatile organic compounds are estimated to emanate from refuelling at service stations. Proposals are now being drafted for curbing VOC emissions from petrol at all stages of storage and distribution in the European Community. □

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Climate change: China

THE GREENHOUSE EFFECT could cause much of China to experience a warmer, drier climate – with a rise in temperature of 2.0°C in the north and west of the country – by the year 2050, according to a recent study by WWF International.* Detailed scenarios show that China is likely to become hotter than it has been in the last 120,000 years. Agriculture is likely to be greatly affected, as well as natural ecosystems.

Particular threats to ecosystems include the likely conversion of cold steppe and temperate desert regions into hot deserts, a reduction of the biological diversity in Tibetan alpine habitats, and a major diminishing of the extent of cold temperate coniferous forests along the Siberian border.

To a certain extent the climatic warming would be favourable for Chinese agricultural production, with an increasing yield as a result of a diversification of cropping systems. By 2050, however, the climate would be less suitable for the cultivation of rice; although the area suitable for it would increase, the average yields would be likely to decrease because of a reduced availability of water.

There are many uncertainties surrounding the scale of any future greenhouse effect and its implications for China and other nations. These uncertainties should not, however, the WWF insists, give any reason to ignore the problem.

The challenge of the next decade, according to WWF, will be to meet the development needs of the majority of the world's population and to reduce the unfair burden placed on the planet's resources by the lifestyles of people in the industrialized nations. In pursuance of this aim, an end-use-oriented approach to energy planning should be substituted for the current focus on the supply side in energy policy. Much greater account must be taken of the environmental impact of energy policies, and greater emphasis given to the potential for investments in energy efficiency.

For many developing nations, China included, such a change in direction will require major financial and technical assistance from donor countries. Multilateral development banks should emphasize energy efficiency and technology transfer in their regular lending to energy projects in developing countries.

Since the emission targets so far discussed within the international community would only have a minor effect on temperature rise, the WWF emphasizes the necessity of a swift implementation and strengthening of the UN Framework Convention on Climate Change.

PER ELVINGSON

* **Climate change due to the greenhouse effect and its implications for China.** Published by World Wide Fund for Nature, CH-1196 Gland, Switzerland.

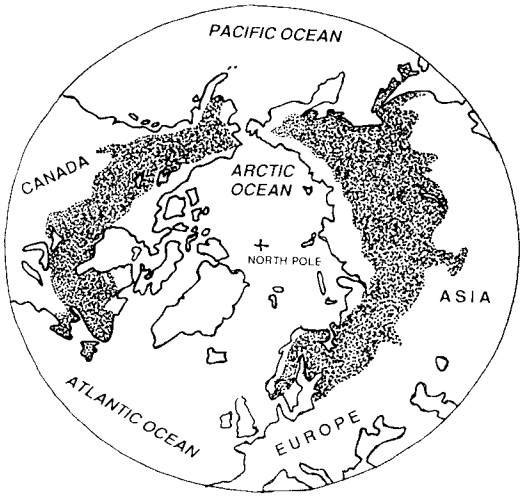
Important as the tropical

THE BOREAL FOREST is a broad belt of coniferous forest encircling the globe in high northern latitudes. It is covering altogether 14.7 million square kilometres, or 11 per cent of the world's total land area. Its location is mainly determined by the climate, with severe winters and mild, moist summers. At their lowest the winter temperatures are generally too cold for most broadleaved trees, while the summer temperatures are not high enough to sustain temperate-zone species.

Consequently the boreal forest consists mostly of coniferous evergreens, with a few deciduous species such as larch and birch that are tolerant of severe frost. The trees are adapted to the low-slanting sunshine at these latitudes through their deep, narrow crowns. The forest structure is generally open, with well developed, highly diversified layers of mosses and lichens. Often the soil is permanently frozen, with consequent inadequate drainage. In such locations the forest will be interspersed with bogs which may cover up to a third of the area.

