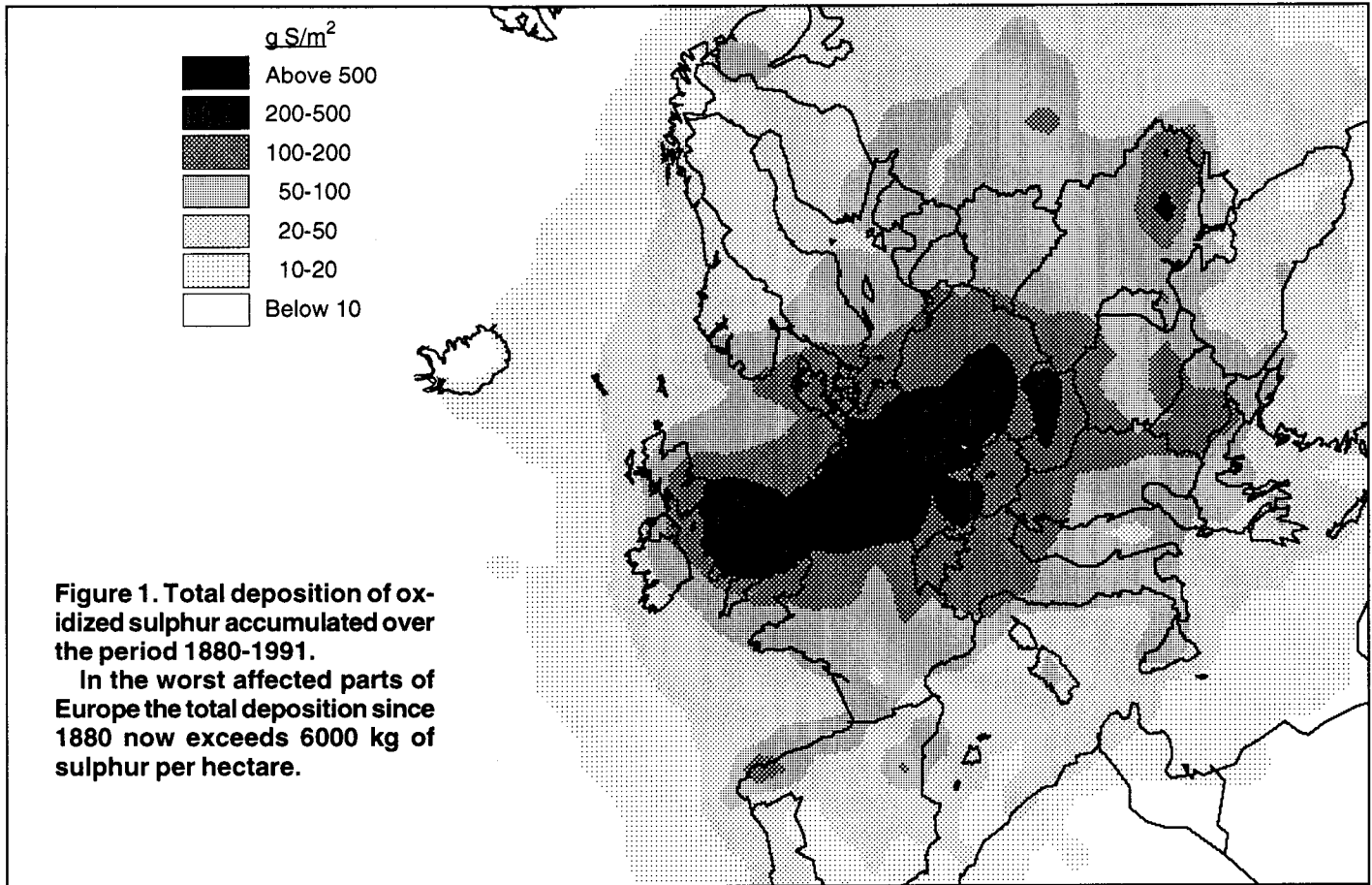


# Acid News

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



## SO<sub>2</sub> EMISSIONS

# The historical trend

IN SOME PARTS of Europe the critical-load limits for sulphur were already being exceeded during the nineteenth century. This occurred quite extensively in Germany, Britain, Norway, the Netherlands, and South Sweden – precisely in those places where damaging effects have subsequently been found in soil, forests, and water. The historical trend can now be seen from a survey presented by the European Monitoring and Evaluation Programme (EMEP), charting the emissions, depositions, and concentrations of sulphur all over Europe.

The emissions are shown country by country, as well as for the area as a whole, during the period from

1880 to 1990. It is noted from the start that compared with the man-made emissions, the natural emissions of sulphur are negligible. The emissions come mainly from the burning of fossil fuels, especially coal and oil (Figure 3, page 4). A certain amount also comes from industrial processes, such as the roasting and smelting of sulphidic ores in the production of copper, lead, zinc, and nickel, from making sulphuric acid, and cellulose for use in pulp and paper making.

The industrial revolution, when extensive mechanization brought about a shift from home manufacturing to large-scale production, started in Britain around the middle of the

eighteenth century and then spread gradually over the rest of Europe. By the end of the nineteenth century the use of coal had come to assume ever greater proportions – first for heating, producing steam, and in iron and steel making, and then in plants for the production of electricity as well as heat. Even as late as the mid-1900s industry was mostly concentrated around the coalfields. A change only came later with the increasing use of oil as fuel.

It was only after the Second World War, too, that attention started to focus on the problems of air pollution resulting from the burning of coal – especially on account of smog

*Continued on page 3*

# 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 fulfill 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 Fiskeforbund)
- The Norwegian Society for Conservation of Nature (Norges Naturvernforbund)
- The Norwegian Mountain Touring Association (Den Norske Turistforening)

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## EDITORIAL

# From words to deeds

ONE THING that came out of the UN Conference on Environment and Development that was held in Rio de Janeiro in June 1992 was Agenda 21, which amounted to a program for action to achieve sustainable development during the twenty-first century. But the question is how the aims of Agenda 21 are to be carried out in practice.

In answer to this, the Swedish Society for Nature Conservation recently put forward proposals for the immediate application of economic and legal measures as a means of hastening the desired development.

By way of introduction the Society propounded three principles, which in its view should, if consistently applied, lead to a marked change in the way we order our affairs.

1. *Society (in this case the community) shall not subsidize investment in unsustainable and unprofitable projects.* As examples of investments that are unprofitable from the socio-economic point of view, the Conservation Society names the proposed bridge over Öresund, certain new motorway projects, and nuclear power. If all the environmental costs are included in the calculations, such investments turn out to be socio-economically unprofitable, and therefore should not be carried out.

2. *Subsidies and special laws that support unsustainable activities should be abolished.* Today a number of environmentally inimical activities are favoured through subsidies and abrogations. If this kind of special treatment ceased to be given, the environmental damage would diminish, sustainable alternatives would be better able to compete as a result of the more even terms, and the national economy, including the government finances, would improve.

An illustration may be found in road traffic, which today does not pay the full costs it entails for damage to the environment, disruption, accidents, etc. – which in effect means that the rest of the community is indirectly forced to subsidize road users.

3. *Full responsibility for the environmental costs should be laid on all economic activity, and environmen-*

*tal taxes used to finance government spending.* Taxes on the emissions of harmful substances, on the use of energy, and the consumption of natural resources are a means of reducing damage to the environment, and thereby its cost to the community. Through a tax switch, whereby some of the taxes on work or capital are replaced by environmental ones, it would be possible to achieve, besides the environmental gains, a more effective way of financing government spending. Lowering the taxes on work would also help to lessen unemployment, without it having any inflationary effect, since there would be no increase in the total of taxes levied.

Proceeding from these principles, the Conservation Society has put forward twenty-one proposals for appropriate measures. It proposes for instance raising the tax on emissions of carbon dioxide to 50 öre per kilogram, in exchange for a reduction of the tax that firms have to pay for each employee by 3.5 per cent. Further the taxes on petrol and diesel fuel should be increased by 10 per cent every year up to the year 2000. These increases should also be used to reduce the taxes on work.

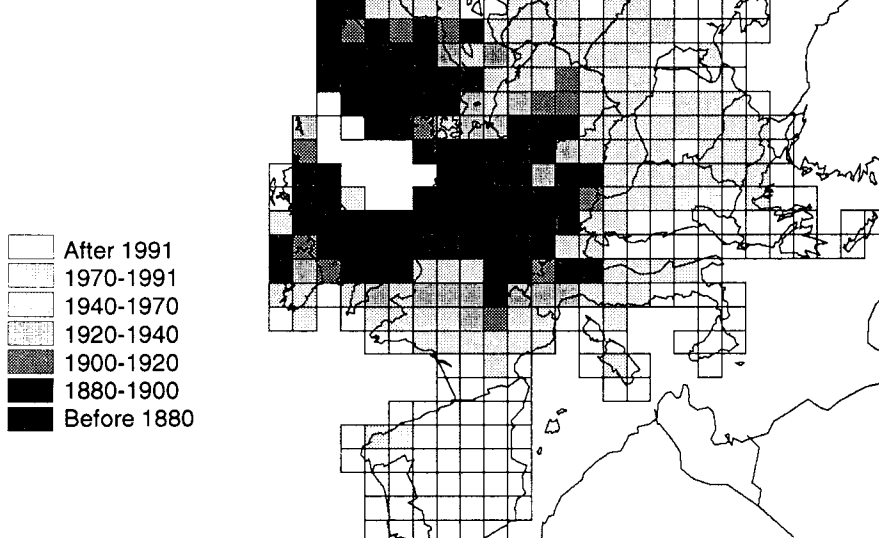
It is unlikely that environmental damage can be stopped merely by economic and fiscal measures. There will also have to be some kind of legal enforcement, say, through the imposition of technical requirements, prohibition, and a concessional process. But to the extent that international trade regulations come to assume greater importance for environmental policy, taxes, charges, and environmental labelling will come ever more into their right.

It will therefore be very important, for the continued improvement of environmental protection, to ensure that international requirements will be minimum requirements. Individual countries must, if they consider it desirable, be able to impose still stricter requirements as well as economic measures. Otherwise the work for environmental improvement will stagnate, and that we cannot afford to risk.

CHRISTER ÅGREN

# ON THE FOLLOWING PAGES

Figure 2. Decade in which the critical load was exceeded for the first time (5-percentile).



Continued from front page

in large cities such as London. Solutions were sought in the obligatory use of cleaner fuel (i.e. with lower sulphur content), in higher smokestacks, and more electric heating. The discovery of acidified lakes and streams in southern Scandinavia, in the later 1960s, set off an international debate on the emissions and long-distance transport of sulphur, which resulted, in the seventies and eighties, in most European countries adopting more or less successful measures for curbing emissions.

When solid fuels, such as coal, are burnt, the emissions are mostly in the form of sulphur dioxide (SO<sub>2</sub>). Sulphur trioxide or sulphates constitute only 2 or 3 per cent of the total. A varying fraction of the sulphur content of the fuel (depending on its composition and the combustion temperature) is retained in the ash. For hard coals it may be between 2.5 and 23 per cent, and for brown coals from 20 to 70 per cent. The EMEP study assumes that the quantity of retained sulphur has been gradually reduced, so as to amount (in the eighties) to 5 per cent for hard coal, and 20 to 30 per cent (depending on the S-content of the fuel) for brown coal.

The sulphur content of the solid fuels is said to be where there is the greatest uncertainty. That of hard coals ranges between 0.8 per cent (Poland) and 6 per cent (Yugoslavia). In brown coals it varies even

more. After the sulphur content for each solid fuel in any particular country had been decided, calculations were performed with their weighted average, based on consumption statistics. Because of limits imposed by national legislatures, the sulphur contents have lately decreased considerably in many countries.

During combustion, petroleum products emit practically all the contained sulphur. Most of it is associated with the residual or heavy fuel oil, which constitutes 30-50 per cent of the crude, and to a lesser extent with gas and diesel oil (so-called middle distillates), comprising 25-35 per cent.

The combustion and process emissions of SO<sub>2</sub> are presented separately for each country. The national emission figures, as reported officially to UN-ECE/EMEP have been available since 1980. It should be noted that the only control measures that are considered in the report are those for the reduction of the sulphur content in fossil fuels, with the implied inclusion of improvements in metallurgical processes.

Advanced technologies for emissions control have been disregarded. The officially reported emissions can therefore be expected to be lower than the estimates in countries that have been applying control measures, such as flue-gas desulphurization, during the last decade. Since countries' official figures are often revised, and even considerably, they

## Forest damage 8

Latest European survey shows marked increase in defoliation for broadleaved trees, but little or no change for conifers. Younger stands are becoming increasingly affected.

## UK flora 10

Evidence of the effects of acid rain on British flora is increasing. The leading plant conservation body has presented a review of past and present damage.

## Emissions trading (1) 11

Since it has several advantages over other methods of attaining environmental standards, trading is attractive to policy makers, and even environmentalists are tending to support it.

## Emission trading (2) 13

Now that more hope is being placed on the market-based approach, it will nevertheless be important to identify its inherent shortcomings before it becomes a Magna Charter of emission control.

