

Acid News



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ACIDIFICATION

Developing a strategy

AS A RESULT chiefly of urging from Sweden, the European Union is now in a process of developing a strategy for combating acidification. It appears from a working document that the commission's environment directorate presented to the member countries in October 31 that it will not be possible to achieve the long-term aim (no exceeding of critical loads and levels) for the whole of EU by 2010 – even if the maximum technically feasible reductions were carried out.

It was said in the fifth EU program for environmental action that there should be “no exceeding ever of critical loads and levels” for acidification, and the aim is now to identify and propose cost-effective solutions for abating emissions of acidifying air pollutants in order to arrive at that state. Interim targets are also

to be set to that end, and other environmental effects of acidifying air pollutants, such as eutrophication and the formation of ground-level ozone, taken into account as well.

In order to be able to calculate the extent to which emissions can be cost-effectively reduced through the application of technical measures, the commission has decided to lean on IIASA, the International Institute for Applied Systems Analysis – which has developed the RAINS computer model used in negotiations for the same purpose under the Convention on Long Range Transboundary Air Pollution.

The base year for the acidification strategy will be 1990. As a means of evaluating the need for additional measures, the types of measures that are available, and their respective costs and effectiveness, a reference

scenario (REF) has been set up. This has been done by calculating, country by country, the effects of current legislation (including projections of future energy use, and the emissions resulting from current national, EU, and international legislation) as well as of current reduction plans comprising commitments for national emission ceilings that countries have made either individually or by signing protocols under the international Convention. That of the two alternatives for each country that should result in the greater reduction of emissions has been embodied in the reference scenario.

The figures in the reference scenario for emissions of sulphur dioxide, nitrogen oxides, and ammonia amount to reductions of 58, 36, and 12 per cent respectively for the whole

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Acid News

is a newsletter from the Swedish NGO Secretariat on Acid Rain, 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 secretariat. All requests for information or material will be dealt with to the best of our ability. Acid News is distributed free of charge.

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 SECRETARIAT

The Swedish NGO Secretariat on Acid Rain was formed in 1982 with a board now comprising one representative from each of the following organizations: Friends of the Earth Sweden, the Swedish Anglers' National Association, the Swedish Society for Nature Conservation, the Swedish Youth Association for Environmental Studies and Conservation, and the World Wide Fund for Nature Sweden.

The essential aim of the secretariat is to promote awareness of the problems associated with air pollution, and thus, in part as a result of public pressure, to bring about the required reduction of the emissions of air pollutants. The eventual aim is to have those emissions brought down to levels – the so-called critical loads – that the environment can tolerate without suffering damage.

In furtherance of these aims, the secretariat operates as follows, by

- Keeping under observation political trends and scientific developments.
- Acting as an information centre, primarily for European environmentalist organizations, but also for the media, authorities, and researchers.
- Producing and distributing information material.
- Supporting environmentalist bodies in other countries by various means, both financial and other, in their work towards common ends.
- Acting as coordinator of the international activities, including lobbying, of European environmentalist organizations, as for instance in connection with the meetings of the bodies responsible for international conventions, such as the Convention on Long Range Transboundary Air Pollution.
- Acting as an observer at the proceedings involving international agreements for reducing the emissions of greenhouse gases.

Stopping too short

THE AIM of the acidification strategy that is now being evolved within the European Union is to arrive at cost-effective ways of ensuring that there will, as it is expressed, be “no exceeding ever of critical loads and levels.” Attacking the problem in this manner represents a distinct advance over the weighing of benefits versus costs which is the method that has previously been pursued.

It seems however from preliminary studies that it will be impossible, within any foreseeable time, to attain the desired goal – even with implementation of all the available technical measures in the whole of Europe. Carrying out that “maximum feasible reduction” scenario would in any case be relatively expensive, since the marginal cost of emission reductions would rise successively, as the cheapest measures give way to more expensive ones.

In the draft that was presented to the member countries by the EU Commission's environment directorate on October 31 (see adjoining article), a first stage was proposed to cover the period up to 2010. During that time an attempt was to be made to reduce by 50 per cent the area within the union in which the critical loads for acidification are now being exceeded in each EMEP square (in the European grid of 150x150 km squares) at the least possible cost.

It is hard to see why the environment directorate should propose such a modest step. A study presented at the same time as its own proposal showed that it would be profitable to reduce emissions considerably more. The cost per kilogram of reduced emission would, it is true, rise the further one goes, but that would be compensated by the gain from avoidance of the damage that would otherwise occur (see article, p. 5).

It should also be noted (as it has been in the proposal for a strategy) that the cost of reducing emissions has been made to appear too high, as the model only takes technical measures into consideration. It is hardly likely that the most expensive measures will be taken, since it will pay, long before their turn comes, to do such things as bringing about

a more efficient use of energy and switching fuels. The computer model also assumes business-as-usual for the sectors in question – with a greater use of energy, more road traffic, and continued heavy subsidizing of meat production – which hardly accords with other environmental aims, such as care for the climate.

From the essays at modelling the most cost-effective ways of reducing emissions it has turned out that it would be highly profitable, community-wise, to deal with those of sulphur and nitrogen oxides from shipping. It would be pointless however for the EU to expect anything for the moment from the deliberations with IMO, the International Maritime Organisation. It would be far more effective if the EU were to initiate a system of environmentally angled charges for harbours and waterways on the lines of the Swedish (see Acid News 2/96, p.4).

It will in any case be impossible to solve Europe's problems of acidification merely through measures taken within the Union. The EU will have to exert pressure within the Convention on Long Range Transboundary Air Pollution to bring about an early revision of the 1994 sulphur protocol, as well as to quickly bring to a close the negotiations for a new so-called multi-pollutant protocol, regulating the emissions of nitrogen oxides, ammonia, and volatile organic compounds.

It cannot be sufficiently emphasized that measures to check acidification will produce tangible benefits in other respects as well – such as reduced eutrophication, lower emissions of substances that are a danger to health, and of gases that give rise to the formation of ground-level ozone. And if sensibly formed, measures to curb acidification will also reduce the emissions of carbon dioxide and so the risk of climate warming.

Despite the fact that the costs are being overestimated and the benefits underestimated, far-reaching measures would thus be worth taking, and this is the attitude that the commission should seek to impress on the council of ministers.

PER ELVINGSON

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The costs of lowering the emissions of air pollutants will, according to a study made for the European Commission, be more than offset by the gains from improvements in health and reduced damage to materials.

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Latest report shows that, despite some examples to the contrary, the general trend for emissions of sulphur and nitrogen oxides in Europe continues steadily downwards.

of Europe by 2010, as compared with 1990. For the EU alone, the reductions would be 66, 50, and 16 per cent.

Under this REF scenario, the critical loads for acidification will still be exceeded on 7 per cent (9 million hectares) of the EU countries' ecosystem area in 2010 as compared with 24 per cent (33 million hectares) in 1990. For Europe as a whole, the figures are 4 per cent (20 million hectares) for 2010 and 14 per cent (81 million hectares) for 1990. The term "ecosystem area" refers to the area for which each country has fixed or estimated critical-load values – which means in all cases forest land and in some countries surface waters, heaths, and wetlands. Farmland, roads, towns, and other intensively worked-on areas are not included.

Three scenarios for maximum technically feasible reductions (MFR) have been worked out with the aid of the RAINS model. The first, MFR-real, shows the technically feasible measures for reductions that can be implemented by year 2010, with account taken of the turnover rate for motor vehicles and stationary plant. The second, MFR-ultimate, gives the result after full implementation of the same measures. Whereas these two scenarios involve measures affecting the whole of Europe, the third,

EU-max, concerns the maximum application of the best available techniques in the EU member states only.

As already noted, there are indications that the long-term aim for the EU generally – that the critical loads shall not be exceeded – will be unattainable by 2010, even if the MFR scenario should apply. A great part of the depositions of acidifying substances in the EU countries comes from outside the union. Consequently the EU-max scenario, which means action taken only within the union, is the worst of the three as a means of providing against the exceeding of critical loads.

It should be born in mind that the model used in these cases, RAINS, only covers technical measures, leaving out non-technical options for bringing about abatement such as structural changes (fuel switching, energy saving and conservation). The MFR scenarios consequently tend to underestimate the potential for reducing emissions, while overestimating the cost for achieving reductions. The calculations are moreover based on a scenario developed by the energy directorate of the EU commission, which assumes an increase of 20 per cent in the use of energy within the union between 1990 and 2010 – which

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Reductions of emissions from 1990 levels, both for the whole of Europe and (in parantheses) for EU countries only (in per cent).