Because most of the processes in a boreal forest are strongly controlled by climate, such forests could be very sensitive to a rapid change of climate. The possibility is all the more serious in view of the projected patterns of climate change. According to current scientific understanding, there will be a global increase both of temperature and precipitation as a result of the greenhouse effect. Although there are major uncertainties as to the local patterns and magnitude of the change, most analyses indicate great changes in the boreal regions, with increases in temperature of up to 15°C in winter but less in summer.

In order to determine the large-scale effects of such a great climate change, it is necessary to establish the relation between the distribution of boreal forest and climate and soils, and then project this relation for changed climatic conditions. This can be done with modern computer technologies that link data bases of forest distribution, soil, and climate, and evaluate their intricate relationships. In carrying out such analyses, the author used scenarios for climate change from several global climatic models.



The boreal forest encircle the globe in a broad green belt.

The results are in all cases similar. Climate warming produces a general northward shift of the boreal forest area. The only difference is that with the most severe scenarios it also decreases considerably in extent. Along its northern edge large areas of tundra will become forested – a change that could occur quite fast because of the numerous small islands of trees that are already there. These islands are remnants from a long warmer period 7000-1000 years ago. Under a warming climate the trees, which are at present not reproducing, could become fertile again, leading to a rapid expansion of forest into the tundra. The trees would not have to cope with competition from other species. The area of tundra would thus be squeezed between the new forest and the polar ocean. In fact all the scenarios show a large decrease (up to 70 per cent) in its extent.

The change will be altogether different, on the other hand, along the southern edge of the forest. Most of the scenarios agree that the present boreal forest would be replaced by a temperate type, with broadleaved deciduous trees in the maritime region (such as the European) and by steppe in the more continental parts such as Central Siberia. The forest dynamics would be entirely different from those on the northern edge. The transition from forest to steppe will depend largely on the rate of change and the available moisture. If the temperature and evaporation should increase faster than the precipitation, the transition would be rapid. The result would be extensive forest dieback and numerous forest fires – with increased emissions of carbon dioxide to the atmosphere. Slower changes would lead to a more gradual transition and a landscape with many surviving patches of forest and open woodland.

The transition from boreal to temperate forest will take place mainly through succession – that is, the replacement of individual trees as a result of mortality among boreal species and subsequent regeneration among temperate species. At first the warmer climate will enhance the growth of boreal species, but because of ineffective regeneration, recruitment will stop and the existing trees become senescent and ultimately die. Openings in the forest canopy after the death of an individual allow better adapted species to establish themselves, making for a slow shift from a typical boreal forest to one with more temperate characteristics.

The change from boreal to temperate forest may take several hundred years. If disturbance regimes are taken into account, however, there will be a change in succession. Intensifying disturbance will probably lead to a more rapid response and adaption to climate change. Early successional species, having the ability to reach maturity in a

Taiga Rescue Network

ACCORDING TO the dictionary definition, *taiga* is a Russian term for the belt of coniferous forest that circles the land masses of the norther hemisphere between the temperate grasslands and the tundra. It is usually regarded as synonymous with the boreal forests, and it was therefore the term chosen when naming the Taiga Rescue Network which has been formed to address the environmental problems of the boreal forests in general.

The Network was set up in October last year at an NGO conference in Jokkmokk, North Sweden, which was attended by more than 200 individuals representing many of the major environmentalist organizations of Russia, North America, and Europe as well as the WWF and Friends of the Earth and Greenpeace International.

Some of the principal decisions of the conference concerned:

☐ A platform for the Taiga Rescue Network.

☐ The publishing of a regular newsletter, to be entitled Taiga News.

☐ A number of international protest campaigns.

☐ An international coordination centre, which is to be relocated every third year.

☐ An international reference group to coordinate network activities.

While discussion chiefly centred on the ecological effects of large-scale forestry operations in the region, a specific outcome of the conference was the setting up of a working group to examine the response of the boreal forests to rapid climate change and also the environmental threats arising from industry and mining.