## Motorways opposed 14

All over Europe people have been staging protests against schemes for motorways. Attention has been directed particularly to the proposals for roads through the Alps and the Pyrenees, as well as the Scan Link with a bridge over Öresund.

## Emissions report 16

Every year the EMEP presents information on transports, concentrations, and depositions of sulphur and nitrogen, as well as on emissions. Tables show latest data.

## Transatlantic transports 18

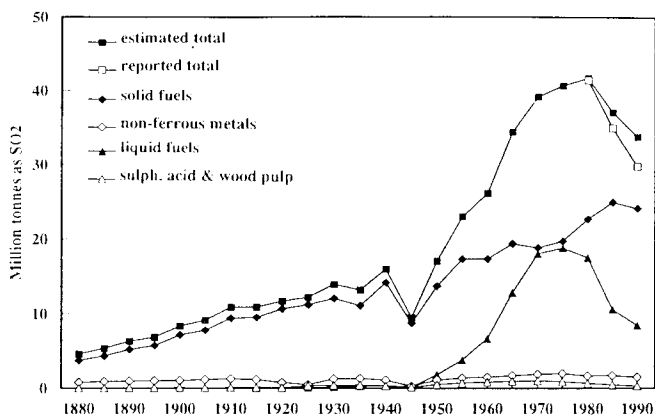
Several European countries hold that a considerable part of the sulphur deposited over Europe comes from the other side of the Atlantic, quoting evidence.

## European environment 19

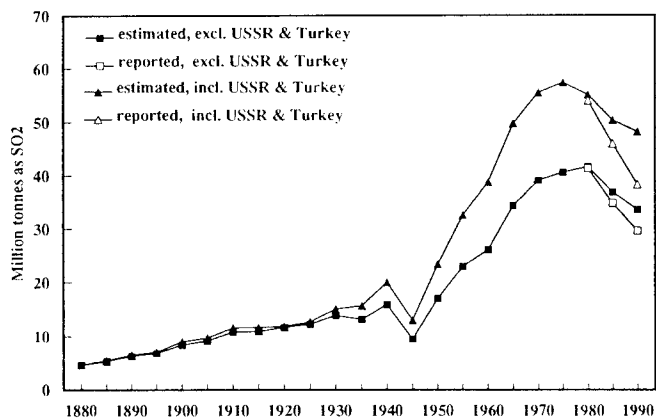
Last April environmental ministers from Western and Eastern Europe endorsed an action program for Central and Eastern Europe, calling for strict application of environmentally sound standards.

## Profitable polluter 20

Norilsk Nickel in northern Siberia, the world's largest producer, also has the world's richest ore and that containing the most sulphur, with commensurate pollution problems.



**Figure 3.** Historical emissions of sulphur dioxide in Europe. Reported total refers to emission figures submitted officially by European countries to UN-ECE/EMEP. Those from USSR and Turkey have here been excluded.



**Figure 4.** Contribution of emissions from USSR and Turkey to the total of European emissions. Reported total refers to emissions submitted officially by European countries to UN ECE/EMEP.

should perhaps be regarded with some scepticism.

Included in the report are charts showing the historical trends of SO<sub>2</sub> emissions for each country. The historical trends for the whole of Europe can be seen from Figures 3 and 4. The contributions of the former USSR and Turkey to the emissions total are excluded from Figure 3, because in these cases the calculated emissions refer to the whole country, whereas the reported emissions concern only those parts covered by the EMEP area for calculation, which are the European ones.

In the case of most countries the relation between the estimated and the reported emissions for 1980 is remarkably good. After that, the estimated emissions are, as already explained, in general higher than the reported ones. During the eighties most countries had, with the exception of some in eastern and southeastern Europe, substantially reduced their emissions.

Over the years the spatial pattern of distribution of European emissions has shown a progressive shift away from the coalfields to oil-refining areas and places that attract transportation. Extending it, too, are significant contributions from new sources in the north, east, and south, away from the traditional core regions of western and central Europe.

In 1880 the maximum concentrations of SO<sub>2</sub> (4-7 micrograms of sulphur per cubic metre,  $\mu\text{g (s)}/\text{m}^3$ ) were confined to the English Midlands, and only moved over to the western and central parts of the continent in the early twentieth century. Since the 1950s they are found in the region comprising South Saxony and North Bohemia, where they are reach-

ing values as high as 25-40  $\mu\text{g (s)}/\text{m}^3$ .

The maximum depositions have likewise shifted gradually from northwestern Europe to the border area between Germany, the Czech and Slovak republics, and Poland,

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*During the eighties  
most countries had  
reduced their emissions*

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where they have increased from approximately 2 grams of sulphur per square metre ( $\text{g}/\text{m}^2$ ) in 1880 to about 12 grams in 1991. As can be seen from Figure 1, in the most exposed regions the accumulated depositions amounted, over the period from 1880-1991, to more than 600  $\text{g}/\text{m}^2$ .

An attempt has been made in the study to compare the depositions with the 5-percentile critical load (the maximum deposition than an ecosystem can tolerate if 95 per cent of it is to be protected). From Figure 2 can be seen the decade in which the critical load in any EMEP grid-square

was exceeded for the first time. It appears that even before 1880 the critical loads were being exceeded in a greater part of Germany, in Britain, Norway, the Netherlands, and southwestern Sweden. This coincides with the high degree of damage to soils, forests, and waters that has been detected in those places.

The historical trends in the atmospheric concentrations and depositions of sulphur can also be presented in the form of time series for each EMEP grid-square. From examination of a grid-square for South Sweden, for instance, it appears that a dramatic increase in the total deposition occurred between 1950 and 1970, finally reaching a peak value of more than 1.5  $\text{g}/\text{m}^2$ . Although by 1990 the deposition had dropped back to the 1950 level, it still exceeds the 5-percentile critical load by more than four times.

CHRISTER ÅGREN

**Trends of sulphur dioxide emissions, air concentrations and depositions of sulphur in Europe since 1880.** EMEP/MSC-W Report 2/93. By Sophia Mylona. Obtainable from the Norwegian Meteorological Institute, P.O. Box 43-Blindern, N-0313 Oslo 3, Norway.

### Taking them seriously

From a poll of 213 power companies in Canada and the United States, it came out that fifty-three were engaged in the development of electric cars, and that twenty-two were allocating \$100,000 or more to such projects. Although there were obviously great differences in the extent and seriousness of the companies' engagement, from the answers to the inquiry it appeared that there could be no doubt about the intention of many of them to intensify their efforts in the

direction of electric cars during the next two years.

Source: *Trafik och miljö*, newsletter.

### Steering into trouble

Crossing the street in Guangzhou is becoming impossible, and Beijing will soon be equally congested. Yet the Chinese government has just announced that the centrepiece of its next round of industrialization will be, just - car plants.

Rocky Mountain Institute Newsletter, Spring 1993.

# Getting them off the streets

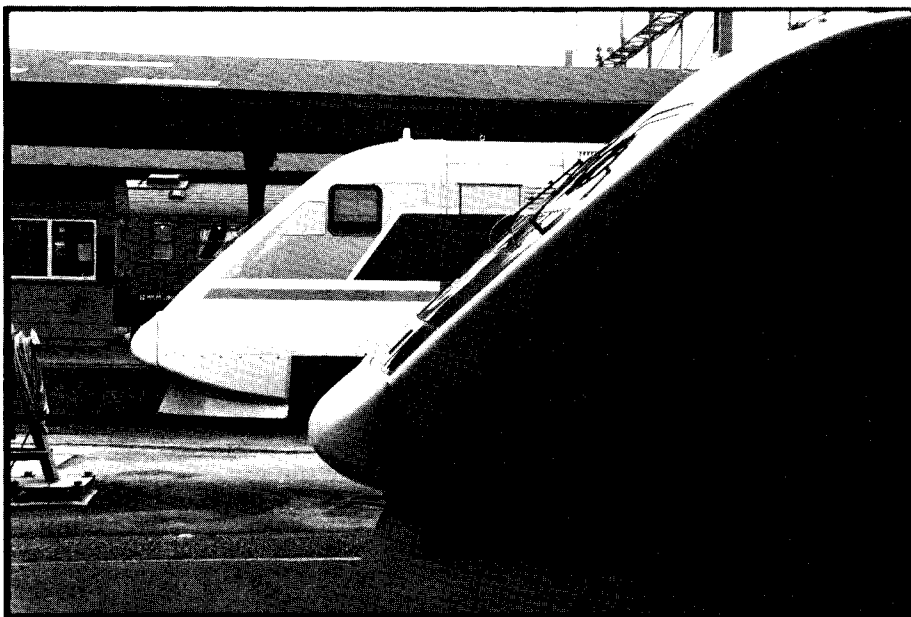
IN ORDER TO SPARE the city as much as possible from the evil-smelling fumes of Trabant and Wartburg cars, the Budapest municipal council has decreed that owners who hand them in for scrapping can have free rides on the public transportation system.

Those who give up their Trabants will get free transportation for two years. For a Wartburg it will be three years. There are still more than 120,000 cars of these two makes spreading their stench over the city. The move is part of a project costing about \$24 million which aims at re-

ducing the prices of new cars and providing interest-free loans for all who decide to replace their old two-stroke junk-heaps with "real" cars.

Another project will involve replacing a third of the existing buses in the public system with new ones, and fitting many of the remainder with new engines, all at a cost of \$196.5 million. Two-thirds of the financing will be provided by the EBRD and the World Bank, the rest coming from municipal funds.

Source: **24 Hours** (Bulgaria), July 24, 1993.



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## CHEAPER FARES

# Better than fast trains

HALVING THE FARES and doubling the schedules would be a better way of getting people to use the trains than the present one of investing in fast intercity services, according to the transportation economist Jan Owen Jansson, writing in *Transportforskningsnytt*, published by Transportforskningsberedningen.

In Sweden the government is now investing large sums in adapting the tracks to superfast trains. But Jansson believes people would prefer lower fares to shorter travel times. He maintains that halving ticket prices would have a three times greater effect on travel demand than

a halving of the time for a journey. Halving the fares and so doubling the number of passengers would cost only half the amount that the fast train service will need in annual subsidy.

It would, according to Jansson, have an upward spiralling effect, with more trains and better service. The transfer of passengers from other modes to the railways would be much greater than that which has so far been achieved through a concentration on fast trains, and the environmental gains would be considerable.

*Transportforskningsnytt* No. 3, 1993

# Promoting energy savings

THE WORLD'S LARGEST single buyer of personal computers, the US government, is exercising its muscle power to bring about more energy-efficient equipment.

The initiative has come from the Environmental Protection Agency in response to a rapidly growing demand for personal computers. An Energy Star Computers program was presented in June 1992 and came into force just a year later. Although the scheme is voluntary, the EPA has managed to get 65 per cent of the US computer and monitor industry to join, and 90 per cent of the laser printer manufacturers. The reason for this success is almost certainly the decision of the federal government, as from October this year, only to buy computers that fulfill the Energy Star requirements.

To gain the official logo, PC units must be able automatically to "power down" when not in use. In that state the computer and monitor must consume no more than 30 watts of electricity apiece, compared with an operational consumption of about 150 watts. Similar figures are set for printers.

Powering-down can result in great saving of energy. According to EPA investigations, 30-40 per cent of all PCs are left switched on for all the 24 hours of the day, every day of the week, while on an average working day they will only be used about 20 per cent of the time.

The cost of electricity for an ordinary PC that remains switched on around the clock will come to \$184 a year, according to one manufacturer, Intel. First-generation improvements can bring the cost down to \$30 a year, while in second-generation units it may ultimately be reduced to \$3.5. The development of energy-efficient computers is being driven forward by the demand for portable machines, where there is a need to get the batteries to last as long as possible.

Source: **ENDS Report**, No. 221, June 1993.

## In favour of trains

□ From the point of view of energy efficiency, trains are immeasurably superior to all other modes of transportation. An intercity train in the United States only uses a third of the energy that an aircraft requires to carry a passenger one kilometre, and only a sixth in comparison with a passenger car with a single occupant.

□ Freight-carrying by railway is far more energy efficient than by road. Trucks (again in the United States) consume more than eight times as much energy per ton-kilometre as a freight train. In the Third World, where the trucks are usually ancient and inefficient, freight carrying by road uses 1.5 to 2.5 times as much energy as it does in developed countries.

□ Railways "eat up" land far less than roads and airports. A double-track railway can transport the same number of passengers per hour as a sixteen-lane motorway. The railway only needs a 15-metre-wide strip of land, compared with one 122 metres wide for a motorway with the same capacity.