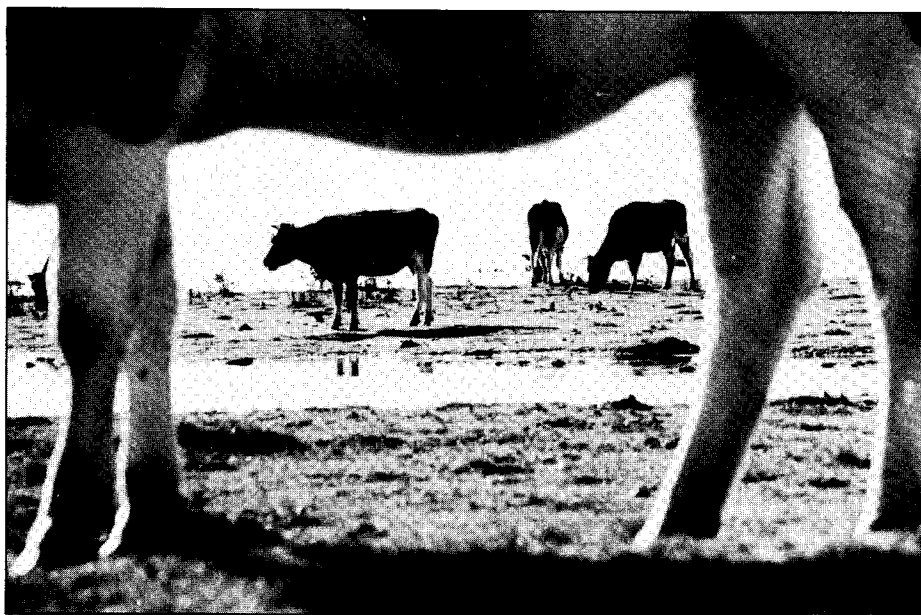
Scenario	REF	50%GAP	MFR-real	MFR-ulti
Sulphur dioxide	-58 (-66)	-67 (-84)	-90 (-92)	-91 (-93)
Nitrogen oxides	-35 (-50)	-40 (-58)	-72 (-70)	-85 (-85)
Ammonia	-12 (-16)	-19 (-28)	-40 (-43)	-40 (-43)

would hardly be compatible with the EU aim for the climate: to have held the emissions of carbon dioxide in the year 2000 to 1990 levels.

Filling the space between the reference and the MFR scenarios are three least-cost scenarios with varying end results – closing the gap between the level of ecosystem protection existing in 1990 and the ultimate target of a 100 per-cent protection by 45, 50, and 55 per cent. A 55-per-cent gap closure means that the area on which the critical load is being exceeded shall decrease by 55 per cent within each grid cell (a 150x150 km square) in the EMEP measuring system. Reducing the extent by which the critical loads are being exceeded in the same degree within each grid cell was also the yardstick employed in the negotiations for a second sulphur protocol.

The least-cost scenario involving a 50-per-cent gap closure was the alternative recommended by the commission's environment directorate when presenting its working document. It had calculated that under this scenario the emissions of sulphur dioxide, nitrogen oxides, and ammonia would be reduced in the EU countries by 84, 58, and 28 per cent respectively, as from 1990 levels. The additional costs as compared with REF would be 8.4 billion ecus per year. The result would be a 97-per-cent protection of the ecosystems, leaving 4.6 million hectares unprotected in the European Union. Computer modelling also shows that it would be highly cost-effective to reduce emissions from shipping in the Baltic Sea and the North Sea. If that was done, a 50-per-cent gap closure could be attained at an annual cost of 6.3 billion ecus, the cost of the reduction from shipping being 0.3 billion.

As regards shipping, the RAINS model shows the importance of reaching international agreement – partly because it will otherwise be impossible to arrive at the final goal of avoiding any exceeding of critical loads. Negotiations to reduce emissions from vessels plying in international trade are going on in IMO, the International Maritime Organisation, which is a United Nations body. Progress is however extremely slow, and present proposals for a worldwide limitation



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of the sulphur content of bunker oils would really bring no improvement at all (see Acid News 2/96).

It also comes out from the RAINS calculations that costs rise rapidly for all increases in the gap closure above 55 per cent. It is not the intention however that each country shall take specific technical measures. An emission ceiling will instead be set

for each one, after which it can itself decide what steps it will take to achieve the desired results. Carrying out the reductions in the most cost-effective manner will probably mean that the most expensive measures are avoided, since it will be cheaper to switch fuels, use energy more efficiently, and so forth. Where technical measures prove to be cost effective, they can be made a matter for EU legislation. This will apply for instance in regard to stricter requirements for new and existing large combustion plants and limits on the sulphur content of oils.

More effective use of energy as well as a switch to renewable fuels will not only reduce the emissions of acidifying substances, but also constrain the emissions of carbon dioxide. The solution to all the problems connected with air pollution must therefore lie *both* in technical and in structural measures.

The next meeting for a strategy to deal with acidification will take place in January. For that the commission has undertaken to present figures based on another, lower, energy scenario.

MIKAEL JOHANNESSON

Note. The decision to develop a strategy for dealing with acidification was taken by the Environment Council in December 1995, after seeing a Commission Working Paper on the situation within the union in regard to acidification. See Acid News 1/96.

In January the commission is to agree on the text that will later be presented to the environment ministers.

Per cent of ecosystem area where critical loads for acidification are or would be exceeded.					
Country	1990	REF	50% GAP	MFR-real	MFR-ultimate
Austria	59	19	13	5	3
Belgium	77	19	1	0	0
Denmark	18	4	2	1	0
Finland	16	4	3	0	0
France	4	1	0	0	0
Germany	80	29	12	2	1
Greece	0	0	0	0	0
Ireland	5	1	0	0	0
Italy	17	4	1	0	0
Luxembourg	16	8	2	0	0
Netherlands	88	37	7	4	3
Portugal	0	0	0	0	0
Spain	.1	0	0	0	0
Sweden	23	3	2	0	0
U.K.	60	29	13	10	7
EU-15	24	7	3	1	1
Belarus	19	3	3	0	0
Czech Rep.	95	24	11	2	1
Norway	25	11	7	3	2
Poland	92	31	27	4	3
Russia	8	1	1	0	0
Slovakia	66	4	4	0	0
Switzerland	30	9	2	2	2
Ukraine	12	1	1	0	0
Total Europe	14	4	2	1	0

Benefits arising from reduction

EVEN THOUGH reducing the emissions of air pollutants may seem expensive, it does actually pay. A study* has compared the costs and benefits that would arise from the various scenarios on which the Commission is seeking to base an acidification strategy (see preceding article). In each case the gains turned out to be greater than the costs, despite the fact of many important items on the benefit side having been left out.

When the emissions of sulphur dioxide, nitrogen oxides, and ammonia lessen, there come benefits in the form of reduced damage. The authors of the study, Mike Holland and Wolfram Krewitt, have attempted to quantify these economically in respect of health, building materials, and crops for each of the scenarios. Other effects, such as damage to ecosystems and cultural objects, had to be ignored mainly because of insufficient material for an economic assessment.

The outstanding benefit in each case was the lessening of health effects as a result of reduced exposure to secondary air pollutants – aerosols of sulphate and nitrate as well as ozone. The health gains were valued partly according to the loss of work output that would be avoided and reduced costs because of such things as fewer hospital admissions, and partly according to estimates of people's willingness to pay for avoiding illness and death.

Although they admit a considerable uncertainty in regard to the connection between chronic exposure to air pollutants (particles) and mortality, Holland and Krewitt maintain that while the basis for quantifying is indeed less certain than it is in the case of other effects that they have considered, a connection does probably exist. They therefore show the outcome both with and without chronic effects.

Lessened adverse effects on health were found to account for about 95 per cent of the benefits arising from pollution reduction, and less damage to materials for most of the rest (mainly paint and galvanized steel, both of which have relatively short life). Although scientific evidence on which to base the cost of damage to

cultural objects is at present lacking, the authors of the study suggest that willingness to pay could be applied in these cases too.

The reduced damage to crops – due mainly to a lowering of the concentrations of ground-level ozone – is balanced by the fact that the amounts of airborne nitrogen also lessen, causing farmers to use more fertilizer. There is at yet no reliable means of economically evaluating lessened damage to natural ecosystems. It can

Effects on health account for about 95 per cent of the benefits

however be seen, from the evidence on which the acidification strategy is being based, how much of those systems would be protected against an excess of critical load under the various scenarios.

Since the benefits are so largely ascribable to improvements in health, it can hardly be surprising that the greatest benefit should be recorded in countries with the largest populations. The amount of damage that could be avoided tends to be greatest, too, in countries in the centre of the union, as a result of all their neighbours reducing emissions.

Holland and Krewitt compare the costs as calculated by IIASA for the acidification strategy with their own calculations of the benefits, and in every case they find the benefits to outweigh the costs (see table).

It may appear from the table that there would be no increase in net gain between the 55%GAP scenario and the MFR-real – since the gain in

both cases comes to 18 billion ecus a year. But gains also arise from items that have not been evaluated in terms of money, such as ecosystems and cultural objects, and so are invisible. Moreover the step from a 55-per cent gap closure to MFR-real would mean some 18,000 deaths being avoided annually as a result of the reduction in acute health effects. What does not show, either, on the profit side in the MFR accounting, is that the lessening of emissions in the non-EU countries, too, will also result in reduced damage outside the study area, as for example in Ukraine.

There are differences between countries in the relation of benefits to cost. For some countries under some scenarios there will be a net cost (for Ireland under every scenario). But then again, gains such as reduced pressure on natural ecosystems and less damage to the cultural heritage have not been taken into account. Nor has any assessment of the effect on mortality of chronic exposure to particulates. If these factors were included, all countries would show net gains.

Some uncertainty naturally reigns in any assessment of this kind. A section in the present study shows the importance of various assumptions in respect of some fundamental points concerning health effects. After considering all of them, however, the authors revert to the conclusion that the results of their study are in the main reliable. In other words, it pays to reduce emissions. Just how much depends however on what assumptions are made.

PER ELVINGSON

* *Benefits of an acidification strategy for the European Union.* By Mike Holland and Wolfram Krewitt. Internal draft report made for the European Commission.

Benefits in respect of annual effects on crops, materials, and morbidity, and acute effects on mortality. Both for the whole of Europe and (in parentheses) for EU countries only. Billions of ecus.