The intention is that the Taiga Rescue Network shall also publish reports and promote international campaigns against air pollution and the mining of fossil fuels.

An action group against air pollution from the Kola Peninsula had been formed as early as 1990 in North Norway, and environmentalist bodies such as Greenpeace and Bellona-Norway are now organizing public protests against large nuclear projects in the taiga regions.

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short time and having high dispersal rates, will be likely to benefit. Such species certainly have a very wide ecological amplitude, but they need great amounts of light to complete their life-cycles. This suggests a more open landscape with woodlands and absence of the typically denser boreal forests of today.

The large shifts in vegetation patterns shown by the analyses can only occur as a result of the expansion and displacement of present distributions. With changing climate patterns the capability for migration and its speed assume importance. The average migration rates were determined for several tree species according to the rates following the retreat of the glaciers during the last eighteen millennia. This gave estimates ranging from 10-40 kilometres per century. Fewer corridors and/or bridges in a modern landscape would cause the rate to be even slower, although this is of lesser relevance for boreal forests. This historical rate is in any case much lower than the 750 kilometres per century that appears likely for the boreal region as a result of the predicted climate change.

The speed of migration is not the only constraint on the spread of species that are already stressed by a rapidly changing climate. The different part of the life-cycle of any individual species – seed, seedling, sapling, mature tree – all require different environmental conditions and all have their own particular tolerance to environmental stress. Probably the most sensitive stages are when the seed is germinating and the young tree is getting established. Although this early phase represents only a small fraction of the total life of an individual, any limiting factor can have a large effect on properties such as succession, diversity, and vegetation structure. Only small changes in the environment could either limit regeneration or bring it to a complete halt. Since already established trees can survive for a long period (up to hundreds of years), they can limit the space for new, better adapted individuals that are seeking to establish themselves. In this way the internal dynamics of ecosystems could further delay or even restrict normal species migration.

It may thus be concluded that the boreal forests not only face immediate threats in the way of large-scale logging and environmental pollution, but are also among those ecosystems that are most severely threatened by climate change. Care will have to be taken to mitigate the negative effects of climate change and reduce the build-up of greenhouse gases in the atmosphere. Boreal forests, and especially old-growth forests, can play an important role by their ability to sequester huge amounts of carbon.

In high northern latitudes there is a strong correlation between the seasonal dynamics of atmospheric CO_2 concentration and the seasonal dynamics of the forests. The boreal forests are among the leading factors in the global carbon cycle and thus in regulating the final atmospheric concentration of carbon dioxide. Recently their importance for the development of regional and global climates has also been stressed. A continuous forest cover results in winters and summers that are milder than they would be without it. The boreal forests are in fact just as important as the tropical ones.

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Air pollution in the taiga

SOME OF THE WORLD'S LARGEST sulphur-emitting industrial complexes are to be found in the Russian taiga region. During the last fifty years many heavy industrial, mining, and power-generating enterprises have grown up in this area with its extensive mineral deposits and oil and gas reserves. Most of them are still operating without any measures for environmental protection, with the result of widespread damage to the forests and problems for human health.

According to the latest governmental report on the state of the Russian environment, 50 million Russians are now breathing air laden with ten times as much pollution as the regulations allow, and in the case of another 60 million it is still five times as much.

With the aim of preparing international protest campaigns, examples of large-scale air pollution problems in the taiga region were examined at the recent conference in Jokkmokk, North Sweden, of the Taiga Rescue Network, and here are three specific cases.

The Kola Peninsula

During the fifties and sixties several big smelters for nickel and aluminium were built here to use the ores that were already being mined on a large scale. Together with other industries, these installations are now emitting almost 600,000 tons of sulphur dioxide per annum. They are also spreading other pollutants, such as copper, nickel, cobolt, chromium, and arsenic over the sub-Arctic environment.