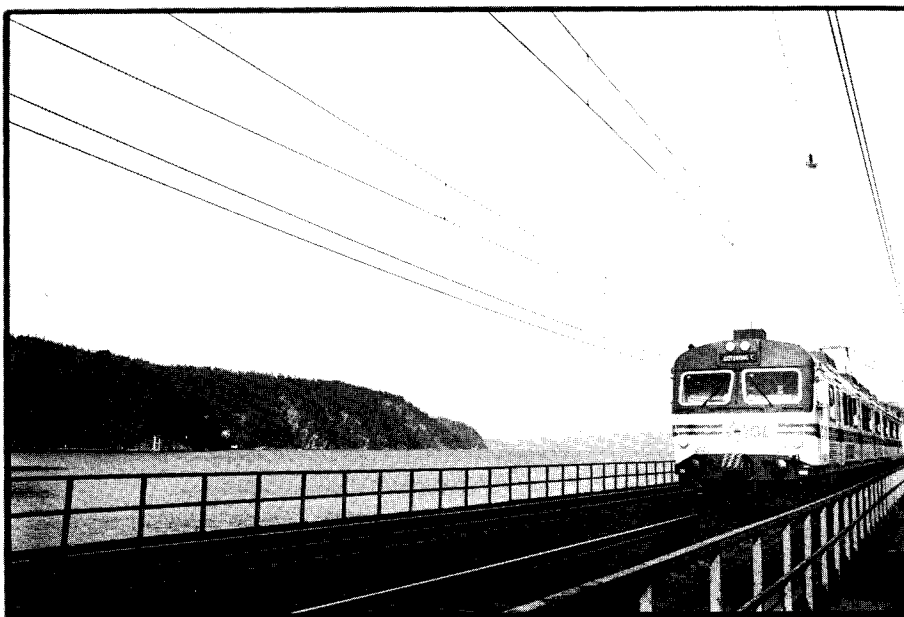
□ Airports and motorways have a tendency to pull development out from towns and built-up areas, thus leading to increased dependence on cars for getting about. Motorways give rise to shopping centres, motels, and lay-by restaurants. A railway station on the other hand helps to ensure the continued existence of the city centre where it is located.

□ Greater use of the railway will relieve pressure on the motorways and airports, and so save society considerable sums. In the United States alone, delays on account of congested airports and air corridors are costing business passengers and the airlines at least \$5 billion a year.

□ Railways make far less noise than airports and motorways. The noise from aircraft can cause discomfort as much as sixty kilometres away from an airport. Compared with a motorway, the noise from a railway is on an average only half to three-quarters as disturbing – assuming equality in the amount of freight, number of passengers, and speed.

□ The railway meets the need for those without cars. Few people in the Third World, for instance, can afford a car. In Peru there is one car for fifty-five inhabitants, in India it is one for 367. Even in the US, the home of the motorcar, there are almost ten million families without one.

Worldwatch Institute  
The State of the World 1993.



© SVEN ÅNGERMARK

## The various modes compared

IN A STUDY recently made in Sweden to compare the various modes of transportation in regard to energy use and emissions, railways came out best in all categories.

For intercity passenger traffic, aircraft are shown to be worst, both as regards energy use and emissions. Flying takes 7 to 8 times as much energy per passenger-kilometre as the modern fast train. Although buses can compete almost equally with the train in energy efficiency, their total of emissions is much greater.

Car travel falls somewhere between trains/buses and aircraft in energy consumption, but in respect of nitrogen oxide emissions, catalyzer cars are better than both buses and aircraft. On longer hauls the energy consumption per passenger-kilometre of aircraft actually increases – on account of the extra weight of fuel that has to be carried.

In local travel, cars are the least efficient users of energy, commuter trains being far and away the best – again reckoned per passenger-kilometre. Cars also cause more air pollution than trains, even assuming that all were fitted with catalyzers and the electricity for the trains was generated in condensing plants fired with fossil fuel.

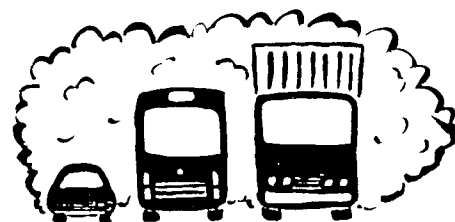
For freight carrying, ships and railways are best, per ton-kilometre,

both as regards emissions and energy consumption. In long-haul traffic, trucks are many times worse in both respects – though not nearly as bad as aircraft.

"These findings only go to confirm our view that investing in railways and shipping is one step on the way towards a society that practises economy in the use of resources. Such investments have moreover the best prospects of being profitable. There can be no doubt, either, that the current urge to expand the road infrastructure is contrary to sound environmental policy," comments Ulf von Sydow, chairman of the Swedish Society for Nature Conservation, in presenting the study.

PER ELVINGSON

**Energiförbrukning och avgasemission för olika transporttyper.** Magnus Lenner. VTI meddelande nr 718, 1993. Commissioned by the Swedish Society for Nature Conservation. Swedish, with English summary. Can be ordered from the Swedish Road and Traffic Research Institute (VTI), S-581 01 Linköping, Sweden.



## Solution in sight

IT IS WELL KNOWN that catalyzers have no cleaning effect on the exhaust gases as long as the converter remains cold (see AN 3/93, pp 16-17). When the more severe requirements in regard to exhaust emissions come into force later in the present decade, some method of heating the catalyst will have to be found.

A way of warming the catalyzer quickly to working temperature has however recently been developed by researchers at the University of Cambridge, England, and the Ford Motor Company. When the car engine is started, an electric pump draws fresh

air into the catalyst chamber, where a pair of spark plugs ignite the incoming fuel-rich exhaust mixture. This heats up the catalyst so that it can start to clean the exhaust gases immediately. Then, soon afterwards, the pump turns off.

The system is still being tested. The electricity consumption is however far less than it would be with electric preheating of the catalyzer. The extra cost of building the system into the car is said to be tens, rather than hundreds, of dollars.

Source: *New Scientist*, July 10, 1993.

### URBAN SPREAD

## Effects scrutinized

PEOPLE IN AMERICAN CITIES use about five times as much petrol for getting about as their counterparts in Europe. The reason is not only that cars are more numerous and bigger in the United States, that petrol is cheaper, and public transportation poorer than in Europe. There is also a more complex and fundamental reason for the disparity: the way cities have developed.

Typical of American cities is their wide-spreading suburbs, in contrast to the older European cities, which are usually more compact. The population density of American cities is

only about a third of that in Europe, and there is an obvious relationship between urban spread and a high consumption of motor fuel. A better control of expansion could lead to considerable savings in energy. Applied to British circumstances, it has been estimated that with proper town planning the emissions of carbon dioxide from the traffic sector could be reduced by 16 per cent within twenty years – according to a study carried out by Ecotech consultants for the British government.

Source: *New Scientist*, July 24, 1993.

### TRANSFORMERS

## Unnecessary losses

EUROPE COULD SAVE large amounts of energy by replacing its inefficient silicon-steel transformers with amorphous metal core types. With a current electricity generation of 2526 TWh per year, the distribution transformer core losses could be reduced by 32 TWh through the use of amorphous core transformers. The annual saving would be equivalent to 7370 tons of oil, or – assuming coal-based generation – 683,000 tons of sulphur dioxide and 27 million tons of carbon dioxide.

Although the amorphous core technology has been applied in the United States for more than a decade, it has as yet made little mark in Europe. An increased interest can however now be noted in several countries, and the EU recently awarded a grant to the Wolfson Centre of Cardiff University, Wales, for developing amorphous technology for the electricity distribution in Europe.

Source: *Energy Report*, May 1993.

### AIR TRAVEL

## Dutch study exposes considerable subsidizing

AN INDIVIDUAL travelling by air uses five times as much energy and causes twenty times as much air pollution as he would if he took the train. Yet, despite its damaging effect on the environment, civil aviation is in effect highly subsidized – through the fiscal benefits it enjoys.

In a study\* conducted by the Institute for Research on Public Expenditure on behalf of the Netherlands Society for Nature and Environment (Stichting Natuur en Milieu), the costs of the external effects of civil aviation, by way of damage to health and the environment, were left unconsidered, on account of the difficulty of assessing them. The fiscal benefits are in any case considerable, including exemption from value-added tax, the absence of excise duty and environmental levies on aviation fuel, and duty-free sales at airports and onboard aircraft.

The revenue that would accrue if all these benefits were abolished for flights between the Netherlands and EC countries would, according to the study, amount to 350-400 million guilders. If taxes were applied consistently for all flights to and from the Netherlands, the result would be an increase in income for the Dutch state of more than 2.3 billion guilders a year.

The Stichting Natuur en Milieu considers it undesirable to continue favouring civil aviation as at present, and urges the imposition of an excise duty on aviation fuel and a value-added tax on air-line tickets as a matter of utmost priority for the European Community.

\* **Public financial support to civil aviation. The Dutch situation.** The full study is in Dutch, but a 20-page summary is available in English, price 10 guilders. Both can be ordered from the Instituut voor Onderzoek van Overheidsuitgaven, Oranjestraat 8, NL-2514 JB Den Haag, The Netherlands.

# Younger stands now affected

A CONTINUED INCREASE in the damage to Europe's forests is what can be read from the last annual report of the International Co-operative Programme on the Assessment and Monitoring of Air Pollution Effects on Forests, the seventh in line.

The assessments are the results of national surveys, carried out in accordance with a common methodology, which are coordinated through the International Programme, now for the last two years together with the Commission for the European Communities. The method involves surveying a number of random plots as well as the permanent ones where the state of so-called common sample trees is noted from year to year. The 1992 survey covered more than 184 million hectares, representing about 80 per cent of the total forested area of Europe.

Sample trees are assessed for damage in accordance with the following five-class system:

Class 0	0-10% defoliation	none
Class 1	11-25% "	slight
Class 2	25-60% "	moderate
Class 3	60%-- "	severe
Class 4	100% "	dead

The intensity of defoliation is employed as a means of showing the trees' general state of health. Class 1 defoliation is regarded more as an early warning stage than an indication of reduced vitality. The extent of defoliation in the ranges moder-

ate to severe (Classes 2-4) can be seen from the table and map opposite.

In 1992, 22.2 per cent of all the broadleaved species fell into Classes 2-4, while for conifers it was 24.3 per cent. That means a marked increase in defoliation for broadleaved trees, but little or no change for conifers, in comparison with the previous year. Direct comparison is however difficult, since the size of the area that was surveyed had changed.

The results of studying the permanent sample plots nevertheless point in the same direction. In the subsample of common trees, covering the period from 1988 to 1992, 31,500 trees, eleven out of twelve species analyzed, showed a more or less obvious increase in the proportion of damaged trees. See chart below.

When seen over the whole period of the surveys, from 1986 to 1992, the results reveal great variations from one year to another (see table). This is as might be expected, since the various factors affecting the vitality of the trees – drought, wind, frost, air pollution, etc. – will also vary greatly. In general it can be said that aged trees and trees standing on high ground will be the worst affected. But it seems from recent studies that considerable defoliation is increasingly occurring in younger stands as well.

It should also be borne in mind that an average figure for a whole

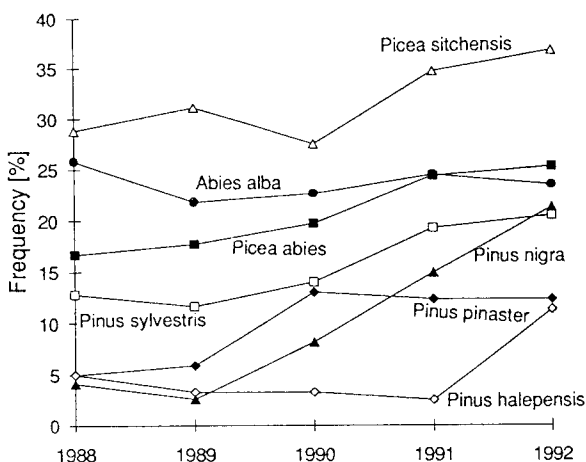
country may, for instance, conceal severe damage in the mountain regions, while the lowland forests are still in good shape. Several thousand hectares of forest on mountain tops in the Czech and Slovak Republics, Germany, and Poland are among the worst affected.

The difficulty of drawing any conclusions as to the causes of damage from the present surveying method is noted in the Programme report. Everything points however to air pollution as a contributing factor in those countries where the critical loads for many pollutants are being markedly exceeded. Cause-effect relationships are in any case now to be investigated through long-term observations and ecosystem analyses on permanent plots. A coordinated program for soil analysis has been started in several countries, and the first results will be available 1995.

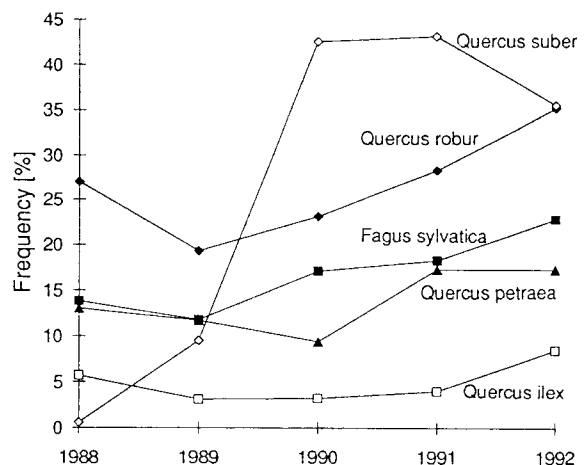
PER ELVINGSON

**Forest Condition in Europe.** Annual report of the forest-damage survey in Europe, prepared by the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests within the UN-ECE Convention on Long Range Transboundary Air Pollution, in cooperation with the Commission of European Communities. See also **Forest damage in Europe**, Environmental fact-sheet No. 1, available on request from the secretariat.