Scenario	Total cost	Total benefit*	Net benefit
45%GAP	5.1 (5.1)	15.9 (13.1)	10.8 (8.0)
50%GAP	8.4 (8.4)	24.1 (19.8)	15.7 (11.4)
55%GAP	13.0 (13.1)	31.0 (25.7)	18.0 (12.7)
MFR-real	73.0 (37.7)	91.0 (51.3)	18.0 (13.6)

* If estimates of the chronic effects on mortality were included, the amounts of benefit would be 3-4 times higher.

Evidence of continued decline

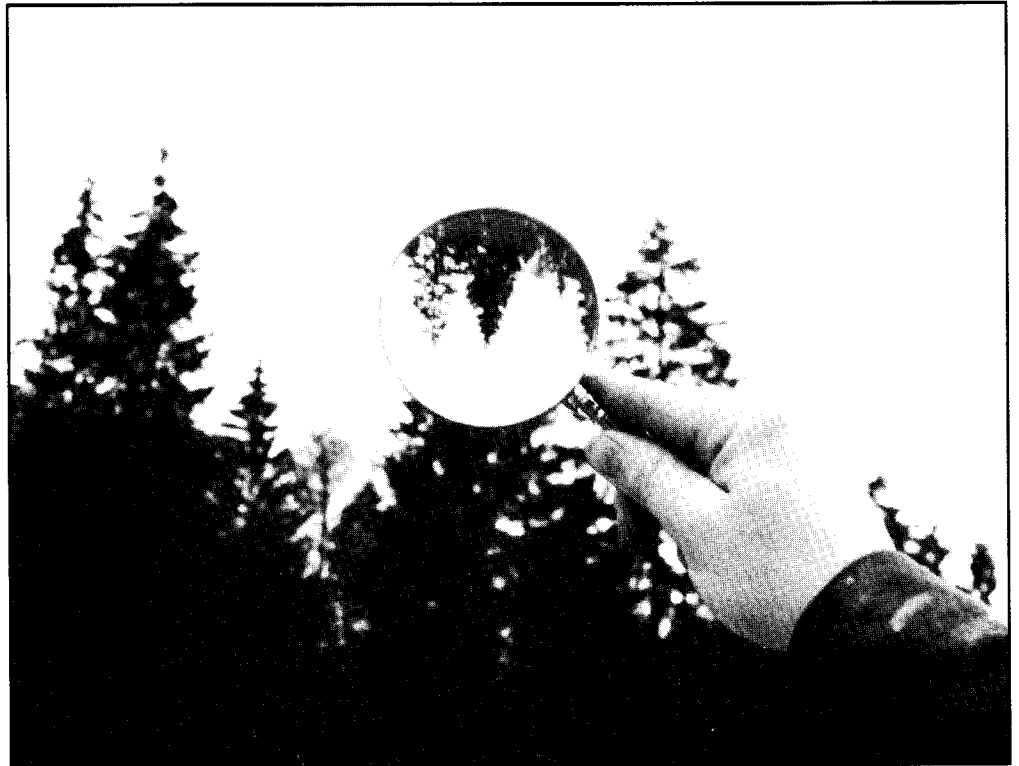
THINNING OF THE CROWN is becoming ever more widespread among the trees of Europe, although the exact cause of it remains uncertain. From the Europe-wide survey of 1995 it appears that 25 per cent of the sample trees could be classified as damaged, in equal proportion for deciduous species and conifers. The worst sufferers among deciduous trees were oaks (*Quercus* spp.), of which 31 per cent were damaged. Among conifers fir (*Abies* spp.) topped the list with 32 per cent.

To be classified as damaged, the trees must show a loss of leaves or needles of at least 25 per cent, compared with a reference tree of the same species. The figures just given represent an average for 117,000 trees in the thirty countries of Europe included in the survey.

Since the survey area has become steadily extended year by year, no proper comparison can be made with previous years. Among the 94,000 trees that were studied both in 1994 and 1995 there was however clear evidence of a decline – from 25.2 per cent damaged in 1994 to 26.8 per cent in 1995.

A smaller number of so-called common sample trees – just about 28,000 – have been under observation every year since 1988. The proportion of these falling into the undamaged category (less than 10 per cent defoliation) has steadily decreased, from 69 per cent in 1988 to 39 per cent in 1995. The number of damaged trees, with more than 25 per cent defoliation, increased from 8 to 22 per cent during the same period. The value of these findings is however somewhat lessened by the fact that the material did not contain any common sample trees from the central and boreal parts of Europe.

Concurrently with the transnational survey referred to above, national surveys, covering a total of 197 million hectares, have been carried out in thirty countries. The area amounts to about three-quarters of Europe's forest land, and the num-



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ber of trees under observation has been about 635,000. The findings can be seen from the table opposite. Although the national surveys do not, for various reasons, allow precise comparison between countries, a general pattern does emerge from

*Even in low concentrations
air pollutants will tend
to stress the trees*

them, showing the worst damage to be occurring in Central and Eastern Europe.

It is difficult, with the present method of survey, to draw any safe conclusion as to the cause of the damage. Since it can occur for several reasons, defoliation is of little help. To get around the difficulty, chemical analyses are now being made of the trees and soil as well as the precipitation. During 1995 this was done at 600 or more sample points in Europe, and the initial results will be presented next spring. The tests will however have to be repeated, in five to ten years, before

any trend can be discerned.

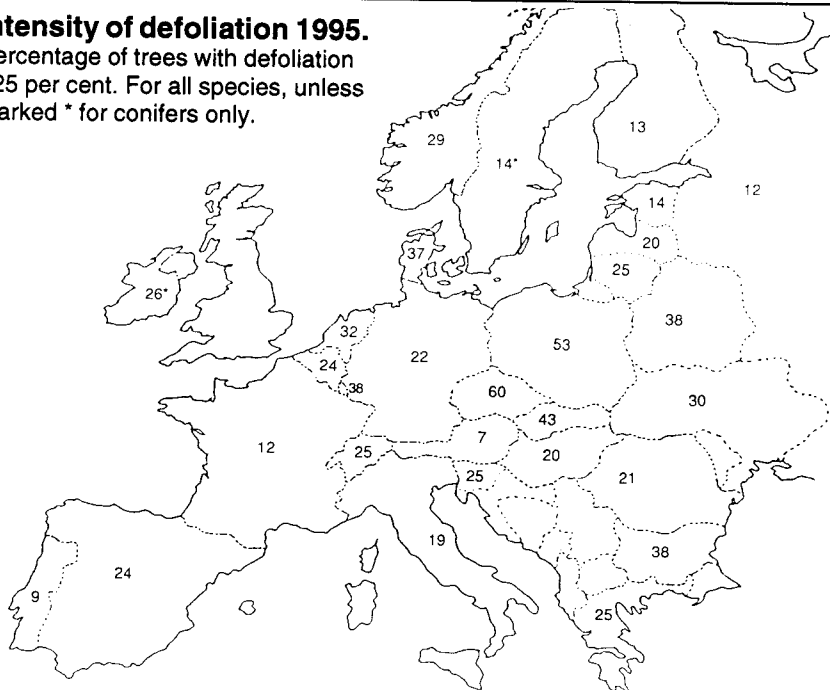
As regards the connection between air pollution and forest decline, the state of knowledge remains largely unchanged. In some places, where the concentrations of air pollutants are very high, the connection is clear. For ozone, too, the critical concentrations are being frequently exceeded over many parts of Europe (see AN 4/96, p.10). It is likely that even in low concentrations air pollutants will tend to stress the trees and make them more susceptible to damage from drought, frost, insect attack, etc. Continued acidification of the soil can be assumed to have a similar effect. It is to be hoped that the newly instituted chemical tests will bring us nearer the answer. In the meantime the assembling of data on crown thinning will continue.

PER ELVINGSON

The information in the article has been taken from *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 Convention on Long Range Transboundary Air Pollution, in co-operation with the European Commission.

Intensity of defoliation 1995.

Percentage of trees with defoliation >25 per cent. For all species, unless marked * for conifers only.



Results from forest-damage surveys 1986-1995. Percentage of trees in Classes 2-4 (defoliation >25 per cent). All species.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Austria	-	-	-	11	9	8	7	8	8	7
Belarus	-	-	-	67	54	-	19	29	37	38
Belgium	-	-	-	15	16	18	17	15	17	24
Bulgaria	8	4	7	25	29	22	23	23	29	38
Croatia	-	-	-	-	-	-	16	19	29	-
Czech Republic	-	-	-	-	-	-	56	53	60	60
Denmark	-	23	18	26	21	30	26	33	36	37
Estonia	-	-	9*	28*	20*	28*	28	20	16	14
Finland	-	12	16	18	17	16	14	15	13	13
France	8	10	7	6	7	7	8	8	8	12
Germany	-	-	-	-	-	25	26	24	24	22
- f. East	-	-	14	16	36	-	-	-	-	-
- f. West	19	17	15	16	16	-	-	-	-	-
Greece ¹	-	-	17	12	18	17	18	21	23	25
Hungary	-	-	8	13	22	20	22	21	22	20
Ireland	-	0*	5*	13*	5*	15*	16*	30*	20*	26*
Italy	-	-	-	9	15	16	18	18	20	19
Latvia	-	-	-	-	36	-	37	35	30	20
Lithuania	-	-	3	22	20	24	18	28	25	25
Liechtenstein	19	19	17	12	-	-	16	-	-	-
Luxembourg	5	8	10	12	-	21	20	24	35	38
Moldova	-	-	-	-	-	-	-	51	-	-
Netherlands	23	21	18	16	18	17	33	25	19	32
Norway	-	-	21*	15*	18	20	26	25	28	29
Poland	-	-	20	32	38	45	49	50	55	53
Portugal	-	-	1	9	31	30	22	7	6	9
Romania	-	-	-	-	-	10	17	20	21	21
Russia ²	-	-	-	-	-	-	-	-	11	12
Slovakia	-	-	39	49	42	28	36	38	42	43
Slovenia	-	-	-	23	18	16	-	19	16	25
Spain	-	-	7	4	5	7	12	13	19	24
Sweden	-	6*	12*	13*	16*	12*	17*	11*	16*	14
Switzerland	10	12	9	10	16	16	13	15	18	25
Ukraine	-	-	-	-	-	6	16	22	32	30
United Kingdom ³	-	22	25	28	39	57	58	17	14	14
Yugoslavia ⁴	-	-	-	-	-	10	-	-	-	-

* Conifers only. ¹Excluding maquis. ²Data only from Kaliningrad and St. Petersburg regions.