Enterprises still operating without any measures for environmental protection

A great increase in the amounts of heavy metals in the natural surroundings along the Russian border has been noted by Norwegian and Finnish scientists. Rough calculations by environmentalists also indicate that some three million hectares of forest have been damaged on the Russian side, with trees on 100,000 hectares already dead.The two main nickel-smelter complexes are Severo-Nikel at Montesegorsk, 100 kilometres from the Finnish border, and Petsamo/Zapolyarni-Nikel which is a mere 10 kilometres away from the Norwegian. Originally built by Canadian and Finnish companies, Severo-Nikel is now fifty years old. Using out-dated technology, it is still producing 140,000 tons of nickel, 100,000 tons of copper, and 3000 tons of cobolt a year. According to an official report from the Russian minister of environment to the Finnish government, in 1988 Severo was also emitting 212,000 tons of sulphur dioxide a year, and the Petsamo/Zapolyarni plants 300,000 tons.

These smelters are not only using ore from the local mines, with a sulphur content of 3-4 per cent, but also millions of tons of ore which is shipped from Norilsk, in Siberia, with a sulphur content up to 23 per cent.

Since the late eighties the Russian government has been carrying on discussions with the Scandinavian countries for modernization of the Kola smelters and the installation of environmental control technologies. This was partly a result of the strong pressure that was being exerted on the Moscow government by the local inhabitants during the period of *glasnost*. The propaganda

of the Norwegian action group going under the name of "Stop the deadly clouds from Russia" has also had its effect.

Some general agreements were reached with Norway and Finland, one being signed by the Gorbachov government in 1989 to reduce Russian and Finnish emissions of sulphur dioxide by 50 per cent by 1994, from 1980 levels. Many reports on ways of modernizing the smelters and the cost of financing have been made by consultants and the governments in Finland and Norway, some putting the cost at as much as US$1 billion. Finland and Norway had each offered $40 million towards defraying it, with the proviso that the work would be done by Finnish and Norwegian companies using their own technology.

Subsequently Russian interest appears to have cooled. In September 1992 came a statement from the Russian minister of environment to the effect that it would be too expensive to use foreign technology. Russia wanted to use its own technology but still have foreign aid. The Finns then withdrew their offer.

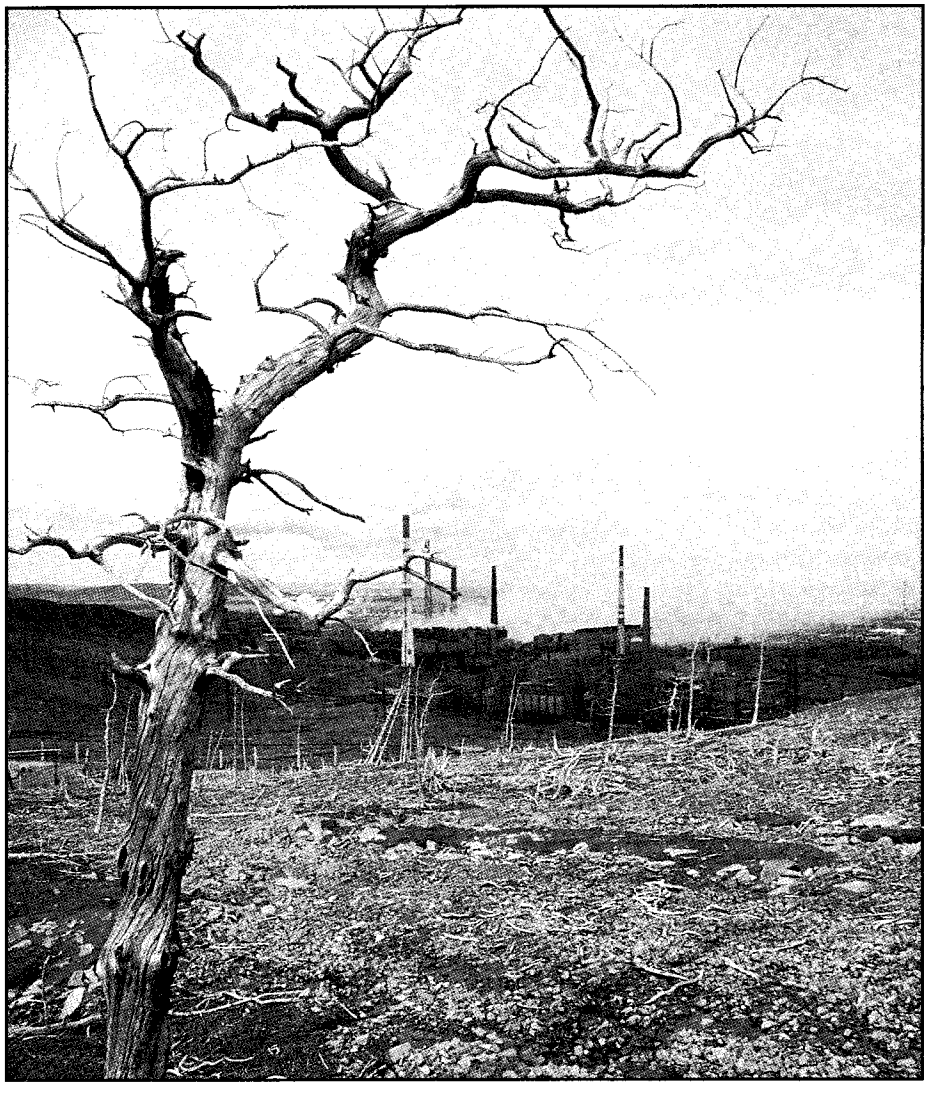
Just now various technological and financial options for modernization are being worked out between the Scandinavian countries and a group of Russian experts, and it is hoped that the Russian government will soon be able to ask for bids. In this way the cost is likely to be much lower, say, between $120 and $400 million.