**Figure 1. Changes in defoliation for coniferous trees (defoliation classes 2-4) common to 1988-1992**

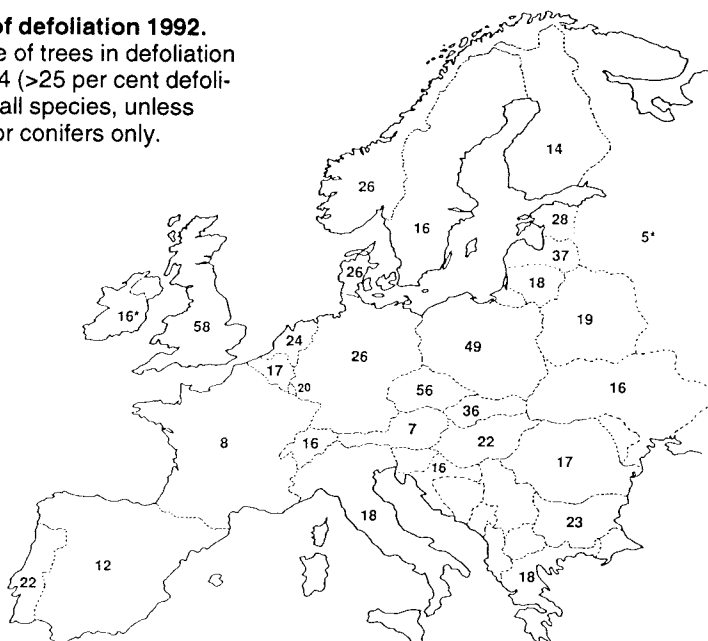


**Figure 2. Changes in defoliation for broadleaved trees (defoliation classes 2-4) common to 1988-1992.**





**Intensity of defoliation 1992.**  
Percentage of trees in defoliation  
Classes 2-4 (>25 per cent defoli-  
ation). For all species, unless  
marked \* for conifers only.



**Table 2. Results from forest-damage surveys 1986-1992. Percentage of trees in Classes 2-4 (defoliation >25 per cent). All species.**

	1986	1987	1988	1989	1990	1991	1992
Austria	4.6	3.6	3.6	4.4	9.1	7.5	6.9
Belgium						17.9	16.9
- Wallonia	-	9.0*	11.0*	16.6	19.1		
- Flanders	-	12.5	10.4	11.6	8.3		
Bulgaria	8.1	3.6	7.4	24.9	29.1	21.8	23.1
Byelorussia	-	-	-	67.2 <sup>R</sup>	54.0	-	19.2
Croatia	-	-	-	-	-	-	15.6
Czechoslovakia	16.4	15.6*	27.4	33.0	46.6	41.3	
Czech Republic						49.2*	56.4
Denmark	-	23.0	18.0	26.0	21.2	29.9	25.9
Estonia	-	-	9.0 <sup>R</sup>	28.5*	20.0*	28.0*	28.5
Finland	8.7*	12.1	16.1	18.0	17.3	16.0	14.5
France	8.3	9.7 <sup>R</sup>	6.9	5.6	7.3	7.1	8.0
Germany						25.2	26.0
- former East	-	-	13.8	16.4	35.9		
- former West	18.9	17.3	14.9	15.9	15.9		
Greece	-	-	17.0	12.0	17.5	16.9	18.1
Hungary	12.0	6.0 <sup>R</sup>	7.5	12.7	21.7	19.6	21.5
Ireland	-	0.0*	4.8* <sup>1</sup>	13.2*	5.4*	15.0*	15.7*
Italy	1.0 <sup>2</sup>	-	-	9.1 <sup>1</sup>	14.8	16.4	18.2
Latvia	-	-	-	-	36.0	-	37.0
Lithuania	-	-	3.0 <sup>R</sup>	21.5	20.4	23.9	17.5
Liechtenstein	19.0	19.0	17.0	11.8	7.1*	19.0	16.0
Luxembourg	4.9	7.9	10.3	12.3	-	20.8	20.4
Netherlands	23.4	21.4	18.3	16.1	17.8	17.2	24.5
Norway	12.0* <sup>2</sup>	17.8* <sup>R</sup>	20.8*	14.8*	17.2	19.7	26.2
Poland	4.6	-	20.4	31.9	38.4	45.0	48.8
Portugal	-	-	1.3	9.1	30.7	29.6	22.5
Romania	-	-	-	-	-	9.7	16.7
Russia	-	-	-	-	-	26.0*	5.2*
Slovak Republic							36.0
Slovenia	-	-	-	22.6	18.2	15.9	-
Spain	13.4	12.6 <sup>R</sup>	7.0	3.3	3.8	7.3	12.3
Sweden	2.1	5.6*	10.6	12.9*	16.2	12.0	16.5
Switzerland	13.0	15.0	12.0	12.0	17.0	19.0	15.7
Ukraine	-	-	-	1.4 <sup>R</sup>	6.4	-	16.3
United Kingdom	-	22.0	25.0	28.0	39.0	56.7	58.3
Yugoslavia <sup>3</sup>	23.0*	9.5	10.0 <sup>R</sup>	-	-	9.8	-

\* Conifers only. <sup>R</sup> Regional survey. <sup>1</sup> Only trees <60 years assessed.

<sup>2</sup> 1985 survey <sup>3</sup> Former Yugoslavia; Croatia and Slovenia excluded from 1991 results.

## Affected after all?

It has usually been assumed that, unlike lakes and streams, marine ecosystems are unaffected by acidification. In an article in the Swedish scientific journal *Ambio*, however, it is suggested that this may not be the case.

According to the article, recent marine-biological and marine-chemical research has shown that several trace metals, among them iron, zinc, cobalt, and manganese, can occur in such low concentrations in seawater that their availability limits the growth of phytoplankton in a species-specific way.

It has long been known that the mobility of many metals will increase in an acid environment. In the streams of western Sweden that run into the Skagerack, Kattegat, and Öresund, a clear relation can be found between low pH values and high concentrations of the trace metal cobalt. The question is whether the acidification of soil and water on the land side can lead to a change in the marine ecosystems.

*Ambio* No. 5, August 1993. **Acidification of surface waters in Sweden - effects and counteracting measures.** Published by the Royal Swedish Academy of Sciences, Box 50005, S-104 05 Stockholm, Sweden.

## More miscarriages

The number of miscarriages and children born with deformities or abnormally low weight is increasing in areas with heavily polluted air, according to a study of 18,600 pregnancies and births that has recently been carried out in the coal-mining district of Bohemia, Czech Republic. The results were presented at a conference on the effects of environmental factors on health that was arranged by the Swedish Institute of Environmental Medicine last August.

Source: *Svenska Dagbladet*, August 18, 1993.

## Windpower for India

This summer the World Bank entered on its first project for the installation of windpower by contributing to the financing of 85 megawatts in India. The move is especially important, since the World Bank is in a position of bellwether for other banks' lending. If the Indian project is successful, money will be forthcoming for further development there, as well as for financing similar projects in other countries.

India already has 50 MW of windpower in operation or in process of being installed. The amount scheduled in the country's current five year plan has recently been raised from 100 to 500 MW.

Source: *Miljöaktuellt*, November 4, 1993.

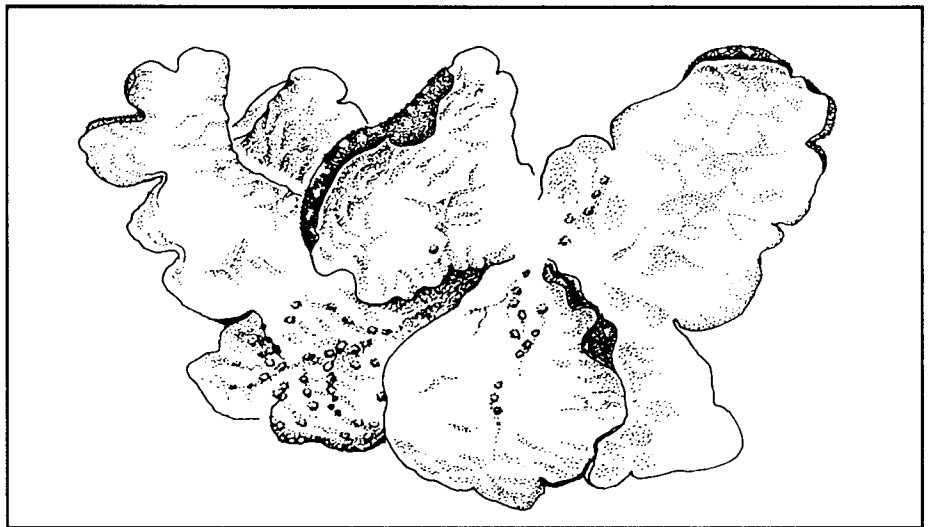
# Threat from acidification

IN THE PAST TEN YEARS, evidence of the effects of acid rain on the British flora has been increasing. (Acid rain here includes the dry and wet deposition of sulphur and nitrogen as well as gaseous acid pollution.) With this in mind, Plantlife – Britain's leading campaigning organization for wild plant conservation – decided to commission a review\* of past and present damage to the UK flora from acid rain, combined with some assessment of the likely future threats. From this, they intend to construct, with other nature conservation and environmentalist bodies in the UK, a strategy to protect Britain's precious (and shrinking) natural and semi-natural habitats from the insidious effects of acid pollution.

Acid pollution is not a new phenomenon in Britain. Problems with coal smoke date back to the 17th century, and the last two centuries of industrialization have seen potent effects on Britain's flora – especially upwind of northern conurbations such as Manchester and Liverpool. A review of current evidence suggests that, in the past one hundred years, *at least* a hundred plants (mainly lichens and mosses) have suffered serious population declines or population extinctions as a result of acid rain.

Increasing acidity and nitrogen in the UK environment has however also caused a number of species to be favoured, having either increased in their overall distribution (as in the case of acid-loving epiphytic mosses and lichens) or in their domination of certain communities (as for example competitive higher plants such as stinging nettle, *Urtica dioica*, and heath false brome, *Brachypodium pinnatum* – both of which are encouraged by excess nitrogen deposition). In general, though, it is common rather than rare species that have "benefited" in this way.

Experimental and field studies have shown, too, that many British wild plants are sensitive to acid rain (in its broadest sense). Over twenty of such potentially threatened species were found to be listed as endangered in the UK and Ireland. These included species of fungi, mosses,



*Lobaria scrobiculata* – one of the lungwort lichens. Now becoming confined to the far corners of Britain where air and rain are pure enough for it to survive.

lichens, charophytes, liverworts, and higher plants. Some of these "at risk" species were, moreover, also found to be on international preservation schedules such as the IUCN Plant Red Data Book, plus the EC Species and Habitats Directive and the Berne Convention. Such species included

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*Broader debate must  
take place as a  
matter of urgency*

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the fungi *Lactarius mairei* and *Sarcodon imbricatus* (the scaly tooth fungus), *Sphagnum* mosses and the slender naiad (*Najas flexilis*). A further number of "at risk" species were also found to be endemic to Europe. Given the scale of the acidification problem in Europe, this obviously is a matter for some concern – although it should be emphasized that there is at present little evidence of wide-scale decline in any of these species.

Work in the UK by the main nature conservation agencies (see Acid News 4/93, p. 8) has also shown the degree of the threat from acidification of soil and water to Britain's network of nature reserves. As most plants are highly dependent on these media, this does not augur well for the future of UK's natural heritage – unless, of course, strin-

gent emission controls are put into place as a matter of urgency. Such controls would, if Britain's native flora is not to be further eroded, have to go beyond the targets now being offered by the British government at the talks on an SO<sub>2</sub> protocol in Geneva.

Plantlife, together with the concerned organizations, is keen to hammer home this message to the UK government. But that is not all. Plantlife is also determined to deal with the problem of the effects of acid rain in context with other threats to the British flora, such as global warming (the subject of another Plantlife report, *Death Knell for Bluebells?*) and loss of habitat. This will require a much broader debate within UK conservation circles. But if Plantlife's long-term goal of protecting and restoring British plant biodiversity from the effects of acid rain is to be realized, such debate must take place as a matter of urgency.

ANDREW TICKLE

Dr Tickle, formerly a senior researcher with Earth Resources Research, lectures in environmental management at Middlesex University, London.

\* **The Acid Rain Test for Plants** (commissioned from Earth Resources Research) is available from Plantlife, The Natural History Museum, Cromwell Road, London, England SW7 5BD. Price £2.50. Published with financial help from the Swedish NGO Secretariat on Acid Rain.

# Theoretical advantages

AT A TIME WHEN THE CLINTON administration in the US is having so much trouble in pushing through its energy tax, another major environmental initiative, utilizing market mechanisms, has recently been adopted with relatively little opposition.

Under the sulphur-dioxide trading program, the Environmental Protection Agency has allocated permits to existing electricity utilities, at no cost but based on new, substantially reduced, emission limits. Each permit allows the holder to emit one US ton of SO<sub>2</sub> in a designated year or any year thereafter. The allowance must not be exceeded, but if a utility reduces its emission sufficiently, it is free to sell any excess allocation on the open market.

The trading system is attractive to policy makers, since it has several theoretical advantages over other methods of attaining environmental standards, such as taxes and command-and-control measures.