³Change of assessment method between 1992 and 1993, in line with that used in other states.

⁴Former Yugoslavia; Croatia and Slovenia excluded.

Great gains from reducing emissions

The effect of the second sulphur protocol that was signed in 1994 should be to reduce the total of European emissions by about 60 per cent between 1980 and 2010. The cost of the necessary measures is estimated to be \$13 billion a year. There will on the other hand be considerable gains. According to two British researchers, Helen ApSimon and David Cowell, the lower sulphur emissions will result in the cost of damage to buildings falling by \$10 billion a year. *Statistics Norway* has pointed out however that the macroeconomic effects of air pollution damage should also be taken into account. If that is done, the cost of damage to materials increases by 48 per cent. It is clear, despite some uncertainty in the calculations, that the savings on building maintenance alone will outweigh a greater part if not the whole of the costs of control. There will in addition be other gains, such as improved health, less acidification of soil and water, and less crumbling of cultural monuments.

Enviro No. 21. September 1996.

East German progress

The emissions of sulphur dioxide from east German power plants have, according to VDEW, the German power industry's trade association, been halved since the wall fell. Last year they amounted to 910,000 tons, as against 1,840,000 in 1990. The improvement is partly a result of a number of old plants having been shut down (during the period east German electricity output dropped by a quarter). But just as much can be ascribed to re-equipment of the remaining plants.

Ny Teknik. No. 40, 1996.

Bad air in Indonesia

Rapid growth in the number of vehicles in Indonesia – more than 20 per cent annually – is contributing to sharply accelerating health costs. Death rates from respiratory illness in the capital, Jakarta, are already twice the national average; there the costs of air pollution are estimated at about US\$500 million annually – a figure expected to double over the next five years, according to a World Bank report published last May. The report called on the government to consider immediate measures such as phasing out leaded petrol, limiting diesel engines, and setting new restrictions on two-stroke motorcycle engines.

Car Lines. M.P. Walsh. No. 4, July 1996.

Declaration promises unkept

MOST OF THE COUNTRIES that had agreed not to emit more nitrogen oxides in 1994 than they did in 1987 have done what they said they would. Not all of the twelve, on the other hand, that had issued a declaration at the same time, saying they would do better, have succeeded. In general, too, countries are taking a long time to ratify agreements signed under the Convention on Long Range Transboundary Air Pollution.

Under the nitrogen-oxide protocol that was signed in Sofia in 1988, all countries undertook to have contained their emissions in 1994 at 1987 levels and not to exceed them thereafter. The figures for 1994 show however that four countries did not manage to fulfill even that modest commitment (see Table 1). The worst performer was Spain, which had increased its emissions by more than a third.

The twelve countries that had issued a special declaration at Sofia did so because they thought the sights had been set far too low in the protocol. They went further by undertaking to reduce their own emissions of

nitrogen oxides by amounts "in the order of" 30 per cent by 1998, reckoned from any one year between 1980 and 1986. To judge from Table 2, however, it seems that only half of them will succeed in living up to their commitments – that half comprising Austria, Switzerland, Liechtenstein, the Netherlands, Denmark and Germany.

With a generous interpretation of "in the order of 30 per cent" the list

*Seems only half will
succeed in living up
to their commitments*

might also be made to include Sweden and Norway. There is on the other hand distinct doubt attaching to the Netherlands; whereas a halving of its present emissions was forecast for 2000, between 1986 and 1994 they had only fallen by 10 per cent.

The country that will fail worst, according to forecast, is Italy, which instead of reducing its emissions by 30 per cent, will increase them by 15 per cent. The other countries – Finland, France, and Belgium – will have to make great efforts if they are to catch up with their commitments.

A hitch in respect of the last two protocols has been the time it has taken from signing to ratification. For a protocol to come into force, it must have been ratified by the legislatures of a sufficient number of states, which usually means sixteen. Until that has been done, it is not legally binding, and if the international efforts to protect the environment are to retain respect, it is important that this last stage of the process should not be allowed to fall into neglect.

The protocol on volatile organic compounds, which was signed in 1991, has so far been ratified by only fourteen of the twenty-three signatories. The countries that have been holding back (in November 1996) are Belgium, Bulgaria, Canada, France, Greece, Portugal, Ukraine, the United States, as has the European Union. Of the twenty-eight countries that signed the second protocol for sulphur, in June 1994, by November 1996 only four had ratified. Those were the Netherlands, Luxembourg, Norway, and Sweden. One wonders why the others are delaying.

PER ELVINGSON

The above figures are those supplied by the countries themselves, as presented in this year's EMEP report. See article on p. 12.

Table 1. Compliance with the 1988 protocol concerning the control of NOx emissions (target 0 per cent).

Change in emissions 1987-94 (%)

Signatories to the protocol

Czech Republic	-55
Ukraine	-48
Hungary	-31
Russian Federation	-25
Austria	-24
Belarus	-23
Bulgaria	-21
Switzerland	-20
Germany	-20
United Kingdom	-13
Netherlands	-12
Slovakia	-12
Denmark	-10
Sweden	-10
France	-7
Norway	-5
Luxembourg	-5
Finland	-2
Ireland	+6
Italy	+8
Spain	+38

Signed but not ratified

Poland	-28
Greece	0
Belgium	+9

Table 2. Emissions of nitrogen oxides in the twelve countries that signed the Sofia declaration 1988 (commitment to reduce them by 30 per cent between 1980/86 and 1998). 000 tons NO₂.

Country	Emissions base year ¹	Emissions 1994 (change in %)	Forecast 2000 (Change in %)	Fulfilling commitment
Austria	246 (1980)	177 (-28)	155 (-37)	Yes
Liechtenstein	0.71 (1980)	0.54 (-24)	0.41 (-42)	Yes
Switzerland	179 (1985)	140 (-22)	117 (-35)	Yes
Netherlands	587 (1986)	526 (-10)	249 (-58)	Yes
Denmark	312 (1986)	272 (-13)	203 (-35)	Yes
Germany	3683 (1986)	2872 (-22)	2470 (-33) ²	Yes
Sweden	454 (1980)	392 (-14)	312 (-31)	(No)
Norway	229 (1986)	225 (-2)	161 (-30)	(No)
Belgium	442 (1980)	350 (-21) ³	350 (-21) ⁴	No?
France	1823 (1980)	1521 (-17) ³	1521 (-17) ⁴	No?
Finland	295 (1980)	283 (-4)	224 (-24)	No
Italy	1804 (1986)	2050 (+14) ³	2098 (+16)	No

¹ Signatories are allowed to choose any year between 1980 and 1986 as their base year. The figures here are for the highest year 1980-1986. ² The official forecast was 2,130,000 tons in 2005. The figure for 2000 assumes a linear reduction between 1994 and 2005. ³ Data for 1993. ⁴ No forecast presented. Emissions assumed unchanged.

Framework directive now approved



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THE FRAMEWORK directive on ambient air quality was finally approved by the EU Council of Ministers in September, with a text that is largely similar to that of the draft which was reported in Acid News 4/95 (p.4).

This framework directive gives general directions for the work on air quality that is to be carried out within the European Union. Some salient points are:

- The definition and fixing of objectives for air quality, with the goal of avoiding, preventing or reducing harmful effects on human health and the environment as a whole.
- The assessment, on the basis of common criteria and methods, of the quality of the air in the member states (discrepancies in methods now prevent comparisons).
- The provision of adequate information, in particular to the public.
- The preservation of air quality where it is good and improvement where it is less than ideal.

Exact limit values as well as alert thresholds are among the requirements that are to be set down in various daughter directives. Drafts of these are to be presented by the Commission at the latest by:

- December 31, 1996 for sulphur dioxide, nitrogen dioxide, fine particles, suspended particles, and lead.
- December 31, 1997 for benzene and polycyclic aromatic hydrocarbons.

March 1, 1998 for ozone (in accordance with directive 92/72).

As soon as possible, but by December 31, 1999 for carbon monoxide, cadmium, arsenic, nickel, and mercury.

The member countries are to prepare short-term plans indicating what measures they will take if limit values are exceeded. These plans can include measures to control, and if necessary suspend, activities contributing to violations. Members are in any case required to take appropriate measures in areas where the levels of one or more pollutant are exceeding the limit values.

Of all the twenty-three amendments that the Parliament wanted to see made in the draft, the ministers agreed only on three – one being that members must not only keep the Commission informed of the state of air quality in their country, but also their own citizens. Among the proposals that the ministers rejected was a lowering of the size of urban areas where air quality has to be measured from 250,000 to 100,000 inhabitants, a stricter definition of target values, and the addition of a third list of pollutants (including dioxins, volatile organic compounds, methane) as an annex to the directive. Commenting on the directive, the European Environmental Bureau expressed the opinion that although it will be a great improvement compared with current legislation, more regard should have been taken to the Parliament's views.