A temporary solution could be for the Russians to modernize only the ore processing at Petsamo, using a washing process to reduce the sulphur content of the ore by 50 per cent. This would result in an annual reduction of the emissions of sulphur dioxide from Petsamo-Nikel to 120,000 tons.

The main argument for this low-budget solution is that this smelter is already on the Russian environment ministry's list of outdated plants that will sooner or later have to be closed down.

Nickel smelters in Norilsk

In the middle of Siberia, east of the River Yenisei, lies Norilsk, which probably holds the world record for the release of sulphur dioxide from a single source, with emissions of 2.4 million tons in 1990 and 2.5 million in 1991 (official figures). Also emitted to the atmosphere (in 1988) were trace metal particles amounting to 32,000 tons. Toxic gases from Norilsk can be tracked all over the Arctic region as far as Canada.



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Forest death and smelters at Norilsk.

The large smelters were built during Stalin's time by some million prisoners working under the most dreadful conditions. Today the Norilsk industry cooperative accounts for 35 per cent of world nickel output. The local population of 270,000 includes 70,000 children, many of whom are affected by respiratory ailments and allergies. There are also reports of children with congenital deformities.

According to Russian scientists more than one million hectares of forest in the surroundings of Norilsk are damaged, and of these there are 400,000 hectares where the forest is completely dead.

The cost of a 75-per-cent reduction of the pollution from Norilsk has been put at $7 billion. Canadian and Japanese firms have indicated an interest, but as yet there are no definite plans to undertake improvements.

Smelters at Krasnoyarsk/Bratsk

Here is another example of industrial gigantism and environmental disaster. At Krasnoyarsk and Bratsk are two smelters each producing 850,000 tons of aluminium a year, or together 25 per cent of the total Russian output. Scientists at Krasnoyarsk say that the large emissions of fluorine in particular have caused widespread forest damage, with some 3.2 million hectares completely dead. Should the emissions continue, the scientists expect to see dead forest within a radius of 100 km around Bratsk. Health problems are serious here, too, and in some areas the life expectancy is no higher than 50 years.