Firstly, the market price of the permits will reflect, to a large extent, the costs of emission abatement and will provide a price signal for other potential emission sources and for regulators. In theory, sources will purchase permits up to the point where the unit permit price equals the marginal cost of emission control. This "internalization" of emission costs should therefore lead to business decisions based on environmental as well as economic considerations.

Secondly, by giving emitters with different cost bases the opportunity to trade in permits, it minimizes the total cost of emission abatement. It allows those sources with high abatement costs to emit beyond their allocation providing they are able to purchase permits from sources that emit below their allocation. In addition, the allocation of permits over a predefined period of time provides polluters with greater certainty in their long-run strategies for pollution abatement.

Thirdly, the system should also produce lower administration costs,

since once the permits are allocated, a permit market can be expected to develop independently of the regulators. The environmental standards can then be modified relatively simply by the release of further permits, if the standard is to be relaxed, or by the regulator's purchase or withdrawal of permits if the standards are to be tightened.

After the initial allocation of SO<sub>2</sub> permits to existing sources, new utilities that wish to enter the market for electricity supply must purchase the number of permits that will equate to their forecast emissions.

*Trading in emissions allowances for sulphur dioxide has now got off to a start in the United States. The idea with tradeable permits is that instead of setting requirements for individual plants, the authorities can allocate a number of allowances to emit, which can subsequently be bought and sold in a free market. The advantages and disadvantages of such a system, both from the economic and ecological point of view, are discussed in this and the following article.*

Although it may be felt that this protects existing companies, the environmental rationale suggests that new companies should only be allowed to enter the market if they displace existing sources of emissions and therefore do not add to total net emissions. The new entrants will have the advantage over existing companies of access to the most up-to-date emission-control technology at the time of their starting up. Therefore, since the permits reflect environmental costs (in this case emission-abatement costs), new plants can make an informed business decision, incorporating these environmental costs into the decision-making process.

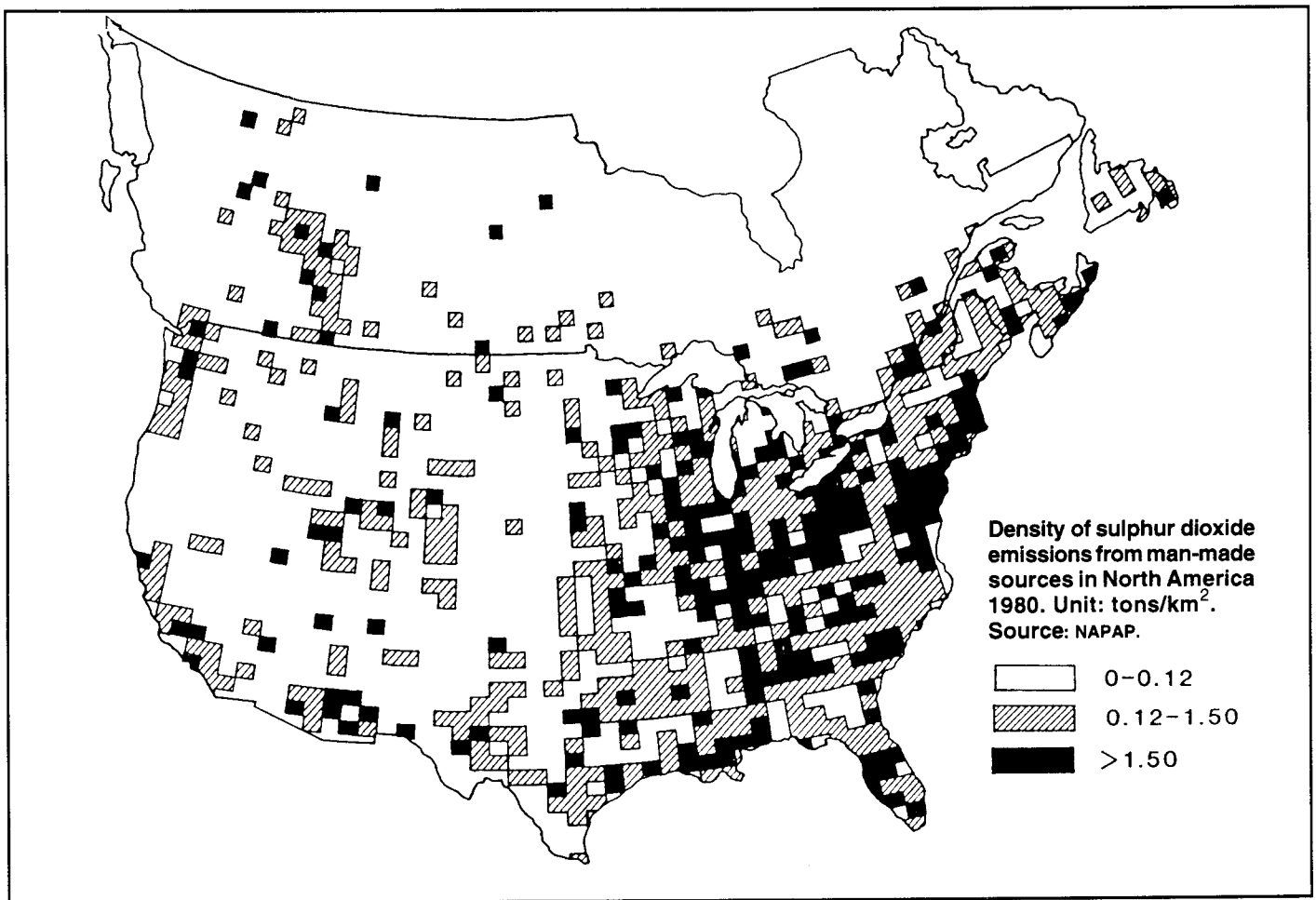
The existing utilities are faced with a number of choices for meeting their reduced emissions allocation. They may use cleaner fuels to reduce

emissions at the source, they may utilize end-of-pipe treatment technologies, or they may purchase additional permits on the open market. Moreover some states already provide incentives for utilities to develop energy-efficiency programs, and it is possible that these schemes could be extended to include the allocation of bonus permits to utilities taking part in such programs. The use of renewable energy to replace traditional energy sources would also be encouraged by the release of bonus permits. These bonus permits could of course be sold on the open market to generate revenue.

When a plant shuts down, its stock of permits becomes non-transferable and is effectively retired. However, there are special provisions for companies that replace an older plant with a newer, less polluting, plant. In this case, the company may be allocated one permit for every two permits held for the old plant. Such "offsetting" will have to be very tightly controlled by the regulators.

One of the main objections voiced by critics of the program is the difficulty of incorporating local environmental considerations into a national permitting scheme. Some areas are more vulnerable to acid deposition than others, and the SO<sub>2</sub> program has no mechanism for reflecting local variations in environmental quality in the price of the permits. Therefore a permit will have the same price in an area which suffers from heavy acid deposition as it has in an area that incurs insignificant deposition, despite the obvious difference between the two areas in the environmental costs of emissions. Although state authorities do have recourse to the National Ambient Air Quality Standards (NAAQS), which provide for additional measures in areas of relatively poor environmental quality (non-attainment areas), it is uncertain how such programs will be integrated with the national trading program.

It will also be interesting to see how the program is viewed by the



governments of neighbouring countries. Canada, in particular, has long been concerned about SO<sub>2</sub> emissions from the United States. When the trading system is fully functioning, there would be nothing to stop a provincial government in Canada from buying up permits and then retiring them to prevent US utilities from acquiring them.

It is not only the Canadian provincial governments that may wish to become involved in the program. As the Canadian national grid is integrated with the US national grid, an increase in Canadian demand for power from the US grid can only be met if the US utilities are producing at below their maximum allowable SO<sub>2</sub> quota. The Canadian utilities may, therefore, wish to hold a stock of permits which could be exchanged for power supply at those times when US utilities are at the limit of their SO<sub>2</sub> allocation.

Environmentalists have traditionally mistrusted emissions permits, which they see as giving emitters a right to pollute. This is however equally true of traditional regulatory approaches to emission control. When an environmental standard is

established, the sources of emission are given a *de facto* right to emit up to that standard, no matter which method of control is adopted to achieve the standard. Under permit trading this right merely becomes a

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*The trading system is  
attractive to policy makers  
since it has several  
theoretical advantages*

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*de jure* right to emit. Pollution should, in theory, occur only if the ceiling is breached, which the limited number of permits should prevent.

Environmentalist organizations have however over time become more supportive of the trading system. Not least it provides them with a chance to directly influence ambient levels of potential pollutants. The purchase of permits effectively buys the right to more stringent standards, since the permits can then be retired, so preventing utilities from obtaining them.

So far, mainly due to limited purchasing power, such acquisition has been restricted to token gestures, although one large utility has donated 10,000 permits to the American Lung Association.

Interestingly, it is reported that major coal companies in the US have also been buying permits, presumably expecting them to increase in value over time and to be a desirable commodity to sell to a customer along with so many million tons of their coal.

Perhaps the most promising application of future emissions trading programs lies in the control of global pollutants such as carbon dioxide and CFCs. For equitable distribution of permits between countries, international agreements would have to be arrived at. Particularly contentious would be the allocation between developed and developing countries, which may provide negotiators with many sleepless nights.

JONATHAN SELWYN

Adapted from an article in the UK Centre for Economic and Environmental Development (CEED) Bulletin, No.43, May-June 1993.

# Possible flaws

MARCH 1993 saw the first open trading of emissions credits in the United States. This unique approach to emission reductions was authorized in 1990 amendments to the Clean Air Act, which allow the Environmental Protection Agency (EPA) to seek a market-based approach for reducing emissions of sulphur dioxide.

The auction or trading of emission credits is being conducted by the Chicago Board of Trade. In the March auction, pollution credits each worth the emission of one ton of sulphur dioxide (SO<sub>2</sub>) were traded. Prices ranged from \$131 to \$450 in the "spot market" portion of the trading, while allowances traded in the "advance" portion fetched from \$122 to \$310. Some allowances traded privately before the auction were priced between \$200 and \$250 each.

Many market analysts anticipate that prices will settle between \$150 and \$175 per allowance. At these prices utilities will benefit more than the environment until at least 2005, since it will be more economical to buy a permit than to install scrubbers or other pollution control devices. For example, the Illinois Power Company has bought enough emission credits for it to emit SO<sub>2</sub> above EPA levels through 1995. It plans to emit these high levels until the year 2000, when more stringent EPA guidelines will go into effect.

At the March auction North Carolina Light & Power was the single biggest buyer of credits, purchasing 85,103 allowances for \$11.5 million, or \$135 each. Seemingly oblivious to the role of SO<sub>2</sub> as a precursor of acid rain, the company is buying emissions credits to avoid installing scrubbers in plants that are now under construction. While many other utilities have chosen to install scrubbers, North Carolina Light plans to avoid doing so until at least the year 2005. The company opposes SO<sub>2</sub> controls, arguing that the region has no acid rain problem: the majority of its emissions blow out to sea.

To allow smaller independent power producers access to purchasing allowances, the first direct sale was held on June 1, 1993. The EPA

is also planning to expand the types of marketable pollutants to include nitrogen oxides and, possibly, other toxic compounds and emissions.

Is all this good for the environment? Economists, the EPA, and some environmentalist groups think the program will prove beneficial. Fred Krupp, director of the Environmental Defence Fund, has observed that "setting emission limits and letting the market choose how to meet them

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## *Important to identify inherent shortcomings of market-based approach*

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would guarantee results, and would do it more efficiently than requiring the government to develop detailed orders regulating myriad parts of the society." This brings up one of the major controversies surrounding emissions trading: although proponents hold that it will be beneficial to the nation as a whole, some regional groups and environmental officials are not so sure. The Attorney General and state environmental officials of New York have filed a suit against the EPA "seeking assurances that the state's acid-rain-plagued upstate regions will be protected under the program (of emissions trading)."

According to a study by the Center for Energy and the Environment at the University of Pennsylvania, imperfections in the emissions trading program will, by the year 2005, raise the costs of environmental cleanup, damage to health, and other externalities by \$3 billion over the standard command-and-control regulations. Stringent monitoring and enforcement will be necessary to ensure compliance both with federal and state programs. At present this is problematic, no matter whether the utilities are self-reporting, or there is possible installation of sophisticated equipment to monitor emission levels.

Criticisms of the free market approach to emission reductions are

easy to find and are applicable not only to the federal program but also to regional ones, such as the California South Coast Air Quality Management District's Emissions Reduction Program (SCAQMD). That program is being implemented in the Los Angeles Basin, which has the most polluted air of any metropolitan area north of Mexico City. The SCAQMD hopes to control emissions of SO<sub>2</sub>, nitrogen oxides, and reactive organics. It has issued allowances to 2800 companies in the Los Angeles area, but it is still struggling to create regulations, enforcement mechanisms, and monitoring systems to ensure compliance in what is now primarily an industry-reporting, and hence industry-regulated, emissions control scheme. The federal program is at present relying on industry reporting.

With one ton of emissions available for as little as \$135, the cost of adverse health effects, property damage, and regulation is being severely discounted. The \$21.4 million received by EPA for the 150,010 allowances that have so far been auctioned (\$143 average per allowance), has been returned to the utilities from which the allowances were taken. This money should however be used for remedying and restoration around the country, instead of being returned to the utilities that caused the damage.