Vital for future air quality will now be the limit values set in the daughter directives. The openness with which the preparatory work on them has been conducted has so far been exemplary, allowing NGOs and others to attend as observers. More information will be forthcoming in later issues of Acid News.

Further details can be obtained from Annette Hauer, European Environmental Bureau, 26 rue de la Victoire, B-1060 Brussels, Belgium. Fax: +32-2-5390921. E-mail: eeb@gn.apc.org. EEB is an umbrella organization for environmentalist NGOs in EU countries.

Not only aiding the environment

ENVIRONMENTAL TAXES can deliver a "multiple dividend" for both the economy and the environment and should be used more widely, is the dictum of EEA, the European Environment Agency, in a report* commissioned by the environmental committee of the EU parliament.

In many countries the use of environmental taxes has increased during the last five or six years, although less has been done within the Union. While the Scandinavian countries are named in the report as especially good examples, Belgium, the Netherlands, France, Germany, Great Britain, and Austria also get favourable mention.

All the sixteen examples of environmental taxes examined in the report are considered to have yielded gains to the environment, and in most cases, cost-effective gains. Environmental taxes were found in general to be a means that produces quick effects, often within two to four years. In the case of energy taxes, however, it will take up to 10-15 years before any substantial change in consumption becomes evident. As examples of taxes that have done well, the report mentions the Swedish ones on sulphur and nitrogen oxides (AN 3/93, p.9), a toxic-waste tax in Germany (Baden-Württemberg), as well as the differential tax schemes used in Sweden for vehicle fuels.

The conclusion is that well-formed environmental taxes can lead to improvements in the environment, employment, innovativeness, and competitive status, as well as aiding the tax system in general. While emphasizing the need for more research, the report notes that there is sufficient knowledge already at hand to "justify much further policy development on environment taxes."

To be successful such taxes should be well formulated and introduced gradually.

* *Environmental Taxes: Implementation and Environmental Effectiveness*. EEA Environmental Issues series No. 1. Available from EEA, Kongens Nytorv 6, 1050 København K, Denmark. Fax +45-33 36 71 99.

Ever more consumed

BETWEEN 1980 and 1994 the price of motor fuel had, according to Eurostat, the EU statistical office, sunk in relation to people's disposable income by more than a third (see table below). This is said to be a main reason for the simultaneous increase in consumption in the union from 140 to 200 million tons a year.

The increasing demand is described as "unsustainable," and said to be one of the main obstacles to achievement of the goal of EU's transport policy for "sustainable mobility" (the other being a voracious demand for ever more land for roads).

The office also questions the sense of taxing diesel fuel at a lower rate than petrol, saying: "In the light of the harm to human health that diesel particulates and oxides of sulphur can cause, such differentials do not seem to be justified on environmental grounds, despite a small advantage in energy efficiency" (meaning: despite diesels consuming less fuel).

It also appears from Eurostat statistics that the proportion of EU energy consumption taken by transportation is steadily increasing. Whereas in 1960 it was 16.7 per cent, by 1994 it had grown to 30.8 per cent. In 1994 the transportation sector had taken 64 per cent of the oil products, and of that 64 per cent, 84 was used up in road transports.

Eurostat Statistics in Focus: Environment. 1996/2. *Road transport and the environment - Energy and fiscal aspects*. Obtainable from Eurostat, Luxembourg. Fax. +352 4301 32594.

Percentage of per capita net disposable income required to buy 1000 litres of a weighted mix of fuel.

	1980	1994
Belgium	6.6	4.1
Denmark	6.4	3.4
Germany	7.3	4.0
Greece	13.0	8.6
France	6.8	4.1
Ireland	13.0	8.6
Italy	9.3	5.9
Luxembourg	4.4	2.1
Netherlands	6.2	4.7
United Kingdom	8.2	5.1
Average EU-10	7.7	4.9

Praised and criticized

IN A LECTURE entitled *The Diesel Dilemma: Is the Commission Proposal Adequate?* the American traffic consultant Michael P. Walsh recently both praised and criticized the EU Commission's auto-oil package* (see Acid News 4/96).

Walsh picked out especially for comment the Commission's proposals for diesel-driven vehicles, with regard to their relatively large emissions of nitrogen oxides and particulates. Among the aspects he noted approvingly were:

- The separate standards for nitrogen oxides and volatile organic compounds. In the past they were combined in a single standard, making it impossible to assure a full degree of control for nitrogen oxides.
- Enforcement in two stages, in 2000 and 2005. This will allow those member countries that so wish to take advantage of market forces to bring about low-pollution technologies more quickly. It will also help manufacturers by giving clear signals in advance.
- Makers' responsibility for seeing that their vehicles fulfill the requirements, with the possibility of ordering recalls if they do not.

In a number of cases, however, Walsh was critical of the Commission's proposals.

- The proposed NO_x levels for diesels are consistently more than three times higher than those for petrol-fuelled vehicles. This provides a potential for severely undermining the overall goal of achieving 60-70-per-cent reductions in NO₂ and ozone by 2010. For every 10-per-cent increase in the number of light-duty diesels on the roads there will be a more than 20-per-cent raising of the effective NO_x standard for light-duty vehicles.
- Particulate levels will remain at least ten times higher than the amounts coming from comparable petrol-driven vehicles. In view of the warnings regarding the serious effects on health coming from WHO, these levels would appear to be unacceptably high. Moreover recent evidence indicates that engine modifications alone - such as would suffice to meet the proposed requirements - tend to reduce the mass of particu-

lates but not their number. In fact they may actually increase the number of small particles. Although more research will be needed, there is already much to suggest that it is the number of particles that matters, not their weight.

Among the conclusions that Walsh draws are the following:

- In setting NO_x standards for diesel-driven vehicles, consideration should be given to health and the environment, rather than to what present diesel technology is thought to be capable of managing. There is no reason for permitting diesels to emit more than petrol engines.
- The only technology that is at present available for reducing both the mass and number of particles is particle traps. The EU standards should be set at such levels as to make particle traps obligatory.
- A general switchover from petrol to diesel would admittedly reduce emissions of the greenhouse gas carbon dioxide, but in order not to add to the health risks, the emissions of NO_x and particulates from diesels will have to be much more strictly regulated than the Commission is proposing.

* Held at the 4th International Conference on the Automotive Industry and the Environment, on September 17-18, in Brussels.

Chinese dilemma

At the same time as the Chinese central government has been declaring passenger-car production to be the key to economic growth, restrictions on the use of autos are being introduced in metropolitan Beijing. By employing an odd-even system, by which vehicles with number plates ending in an odd figure may be used on days with odd dates, and those with figures ending with an even number on even dates, the city Public Security Bureau hopes to bring about an improvement in air quality and reduce traffic congestion. On some streets today the average speed is no more than 8-10 kph.

Last year China produced 11.6 million motor vehicles, of which 240,000 were passenger cars. The total automobile output is expected to double within five years, and emissions standards for different types of vehicle are in process of development.

Car Lines. M. P. Walsh. No. 4, July 1996.

Dangerous air

A World Bank study shows that air pollution is killing 40,000 people a year in thirty-six Indian cities. In the same cities it also leads to nearly 20 million hospital admissions each year. The average annual level of particle pollution is more than five times the WHO standard. With an annual toll of 7500, Delhi has the largest number of pollution-related deaths, followed by Calcutta with 5700. The authors of the study say that their estimates of the effects of smog are likely to be too low, because they are based on studies in more developed countries, where people have a better standard of nutrition and so may be less susceptible to the effects of pollution. About 70 per cent of the smog in Delhi comes from vehicles, mostly from the two-stroke engines of scooters and rickshaws.

New Scientist, October 12, 1996.

Climate ignored

Governments that want to successfully implement climate policies should avoid labelling them as such, because climate policy on its own does not command widespread public support or effective political weight. In order to be successful, climate policy should be attached to some issue that has greater political appeal, says IIASA in a new study.* The institute has found it to be a general pattern in Europe that the UN Climate Convention is taken seriously in some departments of national government, but that there is no coordinated effort to align all government agencies on the issue. In most countries only the environment and foreign ministries are extensively involved in climate policy. There is little or no involvement on the part of the ministries of finance, trade, or industry. Links to employment, social security, and education were lacking in all the countries studied.

* **Politics of Climate Change: A European Perspective.** By J. Jäger and T. O'Riordan. Published by Routledge Publishing, London.

Switching taxes

A report by the Institute of Public Policy Research, a British "think tank," has called on the government to adopt more environmental taxes in order to switch the national tax burden from labour to consumption. The switch could create up to 700,000 jobs in ten years, while reducing carbon dioxide emissions by 9.5 per cent and solid waste by 16 per cent. Among the proposals are higher levies on waste disposal and road fuel, the introduction of energy taxes on commerce and industry, and a levy on quarrying.

Environment Watch: Western Europe. October 18, 1996.



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ENERGY

Sustainable system seen possible

THAT NUCLEAR POWER could be phased out in Sweden by 2010, and emissions of carbon dioxide reduced at the same time, is the thesis of a report by the energy analyst and writer on environmental matters, Fredrik Lundberg, who has been investigating the situation on behalf of five of the country's environmentalist organizations.