REINHOLD PAPE

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Climate Alliance

MANY WILL DOUBTLESS recall the UNCED Conference in Rio de Janeiro last year, with all the fine sentiments that were there expressed – and largely forgotten when the governments of the industrialized countries once again turned their attention to the problems of the recession. Concern for the environment has tended to fade into the background, in the mind both of the public and of the politicians.

This means that environmental campaigning has become all the more urgent – to show by specific examples how the change can be made to a more sustainable lifestyle. For promoting it several new international networks have seen the light.

One of these was the Climate Alliance of European Cities with Indigenous Rainforest Peoples for the Protection of the Earth's Atmosphere. In August 1990 representatives of various European city councils and the indigenous peoples of Amazonia agreed on a manifesto that the former were to publish concerning specific actions at the local level for climate protection (see box).

In 1992 the Climate Alliance constituted itself as an association with four main fields of action, namely

☐ Reductions of carbon dioxide emissions at the local level.

☐ Avoidance of the use of tropical timber.

☐ Stopping chlorofluorocarbons (CFCs).

☐ Cooperation with rainforest peoples.

The Alliance membership now comprises more than 200 city councils, including Vienna the capital of Austria, Berlin and Hamburg in Germany, and Den Haag and Utrecht in the Netherlands. Most of the members are so far from these three countries.

The main planks in the municipal Alliance program for climate protection are as follows:

1. The adoption of a catalogue of immediate measures such as

☐ Improvement of the insulation in buildings and energy efficiency standards.

☐ Giving priority to combined heat-and-power generation.

☐ Compulsory connection to existing district-heating systems and the prohibition of space heating by electricity.

☐ Providing incentives and financing for energy from renewable sources.

☐ Policies giving priority to public transportation and non-motorized private modes (flexible multiple-ride tickets, bicycle-track networks, etc.).

2. Drawing up of municipal CO_2 balances.

3. Development of longer-term programs for reductions in the energy and transportation sectors.

The international action day for climate that are being planned by environmentalist organizations for May 15 will provide good opportunities to spread the climate-alliance idea still further throughout Europe.

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Manifesto of European cities on an alliance with the Amazonian Indian Peoples

GLOBAL CLIMATIC CHANGES are looming. The Toronto World Conference declared that drastic reductions of carbon dioxide emissions are imperative – particularly for the industrial countries of the northern hemisphere.

75 per cent of the emissions from the burning of fossil fuels are produced by northern hemisphere countries. The conclusion we draw is that we are under an obligation to take action.

1. The Alliance of European cities

We, the cities of Europe, are striving to ensure, by reducing energy consumption and motorized road transport, that pressure is taken off the atmosphere so as to enable it to provide satisfactory living conditions for future generations.

2. No unneccessary carbon dioxide emissions

Our aim is to halve carbon dioxide emissions by the year 2010, and then reduce them even further, step by step. We will do everything we can to stop all production and use of CFC propellants immediately.

We regard as our allies all those who take similar steps to protect the world's climate.

3. We support the Alliance of the Amazonian Indian Peoples

We, the cities of Europe, support the concern of the Amazonian Indian Peoples for the preservation of the tropical rain forest, the basis of their very existence, through the designation and the sustainable utilization of the Amazonian territories. Their defence of the forests and rivers is a contribution to sustaining the earth's atmosphere for future generations as the basic precondition for human existence. Wood from tropical rainforests must therefore be neither imported nor utilized in any way; moreover, further forms of forest degradation such as the unlimited production of cattle, colonization projects, the use of pesticides, monocultures, hydroelectrical power stations and the mining and mineral oil exploitations which are environmentally damaging must be all questioned. The forests are a sink for carbon dioxide, the emissions of which we, too – in our own way – seek to restrict.

In our efforts to preserve living conditions for this planet we see ourselves as their partners in the Alliance for the preservation of the rainforests and the protection of the climate, which, we hope, more and more European cities will join!

Signed by nearly 200 cities in Austria (33), Federal Republic of Germany (58), Italy (12), the Netherlands (89), and Switzerland (4).