European Community policy makers are considering a carbon tax to reduce emissions, and the 1992 Rio Convention on Climate Change allows for the investigation of a market-based approach for curtailing emissions. Now that more attention and hope is being placed on the market-based approach, it is important to identify its inherent shortcomings. It would be prudent to make a further study of the implementation of free-market approaches to emission control and their subsequent effects on the environment before they become a Magna Charta of emission control.

**RALPH COMBS**

Research assistant at the Pacific Environment and Resource Center, California.

# Against motorways

SIX YOUNG PEOPLE from six EC member states recently staged a seven-day fast, from September 28 to October 5, in front of the EC Commission in Brussels. They were protesting against the Commission's plan to help in the financing of 12,000 kilometres of new motorways in Europe – and particularly against one crossing the valley of the Aspe in the Pyrenees – all of which will further increase air pollution and the destruction of nature in Europe. Supporting the fasters were up to 100 members from European environmentalist NGO youth networks, such as the European Youth Forest Action, who staged simultaneous demonstrations outside the offices of various EC Commissioners, and organized press conferences and road blocks in Brussels.

Citizen groups at many places in Europe are continuing to try and stop the building of similar ambitious new road networks, such as are being heavily promoted among others by the EC Traffic Commission and industrial and road building interests, including the European Roundtable of Industrialists.

Examples of protests include that in Switzerland against the construction of new transit motorways and tunnels to Italy, one against the planned Baltic coast motorway from Germany to Poland and the Baltic States, and others against the planned trans-European north-south motorways through Hungary, the Pyhrn motorway in Austria to connect Germany with Croatia, the planned motorway through the French Jura and Massif Central, the construction (already started) of the so-called Scan-Link from Norway to Germany, as well as the above-mentioned road from France to Spain crossing the Pyrenees. In the following three of the objects of protest are described more in detail.

## Le Tunnel du Somport

The fasters in Brussels were demanding that the EC cut off subventions for the Tunnel du Somport in the valley of the Aspe in the Pyrenees, which is at present being sub-

sidized to the extent of 21 per cent of the cost. The valley is one of the last largely undisturbed parts of the French Pyrenees. It is inhabited by many species that are protected under European directives – among them being the last brown bears in France.

A small, curvy, two-lane road (RN 134) leads from Oloron through the valley over the Col du Somport (1632 m) to Canfranc in Spain. A rail line running through the valley and tunnelling the Col is still in place, although services ceased in 1970.

To facilitate the Bordeaux-Pau-Zaragoza-Valencia and Toulouse-Pau-Zaragoza-Madrid road links, in 1991 the French and the Spanish governments signed a treaty for the construction of a road tunnel under the Col du Somport. According to an official French study, the tunnel will result in an average of approximately 1000 heavy trucks passing through the valley every day. Environmentalists fear that this will require an immediate expansion of the RN 134 and, considering the local geographical characteristics as well as the ever-increasing traffic, in the near future a four-lane highway which is likely to be upgraded to a motorway.

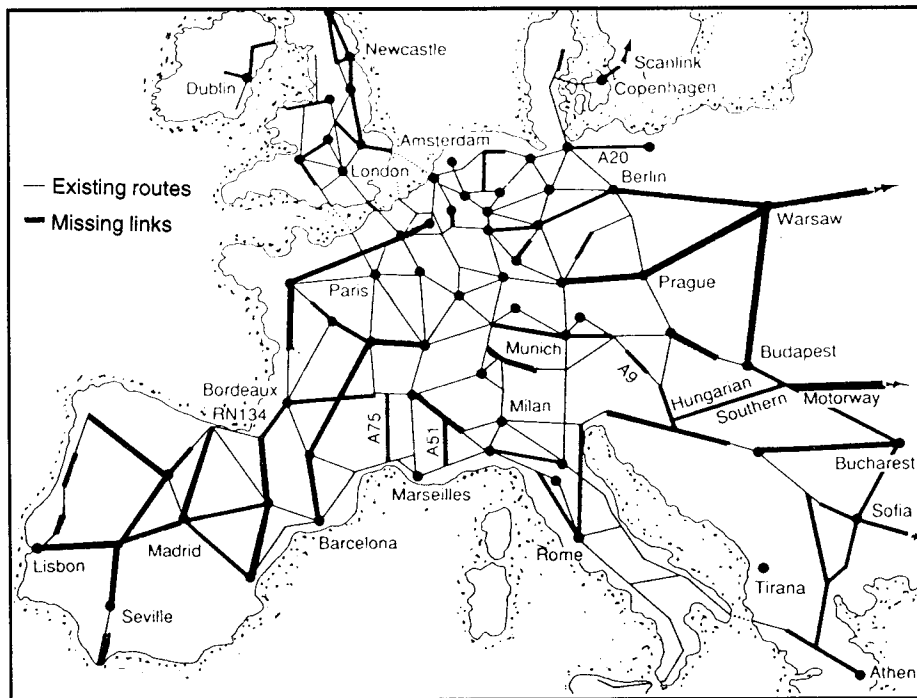
That would mean either the railway being dismantled or the Aspe river disappearing under solid concrete, if not both.

Recently a thousand people demonstrated in the town of Oloron to express their fears about the planned destruction of the nature reserve, future high levels of air pollution and unbearable noise levels.

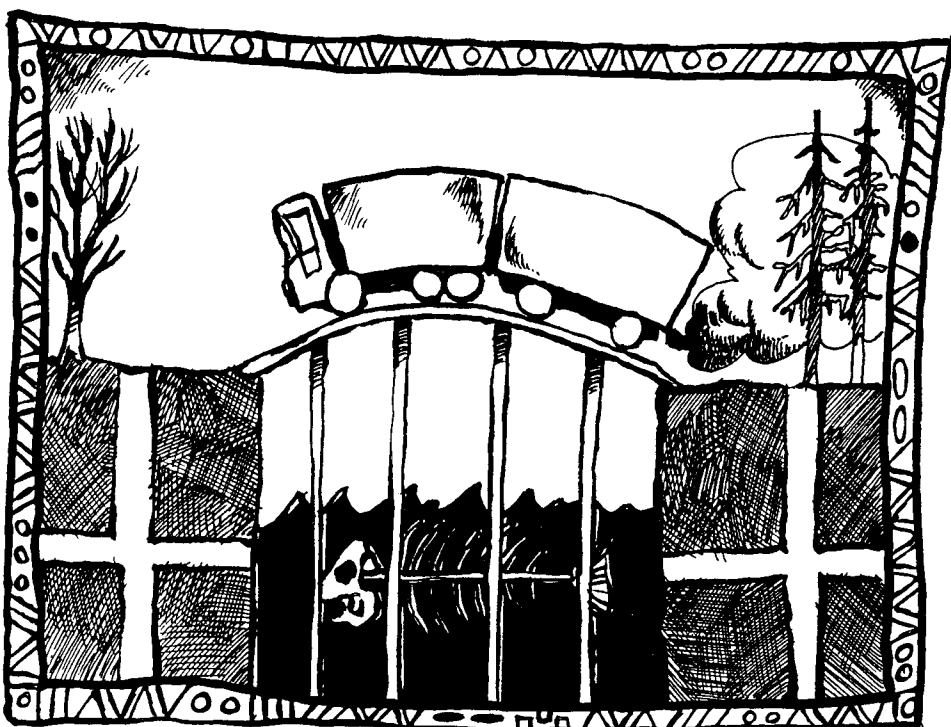
## “Alpeninitiative”

Transit traffic is welling over in sixteen passages through the Alps. It is on the increase everywhere – in Switzerland, Austria, Italy, and France. By the year 2010 the amount of freight so carried is likely to have doubled.

In Switzerland a public initiative has developed during the last few months, which aims at promoting a shift of freight traffic from the roads to the railways. In February 1994 there will be a referendum concerning a rule that all freight in transit across the Alps shall be carried by rail, and it was to this end that the *Volksinitiative zum Schutze des Alpengebietes vor dem Transitverkehr* was formed. Many public discussions and demonstrations are now taking place in Switzerland, such as that



Missing links. Citizen groups are trying to stop many of these projects, fearing they will increase air pollution and the destruction of nature in Europe.



when 3000 people demonstrated on August 14, on the Gottard mountain, against the growing *Transitlawine* through the Alps. That night some 2000 bonfires lit up the sky of the Alpine region.

### Öresund Bridge - Scan-Link

In Scandinavia the proposed construction of a bridge across the Öresund between Sweden and Denmark has become a major political issue. It will form part of the Scan-Link which was initially promoted in the eighties by the Roundtable of European Industrialists. In 1991 the Swedish and Danish governments signed an agreement to construct a road and rail bridge across the Sound. Environmentalist organizations such as Greenpeace, the Swedish Environmental Federation and the Swedish and Danish nature conservation societies are strongly opposing these plans. In this they have the support of many scientists, public organizations, and political parties.

During the last three years public organizations and politicians from the Baltic States, Poland, Germany, and Finland have also come with many strong protests. Their argument is that the Öresund is an important channel between the North Sea and the Baltic, through which salty and oxygenated water from the North Sea can pass. The Baltic Sea ecosystems are dependent on this influx for their survival. Any decrease in

salinity will mean still further stress on the Baltic ecosystems, and changes in the distribution of species.

The critics also say that the Scan-Link bridges will stimulate road traffic in the region and so increase air pollution. Government estimates forecast crossings of 8-10,000 cars per day, while other estimates range between 8000 and 27,000 a day by the year 2000.

In February 1993 Sweden's National Franchise Board for Environment Protection rejected the project on the grounds that a bridge over Öresund would increase the exhaust emissions from road traffic and impede the flow of water through the Sound. "If Sweden is to be able to fulfill the Government's many policy goals about reducing pollution, we cannot build an Öresund bridge. We cannot see how the bridge can be adapted to the environmental goals that Sweden has set itself," stated Ulf Bjällås, president of the Franchise Board. This ruling came as a surprise to the Swedish government, which is supposed to make a final decision at the end of this year.

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 Alpen-Initiative, Postfach 29, CH-3900 Brig, Switzerland

## Recent publications



### Environmental problems in eastern Europe (1993)

Edited by F.W. Carter and D. Turnock. A review of the environmental situation in Albania, Bulgaria, former Czechoslovakia, Hungary, Poland, Romania, and former Yugoslavia. There is a separate chapter for each country, describing and analyzing the major causes and consequences of the pollution of air, water, soil, and vegetation - with particular focus on the effects on the peoples of eastern Europe and the environmental quality of life.

259 pp. Published by Routledge, 11 New Fetter Lane, London, England EC4P 4EE.

### Current and projected global warming potential of passenger cars in the UK (1993)

By J. Wade, C. Holman and M. Ferguson, Earth Resources Research. The report underlines the fact that the global-warming effects of road transportation are not confined to those from the emissions of carbon dioxide. A number of other exhaust gases, such as nitrous oxide, add significantly to the total warming effect, especially in the short-to-medium term. As regards pollution from cars, however, carbon dioxide emissions remain the greatest area of concern, and currently planned technical changes will do little to halt the rise of these emissions.

38 pp. Published by and obtainable from WWF UK, Panda House, Weyside Park, Godalming, Surrey, England GU7 1XR.

### New horizons - Possibilities for co-operation between environmental NGOs and governments in Central and Eastern Europe (1993)

Edited by P. Hardi, A. Juras and M. Toth Nagy. Presents the results of a project for cooperation between NGOs and their respective governments, with a number of case studies for individual countries. Based on the experiences of western NGOs and the specific needs of their Central and East European counterparts, the project identified institutional, legal, financial, and cultural constraints to co-operation.

354 pp. Published by and obtainable from the Regional Environment Center for Central and Eastern Europe, Miklos tér 1, 1035 Budapest, Hungary.

# EMEP report 1993

BETWEEN 1980 and 1992, European emissions of sulphur diminished by about 30 per cent. Those of nitrogen oxides, on the other hand, increased by about 2 per cent. The source of this information is the latest report from the European Monitoring and Evaluation Programme.

The calculations in the EMEP model are based on official figures from the participating countries (Table 1). Together with field measurements of concentrations and fallout, meteorological data and advanced mathematical calculations are used to describe the transformation and deposition of pollutants as they move about in Europe. In most countries the emissions of sulphur have been much better registered than those of nitrogen oxides. Ammonia also figures, but in its case the basic data is so incomplete that no trend analyses can be made.

The EMEP model has been somewhat changed since the previous report (see AN 5/92, pp 10-12). Among other things the area of calculation has been extended eastwards, now covering most of the European parts of Russia and the other new states. Yugoslavia has likewise been split up into its component parts. Most of these states have however still not sent in any reports of their emissions, so the figures in the table must be regarded as only preliminary.

The calculations of the model have been made to include, beside the emissions from land, an estimate of the natural ones of sulphur from the sea, in the form of dimethyl sulphide, NAT. The emissions from international shipping are from traffic in the Atlantic (ATL), the North Sea (NOS), and the Baltic (BAS). The extensive traffic in the Mediterranean and the Black Sea is on the other hand not covered at all. The report notes that the data on emissions from ships is incomplete, probably conveying an underestimate of the actual emissions.