At present nuclear power plants supply about half of Sweden's electricity, most of the rest being of hydroelectric origin. Even with nuclear power out of the picture, carbon-dioxide emissions could be reduced by

a third through a more efficient use of electricity, a much greater use of biofuels, and adjusting the incidence of taxation, Lundberg maintains. And to make matters clearer he examines each of these possible lines of remedial action in turn:

MORE EFFICIENT USE OF ELECTRICITY. Consumption per capita is three times higher in Sweden than in the European Union at large. Power-intensive industries, or indeed industry in general, figures relatively low in this respect. A great deal of electricity is on the other hand used for space heating and in thoughtless

systems for ventilation and lighting. Electricity is sometimes even used for heating the water for district heating – despite the fact that district heating was developed for precisely the opposite purpose, to make use of the waste heat from electricity production.

That extravagant use should be widespread is hardly surprising, seeing that electricity prices have been extremely low in Sweden for a long time, and the aim of energy policy has been primarily to save oil, even at the expense of a greatly increased use of electricity.

MORE BIOFUELS. Sweden is about equal in area to France and Spain, and a greater part of the country is covered with forest. Even with allowance made for nature protection and the needs of the sawmilling and pulp-making industries, much of the biomass could be burnt to produce heat and power.

Biofuels already constitute a large source of energy in Sweden, both for district heating and as fuel for pulp-making. They account for twice as much of the country's total energy consumption as coal and natural gas together. Since forest growth is greater than the cut, extraction could be increased, and more of the waste made use of. Special energy species are also being planted on set-aside arable land, so that altogether the supply of biomass will increase.

TAX ADJUSTMENTS. At present tax rates, biofuels are competitive in many uses. Following the imposition of a general tax on emissions of carbon dioxide in 1991, corresponding to about 4 cents (US) per kilogram, they have already replaced coal to a very considerable extent in district heating.

But the tax on carbon dioxide, which has been altered several times, still shows a lot of discrepancies. Fossil fuels used in the generation of electricity are not even taxed, even for the production of combined heat and power, which gives opportunities for juggling the accounts. Peat is not reckoned as a fossil fuel, despite its being so accounted in Swedish and international CO₂ statistics. Manufacturing industries, with many possibilities for switching fuels or using energy more efficiently, pay a much lower CO₂ tax than householders and traders, which have very much fewer options. Some of the big coal users, such as steelworks, pay no marginal

CO₂ tax at all, and so have no incentive to abandon coal.

There are similar discrepancies in electricity taxation. Industrial undertakings pay no electricity tax, and district-heating utilities only at a reduced rate. Subsidies are paid to wind-power and combined-heat-and-power companies using biofuels, despite there being an overcapacity in electricity production.

One of the arguments in Lundberg's study is that a more uniform application of the existing energy and environmental taxes – where the loopholes are few and hedged about with environmental restric-

*Tax adjustments would
lead to less dependence
on nuclear power
and fossil fuels*

tions – would lead to less dependence on nuclear power as well as lowered carbon-dioxide emissions. There would then hardly be any need, either, to subsidize renewables.

As regards the future, Lundberg writes off long-term planning as a hopeless undertaking, since it is impossible to foresee what technical developments will take place or which technique will be most cost-effective at a certain moment. "A sustainable energy system is a moving target, and the more detailed the planning, the greater the certainty that things will turn out differently."

Society should instead, he says, think in terms of the desired direction for development. If the aim is to phase out nuclear power and reduce carbon-dioxide emissions, then the means of control should be strengthened – the laws, taxes, subsidies, and spread of information that operate to that end while at the same time undermining or abolishing anything that opposes it.

Lundberg also makes some prognostications in regard to future developments.

□ Biofuels and combined heat and power will be paramount in a sustainable energy system for Sweden. Combined-cycle units, with gasification of wood and the black liquor from pulpmaking, will be built to replace that part of the electricity from nuclear plants that cannot be

substituted through more efficient use. Whereas today's heat-and-power plants produce half a unit of electricity to one unit of heat, combined cycle is capable of generating just as much electricity as heat or even more. Just now the technique is in the course of passing from the development to the demonstration stage.

□ The potential for a more efficient use of energy, and especially of electricity, is enormous – and for Sweden in particular, where consumption is exceedingly high by any international comparison. But this concerns thousands of applications, and progress is often taking place with extreme rapidity. In traffic lights, for instance, incandescent lamps are being replaced with halogen types, thus halving consumption of electricity. Light-emitting diodes could reduce it by 80-90 per cent, although the technique only left the laboratory stage in the spring of this year. Nevertheless, specially designed diode posts will probably be available already next year.

Progress can also be hastened by asking for quotations for as-yet undeveloped products. The possibilities have been demonstrated by the efficiency-promoting unit of Nutek, the Swedish agency for energy and technique development. It involves getting a group of bidders to agree on a specification for a product that is deemed technically possible but does not yet exist in reality. The winner is guaranteed a certain amount of orders, and often gets substantial publicity into the bargain. In this way more energy-efficient refrigerators, heat pumps, and windows, among other things, have come onto the market earlier than would otherwise have been the case.

It is often maintained, in respect of nuclear power, that it is destructive of capital to close down a reactor when it might be still kept in operation. Lundberg denounces such reasoning as technically and economically naive, saying that there is no well-defined technical or economic lifetime for an old reactor, any more than for an old car.

* *Går miljömålen att förena? Möjlig el- och koldioxidbalans år 2010.* (Can differing environmental aims be made to coincide? Electricity production and carbon-dioxide emissions in 2010.) Available in Swedish only. Can be ordered from the Swedish Society for Nature Conservation, Box 4625, 116 91 Stockholm, Sweden.

A miscalculation

HIGH-SPEED TRAINS have now been running in Europe for about a decade and a half. Yet they have still done little to dent travel by road and air, as the initiators had hoped and claimed they would.

Since short-haul air travel is highly polluting and wasteful of resources, any reduction is of course welcome. But it is just as important to curtail car trips and provide alternative forms for commuting as well as long-distance journeying by car. The question is just whether high-speed trains are the best solution, or whether the idea is an illusion.

Passengers have switched from air travel to high-speed trains on some domestic routes, such as Stockholm-Göteborg, where 60 per cent have made the change, and Madrid-Sevilla (32 per cent), and Hamburg-Mannheim (8 per cent). But rather than falling, the total of airline passenger-kilometres has continued to rise, by 4-6 per cent a year – with a marked increase especially on longer-haul routes.

The routes for high-speed trains are always laid between cities that are already on the upswing economically and politically – thereby accelerating a process that leads to more business, more jobs, and ever greater prestige for those places, and incidentally hastening the depopulation of the countryside.

A further disadvantage of the high-speed lines is that they tend to form a barrier to the movement of other kinds of traffic, causing people living anywhere near the line to make longer trips than they would otherwise. The time saved for a few travellers means more time wasted for the community as a whole. Furthermore, the high financial cost of the lines has "forced" several railway companies either to pare down ordinary rail traffic, close stations and small local lines, or raise ticket prices exor-

bitantly – again with an impoverishing effect on rural areas.

High-speed trains meet the need of a well-heeled minority for a rapid means of travel over longish distances at the expense of the majority of travellers. The low seat utilization – averaging 50 per cent, but less than 20 per cent on some routes, such as London-Brussels – indicates an excessively expensive transportation system which nevertheless fails to realize the hopes initially placed on it.

A system that really meets people's need and affects the environment as little as possible should be based on these principles:

- A maximum advantage for the greatest number of users, both business and private.
- A spread of the advantages (and disadvantages), to avoid channelling onto a few routes.
- Careful use of limited finance.

ARNE LUND

The writer is active in the Danish environmentalist organization NOAH (FoE Denmark) and author of the book *Om højhastighetstog, opgraderede baner og de mulige følger deraf*. In Danish only. Available from NOAH, Nørrebrogade 39, DK-2200 København N, Denmark. Fax: +45-35-361217.

Which is best?

The Swedish state railways has been programming environmental data so as to make it possible to determine the environmental costs of transportation. The basis has been independent studies of the emission factors for various modes of transport combined with official estimates of the environmental costs of air pollutants. It is calculated for example that a trip between Stockholm and Göteborg (450 km) by high-speed train with 50-per-cent seat occupancy costs in terms of environment 0.76 kronor. Flying costs the most – almost 48 kronor (at 65-per-cent seat occupancy). Travelling by bus or car comes inbetween, with costs of 25 and 34 kronor respectively (assuming a 50-per-cent seat occupancy for the bus and a catalyzer-equipped car with one passenger).

The aim of the program has been to provide information for companies and individuals on the environmental cost of travelling, since this factor is invisible in today's prices.

Further details from SJ Stab Information, S-105 50 Stockholm, Sweden.

Recent publications

Revision of Calculated Critical Loads for Nitrogen in Denmark (1996)

By J. Bak and K. Tybirk. This attempt at calculating the critical loads for nitrogen in respect of eutrophication shows them to be greatly overstepped in most ecosystems.

20 pp. 50 kroner. Report No. 23. Can be ordered from the National Environmental Research Institute, Vejlsøvej 25, P.O. Box 314, 8600 Silkeborg, Denmark.

Developments in NOx abatement control (1996)

By H. Soud and K. Fukasawa. A review of the various technologies for reducing the emissions of nitrogen oxides from combustion plants. Techniques that can be applied before, during, and after combustion, as well as combined methods for reducing NOx and sulphur dioxide are compared both from the technical and economic points of view.

123 pp. Available from Publications Dept., IEA Coal Research, Gemini House, 10-18 Putney Hill, London, England SW15 6AA. Fax: +44-181-780 1746.

Energy Policies of IEA Countries: 1996 Review

Reviews recent trends and developments in energy demand and supply, efficiency, technology, and for the environment in all twenty-three member countries. Summaries of in-depth reviews of the situation in Canada, France, Netherlands, Portugal, Spain, and Sweden.