Climate Alliance Call for actions May 15

A COALITION OF NETWORKS working on environmental and development issues is arranging a day of international action on May 15 to protest against the passivity of most governments in regard to emissions of carbon dioxide.

The coalition is mainly comprised of environmentalist groups connected with the European Youth Forest Action (EYFA) and the Alliance of Northern Peoples for Environment and Development (ANPED). The action day will amount to the continuation and broadening of a tradition developed during the last few years for organizing acid-rain and air-pollution weeks and international traffic action days.

A common minimum demand for this action day is that the emissions of carbon dioxide in the industrialized countries shall be reduced by at least 20 per cent by the year 2000. Some 200 organizations in twenty countries have already announced their intention of taking part. The activities will be decentralized, with each individual group deciding on the form of action it will take, whether as hearings with politicians, bicycle demonstrations, exhibitions to demonstrate the possibilities for energy saving, street theatre performances, or other attention-bringing activities.

Solidarity with the south will be an important aspect of this campaign. The coalition is demanding a stop to overconsumption by the rich and the realization of forest protection in the South through the recognition of human rights and the introduction of land reforms and social change. The greatest responsibility for a reduction of the emissions of carbon dioxide lies with the North. The per capita emissions in Zaire in Africa, for instance, are no more than 100 kilograms per annum, as compared with about 20,000 kilograms for every single person in the United States.

To generate pressure on governments of adopt an international protocol for emissions reduction

The Climate Alliance Action Day is to generate pressure on governments to adopt, as soon as possible, an international protocol for the reduction of CO_2 emissions. The Climate Convention that emerged from the UNCED meeting at Rio de Janeiro in 1992 was a disappointment because of the failure of the industrialized countries to agree on a commitment to stabilize or reduce such emissions by the year 2000. The large oil-producing countries, such as the United States, Russia, and Saudi Arabia in particular, were instrumental in preventing an agreement.

An initiative on the part of Austria, the Netherlands, and Switzerland to form a so-called stabilization club of industrialized countries that would be willing to act without delay also came to nothing because of lack of sufficient support, among others from the Scandinavian countries.

The Climate Convention, which will come into force when fifty countries have ratified it, permits the adoption of legally binding protocols committing the signatories to significant reductions of the emissions of greenhouse gases within a specified period of time. The question is only when negotiations to that end are to start. Some oil-producing countries are currently doing all they can to delay the process.

Environmentalist organizations are demanding that negotiations should start immediately, and that a CO_2 protocol should be adopted at the first meeting of the parties to the Convention in 1994.

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For more information contact International Coordination May 15, Environmental Federation, att. Eva Andersson, Box 7048, S-402 31 Göteborg, Sweden.

Pan-European Conference of Environmental Ministers April 28-30, 1993

ENVIRONMENTAL MINISTERS from all the countries of Europe will meet in Lucerne, Switzerland, in April to discuss the state of the environment. The conference is a follow-up of the first Pan-European Conference of environmental ministers held in Dobris, Czechoslovakia, in June 1991. The ministers are to discuss how far the decisions made at the Dobris meeting have been fulfilled, as well as how to implement Agenda 21 and other agreements made at UNCED which are relevant to Europe.

Preparation for the conference began a year and a half ago. Four task forces of government officials from Europe, Canada, and the US are preparing proposals on:

- ☐ State of the environment in Europe, prepared by the EC.
- ☐ Nature protection, prepared by the Council of Europe.
- ☐ Action program for Central and Eastern Europe, prepared by the World Bank.
- ☐ Environment for Europe program, coordinated by the UN Economic Commission for Europe.

International NGOs are intending to organize a seminar prior to the conference to discuss their own "urgencies for Europe," and activities will also be organized during the week of the conference itself.

For more information contact *Koordination für Europafragen* (Coordination for European Issues), Theresa Herzog-Zimmermann, Box 634, 9500 Wil, Switzerland, tel/fax +41-73-224 853.