In western Europe a considerable part of the fallout comes from indeterminate sources (IND), that is, depositions that cannot be attributed to any known source of emission. Two-thirds of them are thought to emanate from European sources, a

last third being borne by the winds across the Atlantic from North America (see article on page 18).

It is also noted that so far very few countries are reporting emissions of nitrogen oxides from shipping on inland waterways or from offshore installations. Since in some cases such emissions may be relatively large, it is important that they should be included in official emissions data.

Every year the EMEP presents information on transports (exports and imports), concentrations, and depositions of sulphur and nitrogen pollutants, as well as on emissions.

The latest data on exports and imports of sulphur and oxidized nitrogen compounds appear in Tables 2 and 3. Since variations in weather and air currents can cause relatively large differences in the transports of air pollutants, the values given in the tables are averages for 1991 and 1992.

PER ELVINGSON

**Calculated budgets for airborne acidifying components in Europe, 1985, 1987, 1988, 1989, 1990, 1991 and 1992.** EMEP Report 1/93. Can be had from The Norwegian Meteorological Institute, P.O. Box 43-Blindern, N-0313 Oslo 3, Norway.

**Table 1. Emissions of sulphur and nitrogen oxides.**

		Sulphur (1000 tons)		Nitrogen oxides (1000 tons as NO <sub>2</sub> )	
		1980	1992	1980	1992
Albania	AL	[25]	[25]	[9]	[9]
Austria	AT	199	42*	246	216*
Belgium	BE	414	224*	442	335*
Bulgaria	BG	1025	830*	416*	273*
Czechoslovakia	CS	1551	1110*	1204	890*
Denmark	DK	226	122*	273	283*
Finland	FI	292	97*	264	299*
France	FR	1669	685*	1823	1810*
Germany, f. East	DD	2150		590	
Germany <sup>3</sup>	DE	1597	2870*	2980	3230*
Greece	GR	200	250*	746*	746*
Hungary	HU	816	505*	273	238*
Iceland	IS	3	3*	13	12*
Ireland	IE	111	95*	73	130*
Italy	IT	1900	1090*	1480	1761*
Luxembourg	LU	12	8*	23	9*
Netherlands	NL	233	101*	548	548*
Norway	NO	70	24*	183	230*
Poland	PL	2050	1498*	1500*	1205*
Portugal	PT	133	102*	166	122*
Romania	RO	900	900*	[390]	[390]
Spain	ES	1660	1158*	950	839*
Sweden	SE	260	85*	419	404*
Switzerland	CH	63	31*	196	175*
Turkey <sup>1</sup>	TR	138*	177*	[175]	[175]
United Kingdom	GB	2449	1887*	2312	2729*
Byelorussia	BY	370	298*	244	263*
Ukraine	UA	1925	1269*	1059*	990*
Moldovia	MD	75*	53*	38*	53*
Russia	RU	3581	2106*	1734	2675*
Estonia	EE	81*	57*	35*	48*
Latvia	LV	56*	39*	28*	39*
Lithuania	LT	143*	100*	53*	73*
Slovenia	SI	110*	125*	63*	75*
Croatia	HR	183*	208*	97*	116*
Bosnia & Hercegov.	BA	64*	72*	43*	51*
Yugoslavia <sup>4</sup>	YU*	295*	334*	148*	177*
Remaining area <sup>1</sup>	REM	[256]	[256]	[100]	[100]
Int. trade, Baltic Sea	BAS	[36]	[36]	[80]	[80]
Int. trade, North Sea	NOS	[87]	[87]	[192]	[192]
Int. trade, rem. Atl.	ATL	[158]	[158]	[349]	[349]
Int. trade, Mediter. <sup>2</sup>	MED	[6]	[6]	[13]	[13]
Int. trade, Black Sea	BLS	n o d a t a			
Biogenic sea emis.	NAT	[362]	[362]	[0]	[0]
<b>Sum</b>		<b>27935</b>	<b>19475</b>	<b>21970</b>	<b>22362</b>

The table shows national official data received at the ECE secretariat up to April 8, 1993. Data estimated by MSC-WCCC are given in square brackets.

\* Interpolated data (no data have been officially submitted). <sup>1</sup> Part within the EMEP area of calculation. <sup>2</sup> Data for the vicinity of Gibraltar only. <sup>3</sup> Incl. former East Germany in 1992 figure. <sup>4</sup> Former Yugoslavia, excluding Slovenia, Croatia, Bosnia and Hercegovina.



**Table 2. Provisional estimate of sulphur budget for Europe. Average for 1991-1992. Total (dry + wet) deposition of sulphur. Unit: 100 tons sulphur per year.**

	AL	AT	BE	BG	CS	DK	FI	FR	DE	GR	HU	IS	IE	IT	LU	NL	NO	PL	PT	RO	ES	SE	CH	TR	GB	BY	UA	MD	RU	EE	LV	LT	SI	HR	BA	YU*	REM	BAS	NOS	ATL	MED	BLS	NAT	IND	SUM		
AL	40	0	1	39	9	0	0	4	14	14	12	0	0	29	0	0	0	8	0	18	1	0	0	1	2	1	4	1	0	0	0	0	2	7	4	24	2	0	0	0	0	1	60	299			
AT	0	106	22	4	240	4	0	98	419	0	72	0	1	188	2	7	0	110	0	18	9	0	12	0	50	4	7	0	2	0	0	2	44	28	4	12	1	1	4	2	0	1	158	1636			
BE	0	0	444	0	15	1	0	136	117	0	2	0	2	2	3	28	0	10	0	0	7	0	0	0	107	0	0	0	0	0	0	0	0	1	0	0	14	2	0	0	2	40	934				
BG	4	2	3	2044	54	1	0	8	75	23	80	0	0	21	0	2	0	58	0	366	2	0	0	6	8	9	99	11	10	0	1	2	6	19	7	148	1	0	1	0	0	2	195	3248			
CS	0	20	28	10	2837	8	0	70	1271	2	290	0	2	42	2	10	0	538	0	52	7	2	2	0	68	10	28	1	5	0	1	4	19	28	4	27	0	2	6	2	0	202	5606				
DK	0	0	9	0	20	138	0	12	122	0	3	0	2	1	0	6	1	36	0	2	2	6	0	0	96	2	2	0	2	0	0	1	0	0	0	0	0	5	9	1	0	0	4	46	529		
FI	0	0	7	1	36	18	293	10	162	0	8	0	2	2	0	4	4	110	0	7	2	43	0	0	55	20	2	1	288	46	10	18	1	1	0	1	0	14	4	1	0	10	330	1530			
FR	0	6	212	2	136	8	0	2283	590	0	32	0	12	273	10	44	0	76	10	0	10	337	2	20	0	404	3	4	0	0	0	1	12	16	3	9	6	1	48	35	0	33	628	5276			
DE	0	18	290	3	869	50	2	551	919	0	60	0	14	98	15	128	2	362	2	15	49	5	22	0	562	8	14	0	8	1	2	5	11	13	1	7	1	8	58	12	0	20	510	12907			
GR	9	2	2	355	29	1	0	8	43	411	37	0	0	34	0	1	0	31	0	102	2	0	0	21	6	6	50	5	6	0	0	1	5	14	6	68	4	0	0	0	0	0	4	244	1491		
HU	1	14	8	20	249	2	0	22	204	2	1328	0	0	52	0	4	0	158	0	127	3	1	1	0	20	6	36	2	3	0	0	2	34	85	13	73	1	1	2	0	0	1	132	2613			
IS	0	0	0	0	0	0	0	1	4	0	0	5	1	0	0	0	0	1	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	13	42	82		
IE	0	0	0	0	0	0	0	8	16	0	0	0	208	0	0	2	0	3	0	0	0	0	0	0	114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	0	16	60	448	
IT	2	16	16	28	139	4	0	165	270	12	108	0	1	2904	1	6	0	103	3	37	71	1	20	2	56	4	14	1	2	0	0	1	70	103	22	39	22	1	4	4	0	0	13	562	4860		
LU	0	0	0	0	0	0	0	12	8	0	0	0	0	0	13	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	45	
NL	0	0	112	0	21	2	0	74	210	0	2	0	4	2	1	156	0	14	0	0	4	0	0	0	196	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	2	0	0	4	47	876
NO	0	0	14	0	34	32	8	18	167	0	8	0	10	1	10	56	66	0	4	4	22	0	0	0	254	4	6	0	83	2	2	3	1	1	0	1	0	5	16	6	0	0	35	362	1236		
PL	0	9	59	15	888	52	4	100	2705	2	161	0	5	33	2	28	2	4998	0	70	12	14	2	0	202	56	78	3	40	5	6	32	13	23	4	27	1	16	18	4	0	0	9	498	10194		
PT	0	1	1	0	2	0	0	6	4	0	0	0	0	2	0	0	0	1	230	0	119	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	61	558	
RO	2	5	9	318	234	4	2	21	256	11	356	0	0	50	0	4	0	270	0	2654	3	2	0	6	24	28	304	34	27	2	2	6	15	39	12	223	1	1	2	0	0	0	2	352	5412		
ES	0	1	20	2	24	2	0	138	90	0	7	0	4	49	1	6	0	18	100	2	3134	0	2	0	90	0	0	0	0	0	0	0	4	7	1	3	20	0	6	44	3	0	24	416	4212		
SE	0	1	27	0	57	110	38	33	330	0	12	0	6	2	0	17	22	142	0	8	3	232	0	0	22	12	16	0	65	12	6	14	1	2	0	4	0	24	19	4	0	0	22	396	1862		
CH	0	3	12	0	28	1	0	108	106	0	14	0	1	188	1	4	0	14	0	1	17	0	83	0	39	0	1	0	0	0	0	4	4	1	1	0	0	2	2	0	0	2	84	720			
TR	2	3	3	202	43	2	1	8	68	75	46	0	0	20	0	1	0	58	0	141	2	0	0	560	10	14	215	12	37	1	1	4	3	9	3	41	2	0	0	0	0	0	0	8	111	2391	
GB	0	1	50	0	39	6	0	97	182	0	3	0	76	2	1	26	1	35	1	2	17	2	0	0	5205	2	4	0	1	0	0	0	0	0	0	0	0	0	1	52	26	0	40	216	6088		
BY	0	2	10	16	104	14	8	18	268	2	54	0	2	14	0	6	1	447	0	60	2	8	0	1	46	891	150	7	92	10	19	75	5	10	2	17	0	6	4	1	0	0	3	352	2726		
UA	1	5	18	103	316	16	9	32	568	12	248	0	2	35	0	10	1	870	0	440	4	8	1	19	68	232	4648	85	314	9	10	37	13	30	8	75	1	6	6	2	0	0	6	1073	9332		
MD	0	0	2	15	22	1	0	2	36	2	19	0	0	3	0	0	0	48	0	100	0	0	0	1	4	9	114	106	9	0	0	2	1	3	1	8	0	0	0	0	0	0	0	58	568		
RU	0	4	32	92	264	62	176	52	710	10	148	0	4	26	0	18	8	862	0	242	8	60	1	42	184	678	2074	35	9802	124	72	156	10	23	6	63	0	36	15	4	0	0	25	6332	22450		
EE	0	0	2	0	10	5	12	2	40	0	2	0	0	0	1	0	32	0	2	0	6	0	0	13	5	5	0	14	83	10	8	0	0	0	1	0	6	1	0	0	0	0	2	56	322		
LV	0	0	4	2	24	9	8	5	80	0	6	0	0	2	0	2	1	76	0	4	1	6	0	0	24	22	10	1	22	16	76	40	1	1	0	3	0	6	2	0	0	0	2	100	555		
LT	0	1	6	2	39	10	4	10	135	0	10	0	1	2	0	3	1	170	0	7	1	6	0	0	28	27	14	1	29	4	18	242	1	1	0	3	0	5	2	0	0	2	115	902			
SI	0	8	3	3	31	1	0	15	52	0	28	0	0	92	0	1	0	23	0	8	3	0	1	0	7	2	0	0	0	0	0	0	0	256	68	10	10	1	0	0	0	1	52	681			
HR	1	6	5	10	64	1	0	19	94	2	91	0	0	108	0	2	0	49	0	18	5	0	1	0	12	1	5	0	0	0	0	74	488	45	38	3	0	1	0	0	0	1	103	1251			
BA	1	4	4	14	55	1	0	14																																							

## Further publications

### Baltic Sea region environmental protection – “Eastern” perspectives and international cooperation (1993)

Edited by Mikael Sandberg. Ten social scientists from central and eastern European countries present their views on past, present, and future environmental protection in their own countries. A sequence of priorities for future investments in environmental protection is proposed in a concluding chapter.

172 pp. Price 212 kronor. Published by Almqvist & Wiksell International, Box 4627, 116 91 Stockholm, Sweden.

### Taxation and environment (1993)

Report prepared by environmental and tax experts from OECD governments who had been investigating how integration could be achieved between environmental and fiscal policies. Review of the key fiscal issues raised by “eco-taxes.”

116 pp. Available from OECD, 2 Rue Andre Pascal, F-75775 Paris Cedex 16, France.

### International Economic Instruments and Climate Change (1993)

Review of experiences with tradeable permits and taxes, outlining the principal problems that might arise if they were applied to the problem of climate change. Also a review of the most important issues that would have to be considered when designing programs for the abatement of greenhouse-gas emissions in which these instruments of policy were involved.