360 pp. FF 380. Can be ordered from OECD Publications Service, 2, rue André-Pascal, 75775 Paris cedex 16, France. Fax: +33-1-49104276.

Towards Clean Transport: Fuel Efficient and Clean Motor Vehicles (1996)

Pollution from motor vehicles is a major environmental challenge for the coming decades. Should we make motor vehicles more fuel-efficient and more benign for the local and global environment? Or should we attempt to curb or even reduce the growth in the number of vehicles and their use? This publication presents a discussion on possible strategies for combining these approaches, held at a conference in Mexico City.

600 pp. FF 475. Obtainable from OECD, address as above.

Transport and acidification

Special issue of the magazine *Enviro*, No. 21, September 1996. Subscription is free of charge. Please apply to the Swedish Environmental Protection Agency, S-106 48 Stockholm, Sweden.

What do you say?

In this article Arne Lund has given his views on high-speed trains. What are yours on the matter? Are there any others you would especially like to see taken up in *Acid News*? If so please write or fax us.

The latest monitoring figures

EMISSIONS OF SULPHUR in Europe continue their downward trend. According to the latest data they amounted in 1994 to 14.6 million tons (reckoned as pure sulphur), which is just about half the figure for 1980. Nitrogen oxides are also on the way down, falling slowly after reaching a peak during the second half of the eighties. Emissions in 1994 were 8 per cent lower than in 1980.

The figures come from EMEP, the European Monitoring and Evaluation Programme, and are based on information supplied by each of the participating countries. Besides the country-by-country data, the EMEP report includes estimates of the natural emissions of sulphur from the seas (production of dimethyl sulphide by phytoplankton), as well as from shipping engaged in international trade. There is however no data on the latter from the Mediterranean and Black Sea, and that from other seas is probably an underestimate. See Table 1.

Together with meteorological data, the emissions data form the basis for calculations in a computer model, using advanced mathematical procedures to describe the transformation and deposition of pollutants as they move about over Europe, with field checks of concentrations and fallout to control the computer results.

Since a considerable part of the depositions in western Europe cannot be attributed to any specific country, they have to be ascribed to indeterminate sources (IND). Two-thirds of them are nevertheless thought to emanate from within Europe, the rest being carried in by winds from North America and Asia.

The latest figures for exports and imports of sulphur and oxidized nitrogen compounds are to be seen in Tables 2 and 3. Since weather and air currents may cause relatively large differences in the transports of pollutants, the values in the tables represent averages for 1994 and 1995 (1994 emission figures run with those years' weather data).

The EMEP reports are of importance in providing a check on the extent to which signatories to inter-

national agreements are fulfilling their obligations, as well as showing the general effect of such agreements (see article, p.8). The data they provide is moreover needed when agreements are being negotiated under the Convention on Long

Range Transboundary Air Pollution.

PER ELVINGSON

Transboundary Air Pollution in Europe. MSC-W Report 1/1996. Available from the Norwegian Meteorological Institute, P.O. Box 43-Blindern, N-0313 Oslo 3, Norway.

Table 1. Emissions of sulphur and nitrogen oxides (1000 tons a year).

		Sulphur		Nitrogen oxides (as NO ₂)	
		1980	1994	1980	1994
Africa, north		[256]	[256]	[100]	[100]
Albania	AL	[60]	[60]	[30]	[30]
Austria	AT	198	37	246	177
Belarus	BY	370	190	234	2073
Belgium	BE	414	147*	442	350*
Bosnia & Herzegovina	BA	240*	240*	[54]	[54]
Bulgaria	BG	1025	742	416*	327
Croatia	HR	75	44	83*	59
Czech Republic	CS	1128	635	937	369
Denmark	DK	226	78	274	272
Estonia	EE	[138]	[70]	[72]	[43]
Finland	FI	292	58	295	283
France	FR	1669	565*	1823	1521*
Georgia		[81]	[81]	[188]	[188]
Germany ¹	DE	3758	1498	3657	2872
Greece	GR	200	255*	306*	306*
Hungary	HU	816	370	273	183
Iceland	IS	3	12	13	22
Ireland	IE	111	78*	73	122*
Italy	IT	1900	745*	1480	2050*
Kazakstan		[70]	[70]	[76]	[76]
Latvia	LV	[58]	[58]	[93]	[93]
Lithuania	LT	[111]	[111]	[158]	[158]
Luxembourg	LU	12	6	23	21
Macedonia ²	FYM	[5]	[5]	[2]	[2]
Moldova	MD	[46]	[46]	[35]	[35]
Netherlands	NL	245	74	583	526
Norway	NO	70	18	184	225
Poland	PL	2050	1302	1229	1105
Portugal	PT	133	136	96	254
Romania	RO	881*	280*	369*	443*
Russian Federation ³	RU	3580	1492	1734	1995
Slovakia	SK	390	119	197*	173
Slovenia	SI	118	88	48	66
Spain	ES	1660	1036*	950	1227*
Sweden	SE	254	48	454	392
Switzerland	CH	58	16	170	140
Turkey ³	TR	430	177*	[175]	[175]
Ukraine	UA	1924	858*	1145	568
United Kingdom	GB	2452	1359	2319	2219
Yugoslavia ⁴	YU	203	212	47	52
Int. trade, Baltic Sea	BAS	[36]	[36]	[80]	[80]
Int. trade, North Sea	NOS	[87]	[87]	[192]	[192]
Int. trade, rem. NE Atlantic	ATL	[158]	[158]	[349]	[349]
Int. trade, Mediter. Sea ⁵	MED	[6]	[6]	[13]	[13]
Int. trade, Black Sea	BLS	n o d a t a			
Biogenic sea emissions	NAT	[360]	[360]	[0]	[0]
Volcanic		[285]	[285]	-	-
Sum		28,644	14,607	21,718	19,942

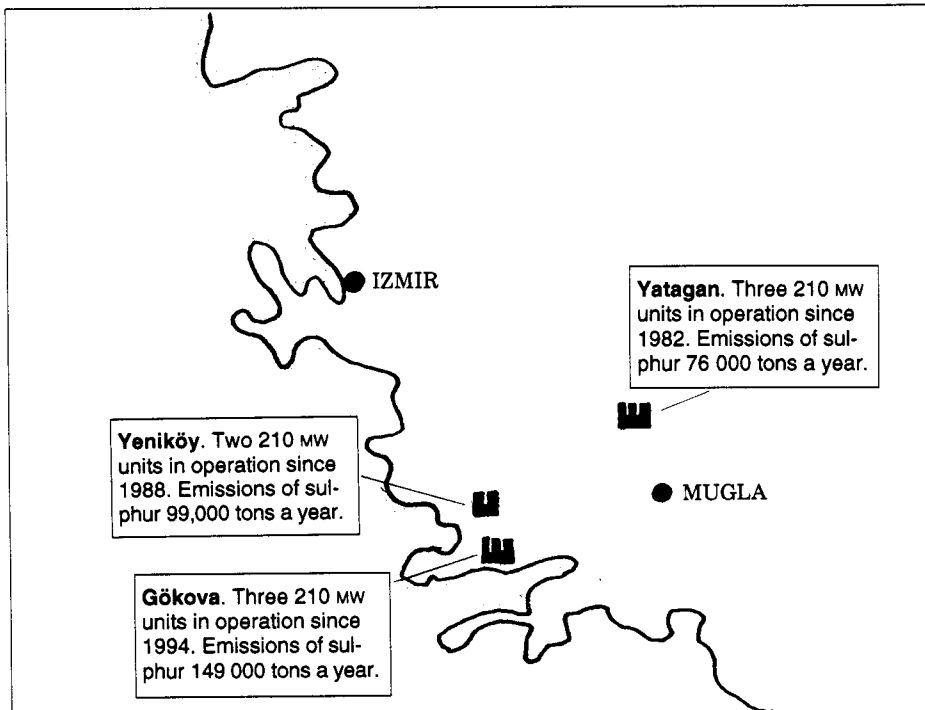
The table shows national official data received at the ECE secretariat. Data estimated by MSC-W/CCC are given in square brackets. * Interpolated data (no data have been officially submitted). ¹ Incl. East Germany in 1980 figure. ² Former Yugoslavian republic of Macedonia. ³ Part within the EMEP area of calculation. ⁴ Former Yugoslavia, excluding Slovenia, Croatia, Bosnia and Herzegovina, and Macedonia. ⁵ Data for the vicinity of Gibraltar only.

Table 2. Provisional estimate of sulphur budget for Europe. Average for 1994-95. Total deposition of sulphur. 100 tons per year.