100 pp. Obtainable from OECD, address as above.

### OECD Environmental Data 1993

Compendium updated every two years. Relates data on pollution and natural resources to such areas of economic activity as energy, transport, industry, and agriculture. The data is arranged from three points of view: the present state of the environment, the pressures upon it, and environmental management.

324 pp. Available from OECD, address as above.

### Behöver skogen intensivvård? (1993)

Is the forest in need of intensive care? While there is no doubt about the forest in south Sweden being damaged, there are sharp differences of opinion as to what to do about it. Here the various proponents present their views.

In Swedish. 40 kronor. 106 pp. Can be ordered from Forskningsrådsnämnden, Box 6710, S-11385 Stockholm, Sweden

## SULPHUR

# Transatlantic transports

RECENTLY, during negotiations for a new agreement under the UNECE for reducing the emissions of sulphur, the question was raised as to how much of the air pollution in Europe actually emanates from North America. Several European countries, referring to a report\* from the EMEP, maintain that a considerable part of the sulphur deposited over Europe does in fact come from the other side of the Atlantic, and from the United States and Canada in particular.

In the tables of exports and imports of air pollutants that are published annually by the EMEP, certain amounts are designated IND – from indeterminate sources. According to EMEP estimates, at least two-thirds of the indeterminate depositions are from European sources, while the remainder, about 30 per cent, is ascribable to transports from across the Atlantic.

The countries receiving a great part of the indeterminate depositions are precisely those with a western exposure. The report presents calculations for 1988, showing that a full 12 per cent of the wet depositions of sulphur on those countries could be traced to sources in North America. The North American contribution to the total deposition of sulphur over them was put at 3.5 per cent.

There are wide differences in the way various countries are affected. As might perhaps be expected, Iceland receives most of the pollution. It is estimated that 37 per cent of its wet depositions and 31 per cent of the dry come from sources in North America. The figures for the other countries were:

	Proportion of deposition (%)	
	wet	total
Ireland	24	5
Norway	9	5
Portugal	8	3
Sweden	7	3
Spain	8	2
United Kingdom	8	1
Denmark	5	1

In a final summing up the report notes that North American and Asian

sources represent 25 and 5 per cent respectively of the total indeterminate deposition over Europe. The remaining 70 per cent is of European origin, the sulphur having been transported up to the free troposphere and moved about there until scavenged out by precipitation.

The United States and Canada have so far shown no intention of making new commitments – referring instead to their bilateral agreement of 1991. During the negotiations it had emerged that the United States would be prepared to agree to reduce emission by no more than 23 per cent by the year 2000, and 40 per cent by 2010. Canada said it could agree to a reduction of 46 per cent between 1980 and 2000, but only for the southeastern part of the country – where such reduction has, practically, already been achieved.

To some European countries, all this is a matter of growing concern.

CHRISTER ÅGREN

\* Contributions to sulphur background deposition over Europe: Results for 1988. EMEP/MSC-W Note 5/92. By Leonor Tarrasón. Obtainable from MSC-W, The Norwegian Meteorological Institute, P.O. Box 43-Blindern, N-0313 Oslo 3, Norway.

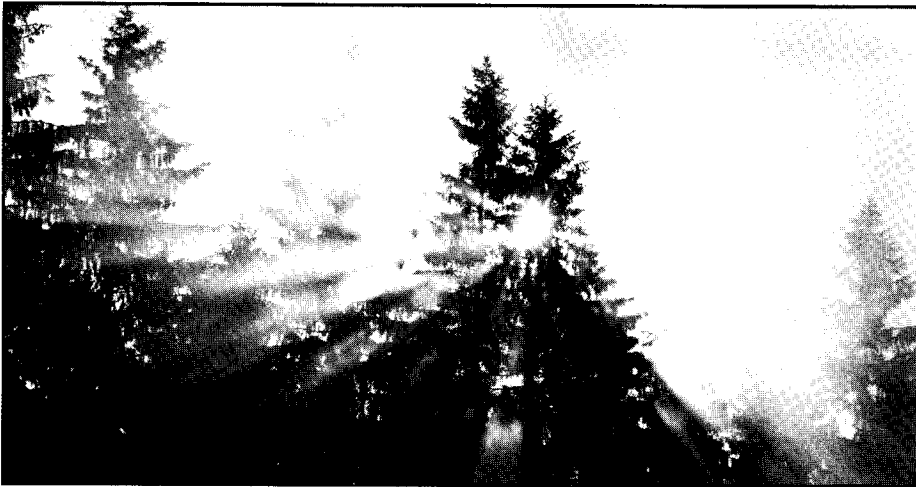
## Flue-gas cleaning with dung

Spraying ammonia into the flue-gases is a well-known technique for reducing the emissions of nitrogen oxides from combustors. But now the Danes have been trying atomized liquid manure instead, with good results.

Dung contains ammonia, and farmers are glad to find a way of getting rid of it, since intensive husbandry brings a troublesome problem of waste. The disadvantage of liquid manure is not, as might be supposed, that it gives off a bad smell. In that respect there has been no problem. The main difficulty has been the high water content, which is expensive to deal with. Trials are however continuing.

Source: Ny Teknik, No. 30. September 30, 1993.

# Lengthy talks foreseen



© DAN RAPP

DURING THE LAST FEW YEARS environmental ministers from Western and Eastern Europe have met several times to discuss a joint environmental program. This is naturally a far from easy task, and many see it as a lengthy process of negotiation between East and West. At a conference in Lucerne last April the following matters were discussed: An Environmental Action Programme for Central and Eastern Europe. A Report on the State of the Environment in Europe, to be completed before the end of 1993. A long-term environmental program for Europe.

In the declaration that was subsequently issued, the ministers endorsed the broad strategy, with its principles and general priorities, contained in the Environmental Action Programme for Central and Eastern Europe (EAP), as a basis for action by national and local governments, by the Commission of the European Communities, and also by international organizations and financial institutions and private investors active in the region.

They also called for the strict application of environmentally sound standards and requirements in all assistance to Central and Eastern Europe by governments and international organizations and financial institutions.

By openly supporting the EAP the ministers established a framework to facilitate the process of preparing projects and investments, and a Project Preparation Committee (PPC) was also set up. The PPC shall help to provide feasibility studies leading

to concrete investment projects, and identify possible sources of financing for small projects as well as large capital-intensive ones, including projects in the private sector. The EAP program shall address both local and transboundary problems, since it has been shown that local environmental measures can also lead to a decrease in transboundary pollution.

Concerning the Environmental Action Programme for Europe some of the outstanding principles and proposals adumbrated in the ministerial declaration were:

□ The development of the European Environment Agency, based in Denmark, into an instrument for the coordinated collection and analysis of data for the whole of Europe.

□ The reaffirmation of the commitment to the Polluter Pays Principle, but acknowledging that the special situations of the CEE countries during their transition to market economies must be taken into account in the application of this principle.

□ The OECD and UN-ECE shall explore ways and means to facilitate a wider use of economic and fiscal instruments.

□ Consideration of the concept of burden sharing to assist countries under the EAP, under the protocols to the Convention on Long-Range Transboundary Air Pollution, and within the flow of financial resources to CEE.

□ A welcome to the consensus on the importance of coordinating the use of economic and fiscal instruments and of introducing as soon as

possible taxation that leads to an effective limitation on CO<sub>2</sub> emissions and to an improvement in the efficient use of energy.

□ A call for early completion of the negotiations of the European Energy Charter and the related protocols on energy efficiency and the environmental aspects of energy systems.

□ Agreement that the UN-ECE shall expand the scope of its Energy Efficiency 2000 campaign and emphasize the role of energy efficiency measures and renewable energy sources for the reduction of the emissions of greenhouse gases and acidifying substances, and identify opportunities for developing energy efficiency standards and labelling.

It was decided that the next Ministerial Conference should be held in April 1995 in Bulgaria. A working group of senior officials was formed under the ECE to serve as the central coordinating body for the further development of the process of "Environment for Europe."

A Task Force with members nominated by the Ministers was set up to facilitate implementation of the EAP, with the active support e.g. of the World Bank and the EBRD. The Task Force will be co-chaired by a representative of the Commission of the European Communities and one from a CEE country on a rotating basis and the OECD will provide the secretariat.

In conclusion it may be said that this newly established pan-European environmental process still remains weak and undefined, and consequently many governments are not really taking it seriously. This will make it necessary for environmental NGOs to press their governments to make more concrete commitments at the Sofia Conference, for instance for cleaning up the many environmental hotspots that were listed by the ministers in their report on Central and Eastern Europe.

REINHOLD PAPE

The documents, **Environmental Action Program for CEE** and the **European Environmental Report**, can be ordered from the EC Commission, DG XI, Rue de la Loi 200, B-1049 Brussels, Belgium

# A profitable polluter

NORILSK. Largest city in northern Siberia, lies ninety kilometres east of the Yenisei. Unique on account of its combination of geographical location, good living standards, enormous natural resources, and almost unbelievable pollution.

Originally built by political prisoners in the Stalin era, on a site characterized by tundra and permafrost, Norilsk now counts 270,000 inhabitants, favoured by wage supplements to compensate to some extent for the harsh environment, and housed comfortably in high-rise concrete blocks with relatively spacious apartments. But they also have to put up with the heavily polluted air outdoors and the dark and cold of a nine-month-long winter.

Norilsk Nickel is the world's largest producer of the metal, with plants both in Norilsk and on the Kola Peninsula, not far from Murmansk. It not only supplies one-third of the world demand for nickel, but also brings in almost 10 per cent of Russia's foreign-currency earnings.

In July, 1992, Norilsk Nickel became privatized. The Russian state has retained a 50-per-cent holding in the new company, the rest of the stock being sold publicly. "Privatization saved Norilsk," says company president Anatolij Filatov, who is also one of the most influential men in Russia.

"Now that we no longer need to hand over hard currency to Moscow, we can gradually start to invest in cleaning up. The technology is there, and if we can find all the additional cash, in fifteen years the pollution problem should have been solved. But so far," he adds, "all we have got from the Scandinavian countries has been talk. Generous promises, but nothing being done to bring an end to pollution on the Kola Peninsula."

Anatolij Filatov has ceased to hope for aid from that quarter. In the meantime the big smelters on Scandinavia's doorstep go on pouring out sulphur dioxide, which is carried away by the winds and falls out as acid rain on a vulnerable environment.

Actually the Kola ore only contains 5 per cent of sulphur, but as early as



the seventies it was beginning to become worked out. At Norilsk, on the other hand, the smelter capacity was insufficient to meet the demand.

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*The world's richest ore, also containing the most sulphur*

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Under a planned economy quotas still had to be filled, so ore had to be shipped from the Siberian mines with the aid of nuclear-powered icebreakers to the Kola Peninsula – a million tons a year of the world's richest ore, but also that containing the most sulphur, 20-30 per cent.

According to the Norwegian environmentalist group Bellona, which has been keeping track of the emissions from Norilsk Nickel's plants for several years, shipping ore from Siberia is clearly uneconomic. But Anatolij Filatov disagrees, saying that the only alternative – too expensive – would have been to build new smelters at Norilsk. He also counters with the usual taunt that the West spreads quite as much pollution over Russia as vice versa.

"Western businessmen are pretty smart. By buying metals from us they avoid damaging their own environment. Russia has become a colonial supplier of raw materials," he adds, giving his words an ironic twist.

The ore at Norilsk, mined at a depth of 1400 metres, yields besides nickel copper, cobalt, gold, and silver, as well as various metals of the platinum group. According to mine superintendent Kazbek Karginov,

there is ore enough for several generations.

Out of the chimneys at Norilsk comes 4.3 tons of sulphur dioxide a minute. That makes 2.3 million tons a year, or twenty times as much as from the whole of Sweden. The smelter was built in 1940, just before the Soviet Union came into the war, and hardly anything has been done to it since.

Out on the street one's eyes are continually running, and the sulphur fumes prick the throat like needles. A passing workman alternately takes a puff and covers his face with a gasmask. "He'll soon be ready for the sanatorium," comments the guide, holding his own nose tightly.

On one hundred days of the year the fumes are so thick that people try as much as possible to stay indoors. On thirty days it may be directly unhealthy to go out, is what we hear from the municipal environmental office. When the concentration limits are exceeded, the nickel works are told to ease off output. The public is kept informed by radio, and information can also be obtained free of charge by calling the meteorological service. Seven years in Norilsk is the most anyone can stand, according to the latest medical findings.

Norilsk employees have shorter hours of work, a longer vacation, earlier retirement, and considerably higher earnings than is usual in Russia. They have food subsidized by the company, which also provides for all kinds of sports, indoors and out. It maintains a vacational facility on the Black Sea, to which whole families are flown free every other year. And to enable children to recuperate in fresher air, there is a summer camp at Krasnoyarsk.

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Adapted from an article in Svenska Dagbladet, January 25, 1993.

A previous article on Norilsk and air pollution in the taiga region appeared in Acid News 2/93. Further information can also be had from Bellona, Thomas Nielsen, P.O. Box 8874, N-0028 Oslo 1, Norway.