	AL	AT	BE	BG	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	YUFYM	CS	SK	REMBAS	NOS	ATL	MED	NAT	IND	SUM				
AL	65	0	0	24	0	0	2	6	31	6	0	0	32	0	0	0	5	0	3	3	0	0	1	1	0	3	0	0	0	0	0	0	1	13	14	1	4	1	17	0	0	0	0	1	58	294		
AT	1	52	12	4	2	0	60	202	2	50	0	1	105	0	4	0	64	0	4	12	0	7	0	28	1	4	0	0	0	0	1	57	6	9	10	0	135	21	4	0	4	1	0	2	174	1045		
BE	0	0	170	0	0	0	106	50	0	0	0	2	2	20	0	0	6	0	0	10	0	0	0	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	14	2	0	2	42	522	
BG	13	2	2	986	1	0	4	37	26	49	0	0	18	0	0	0	44	0	105	2	0	0	8	4	3	46	7	7	0	0	2	2	4	32	86	2	24	10	8	0	0	0	0	1	200	1736		
DK	0	0	7	0	66	0	10	76	0	2	0	2	1	0	4	1	38	0	0	2	2	0	0	74	1	1	0	0	0	0	1	1	0	0	0	0	0	18	1	5	9	1	0	4	42	372		
FI	0	1	5	3	12	126	8	71	0	8	0	1	1	0	3	4	80	0	5	1	22	0	0	40	19	18	1	176	40	15	18	0	0	2	2	24	3	0	13	4	1	0	7	278	987			
FR	0	4	117	2	3	0	1281	204	0	11	0	10	130	8	27	0	40	13	3	399	0	10	0	279	0	3	0	0	0	0	1	6	2	4	4	0	54	4	16	0	44	35	0	28	594	3338		
DE	0	16	224	4	31	1	433	3242	0	34	0	112	76	14	98	1	280	1	6	62	3	12	0	482	3	12	1	4	0	2	4	9	2	4	6	0	642	16	6	8	60	10	0	16	5540	6376		
GR	29	1	1	310	2	0	4	16	236	18	0	0	32	0	0	0	19	0	22	4	0	0	20	2	2	22	2	4	0	0	0	1	2	18	30	2	10	4	38	0	0	0	0	3	207	1060		
HU	2	15	4	20	2	0	20	108	3	600	0	0	51	0	2	0	115	0	42	6	0	1	0	14	2	14	1	1	0	0	2	22	20	41	60	0	94	72	4	0	2	0	1	155	1499			
IS	0	0	0	0	0	0	2	1	0	0	12	1	0	0	0	0	0	1	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	32	70	
IE	0	0	3	0	0	0	10	8	0	0	0	108	0	0	1	0	2	0	0	6	0	0	0	97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	10	14	50	315	
IT	4	11	8	22	2	0	132	94	0	46	0	0	1305	1	2	0	48	2	8	56	0	11	1	20	1	4	0	0	0	1	48	22	46	24	0	54	11	302	0	2	2	0	9	528	2840			
LU	0	0	0	4	0	0	0	14	4	0	0	0	0	3	0	0	0	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	36		
NL	0	0	67	0	1	0	54	87	0	1	0	3	2	0	89	0	8	0	0	6	0	0	0	162	0	1	0	0	0	0	0	0	0	0	0	0	14	0	0	0	20	2	0	4	46	570		
NO	0	1	9	2	22	5	20	121	0	6	0	4	2	0	6	32	64	0	2	7	16	0	0	151	4	4	0	54	4	3	6	1	0	2	1	0	33	2	0	6	14	6	0	28	331	968		
PL	2	10	39	22	34	2	78	752	2	142	0	4	62	2	20	1	3300	0	31	14	8	2	0	162	21	66	4	23	4	8	34	12	6	19	24	0	707	80	2	16	17	4	0	8	490	7202		
PT	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	149	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	4	54	330
RO	7	6	5	240	2	0	18	109	10	248	0	0	40	0	2	0	173	0	595	4	1	1	6	16	11	142	24	16	1	2	6	10	10	71	158	1	82	51	8	1	2	0	0	2	362	2442		
ES	0	0	4	0	0	0	68	21	0	0	0	2	16	0	2	0	8	98	0	1752	0	1	0	24	0	0	0	0	0	0	0	1	0	0	0	0	0	6	0	20	0	2	34	0	14	354	2379	
SE	0	2	16	4	74	21	28	219	0	17	0	4	4	0	10	18	156	0	4	4	101	0	0	138	14	16	0	46	13	12	20	2	1	2	4	0	58	6	0	24	15	4	0	18	370	1446		
CH	0	2	6	0	0	0	69	28	0	3	0	0	106	0	2	0	4	1	0	15	0	26	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	87	387
TR	6	1	1	208	0	0	6	24	76	21	0	0	18	0	0	0	33	0	31	2	0	0	393	3	6	100	6	20	1	1	2	1	10	22	0	15	4	32	0	0	0	0	0	6	760	1812		
GB	0	0	34	0	4	0	96	84	0	3	0	52	4	1	20	0	22	2	1	38	0	0	0	2594	0	2	0	0	0	0	1	1	0	0	1	0	22	2	0	1	44	24	0	34	198	3289		
BY	0	3	8	23	8	4	18	204	2	50	0	1	10	0	4	1	490	0	23	5	4	1	2	34	366	132	7	60	10	22	78	4	2	8	10	0	95	20	2	5	3	1	0	2	303	2024		
UA	6	8	14	202	8	3	38	350	12	276	0	2	47	1	6	1	777	0	192	10	3	1	21	56	119	2206	76	198	8	10	32	14	10	44	71	0	205	92	17	4	5	1	0	6	925	6078		
MD	0	0	1	16	0	0	2	14	1	14	0	0	3	0	0	0	27	0	29	0	0	0	1	2	4	50	40	4	0	0	1	0	1	3	5	0	8	4	1	0	0	0	0	0	0	48	280	
RU	6	8	26	202	36	116	50	465	24	156	0	4	32	1	14	7	912	0	124	10	38	1	59	150	496	1598	38	5686	234	121	178	10	7	31	51	0	217	52	190	32	14	4	0	26	5266	16734		
EE	0	0	2	2	4	10	2	30	0	4	0	0	2	0	1	1	41	0	2	4	0	0	0	11	10	8	0	18	67	21	14	0	0	0	1	12	2	0	6	1	0	0	0	1	62	342		
LV	0	0	2	6	6	4	4	54	0	7	0	0	2	0	2	1	90	0	3	1	5	0	0	18	24	14	1	18	10	78	60	1	0	2	2	0	20	3	0	6	2	0	0	2	88	537		
LT	0	1	4	6	6	2	8	84	0	8	0	1	3	0	2	0	154	0	4	1	4	0	0	23	22	16	2	20	3	18	186	1	0	2	2	0	30	4	0	5	2	0	0	2	90	716		
SI	0	6	1	2	0	0	8	22	1	14	0	0	52	0	0	0	10	0	2	4	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	310	
HR	2	6	2	10	0	0	14	50	3	56	0	0	91	0	1	0	32	0	6	8	0	1	0	6	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	106	632
BA	4	2	2	16	0	0	8	36	6	37	0	0	48	0	0	0	24	0	7	6	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	106	737
YU	25	3	2	75	1	0	10	52	19	104	0	0	54	0	1	0	53	0	34	5	0	0	2	7	2	14	2	1	0	0	1	6	10	194	382	3	38	16	19	0	1	0	0	2	286	1322		
FYM	18	0	0	44	0	0	1	6	22	7	0	0	10	0	0	0	6	0	5	1	0	0	2	1	0	3	0	0	0	0	0	0	0	0	1	10	19	4	4	2	6	0	0	0	0	44	218	
CS	0	12	16	6	3	0	48	704	0	38	0	1	17	1	6	0	232	0	6	9	0	2	0	40	2	6	0	1	0	0	2	8	2	4	6	0	922	27	2	1	4	1	0	2	140	2273		
SK	1	10	4	9	2	0	14	108	1	162	0	0	18	0	2	0	180	0	13	3	0	1	0	12	1	10	0	0	0	0	2	6	4	10	14	0	114	145	2	0	1	0	0	1	86	940		
REM	2	1	2	30	1	1	38	34	12	16	0	0	78	0	1	0	40	6	9	79	0	1	13	13	13	152																						

ENVIRONMENTAL DESTRUCTION

Turkish lawyers' appeal



EVERY YEAR millions of tourists come to Turkey's southwestern corner, famed for its fine beaches, unique nature, and rich cultural history. But what the tourists usually not see is the extensive damage that is being done to the area. In the Mugla region there are three large coal-fired power plants operated by the Turkish ministry of energy and TEAS, the Turkish Electricity Authority – all lacking any form of flue-cleaning equipment.

Separated by no more than a few tens of kilometres from each other, they emit altogether 300,000 tons or more of sulphur every year, besides a variety of other pollutants. Open-cast mining of the coal has already devastated hundreds of thousands of hectares of fruit orchards and forest, on which the ash from combustion is also being deposited. Since there are no arrangements for containment, there is a clear threat to the groundwater, too.

Three years ago the Izmir Lawyers for Environment instituted legal ac-

tion at the Regional Administrative Court, claiming that the emissions from the three power plants were causing unacceptable damage to the environment. The court appointed three scientists from the universities of Izmir and Istanbul to look into the matter, and their conclusion was that the power operations were causing irreparable damage not only to fauna and flora but also to human health.

Consequently on June 20 this year the court issued an injunction call-

ing for immediate cessation of operations at the three plants. According to Article 138/4 of the Turkish constitution, "Legislative, executive powers and administration are obliged to obey the decision of the courts. These powers and the administration can never change and delay the implementation of the courts' decisions."

However, the Turkish Council of Ministers has breached the constitution by issuing a ruling on September 3 for the operation of the plants despite the court's decision. Thus, the Turkish administration did not obey the court adjudication. The Izmir Lawyers for Environment are now appealing for worldwide support for their demand that the court's decision should be upheld. *The emissions from the offending plants must cease.*

You are asked to address protests to:

- Mr Süleyman Demirel, Cumhurbaşkanı, President of Turkish Republic, Ankara, Turkey. Fax. +90-312-4412612.
- Mr Mustafa Kalemli, TBMM Başkanı, President of National Assembly, Ankara, Turkey. Fax. +90-312-4205165.

For further information, please contact Izmir Lawyers for Environment, Noyan Özkan, 1378 Sokak, 4/1, Kordon Ishani, No:107, Alsancak, Izmir, Turkey. Tel. +90 232 4638542. Fax. +990 232 4638543.

