

Acid News



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AUTO-OIL

Full package revealed

ON JUNE 18 the European Commission presented its long-awaited proposal for directives on the emissions from passenger cars and standards for fuel quality, to take effect from the year 2000.* The reception was, as expected, distinctly mixed.

The basic aim is to ensure a good quality of urban air at the latest by 2010. This angle of attack is, in EU circumstances, somewhat epoch-making. The guiding principle of EU directives affecting the environment has always been to strike a balance between the hoped-for gain and the feared costs, but in this case the goal has first been defined and then the measures to achieve it at the lowest cost.

As a yardstick for good air quality the commission has taken figures that are likely to result from the

revision of the Union's own air-quality standards, coupled with those in coming WHO guidelines. The targets from which the commission has proceeded appear in Table 1.

In cooperation with the trade associations of the automobile and oil industries in the so-called auto-oil programme, the commission has tried to determine how much emissions would have to be reduced in order to attain the desired goal. It turned out from its calculations that in several cases reductions of 60-70 per cent would be needed, but over 70 per cent for NO_x and volatile organic compounds (VOCs), to avoid ozone episodes.

An important part of the auto-oil programme has been to plot the emissions of vehicles with different types of exhaust-cleaning techniques and

using different kinds of fuel, besides working out the most cost-effective means of ensuring good air quality.

The measures for passenger cars and fuels that are now proposed, together with those for heavy vehicles that are scheduled for 1997, are expected, when added to others already decided upon, to result in markedly cleaner air by 2010. It is estimated that the emissions of NO_x from road traffic will then have dropped by 65 per cent from 1995 levels, and those for VOCs, carbon monoxide and urban particulate matter by 70 per cent. More than half of these reductions will be the result of already adopted measures, while those attributable to the auto-oil programme will account for something between a third and a half of

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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.

EDITORIAL

Could have been worse

ONE CAN well understand the response of the T&E director – “It could have been worse” – to the EU auto-oil package, extensively reported in this issue. Especially as it had been produced in collaboration with the automobile and oil industries' trade associations, without any observers either from the member countries or environmentalist organizations.

The resulting proposals for directives were in any case epoch-making, in that the commission first set an objective, and then considered the measures that would be necessary in order to meet it. That in itself is a positive development. There are reasons however to criticize the framing of the objective.

In the first place it makes health the sole consideration, despite the fact that air pollutants also cause serious damage to ecosystems, buildings, and so forth. Those receptors may call for stricter curbing of emissions than health would alone.

Secondly, the objective of good air quality has been made far too weak. The limit for ozone concentrations, for instance, has been set at 180 $\mu\text{g}/\text{m}^3$, whereas the Institute of Environmental Medicine (Sweden) recently put forward 80 $\mu\text{g}/\text{m}^3$ as the maximum that could be allowed if people's health were to be protected.

Among the measures proposed by the commission, that concerning quality standards for fuel is especially weak. The sulphur content both of petrol and diesel fuel could be markedly lower, at a negligible cost to the average motorist but with clear gains to the environment. It seems it was considered more important to prevent the demise of a few European oil refineries than to ensure human survival. As regards emission standards for passenger cars, the commission has adhered to an EU tradition of allowing less strict limits for diesel-driven vehicles – a difference that can hardly find support in environmental reasoning (see p. 6).

The second stage of the directive, setting standards for 2005, represents a considerable tightening-up for vehicles. It is essential that the proposed standards should actually be adopted, and similar advances be

made on the fuel side. The negotiations should too, as a matter of sheer democratic decency, be carried on openly, with full visibility from outside.

Despite these weaknesses, the auto-oil package may be considered as ranking among the more promising proposals for the traffic sector that have come from the commission of late. At the end of last year there was a green paper, *Towards Fair and Efficient Pricing in Transport*, followed by one on a citizen network for mass transportation and a proposal for a new directive setting road pricing for heavy vehicles according to the extent of the environmental damage they cause (see p.5).

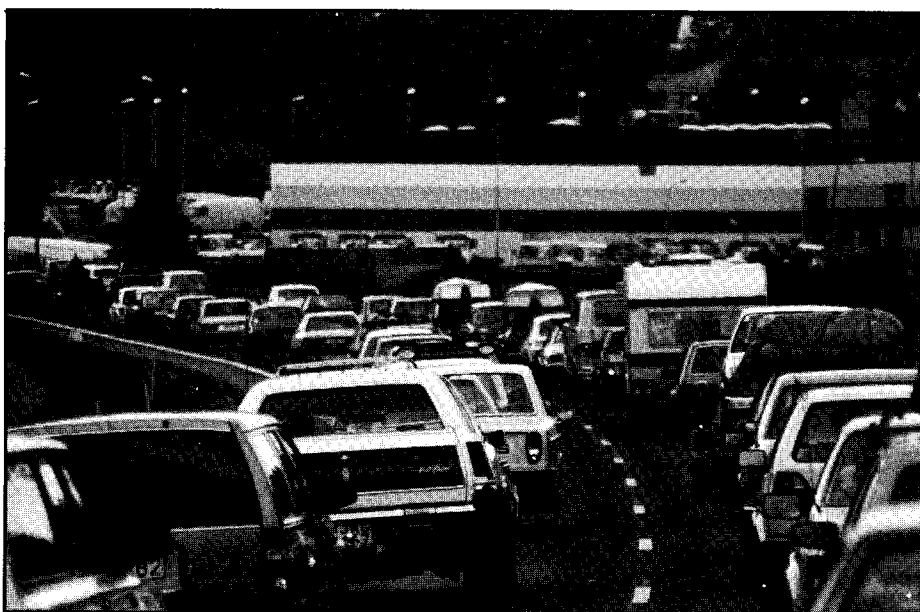
It remains to be seen, of course, how many of these proposals will become fact. Many changes will in any case be necessary before the transportation system can be called sustainable. Decisions made within the Union will obviously be of great importance for the quality of air, not only in the present fifteen member countries but in the whole of Europe, especially as some ten countries are now lining up for membership.

PER ELVINGSON

But not here

Little can be found to praise in what the IMO, the UN body dealing with shipping, is doing in regard to the environment. Although shipping is on the way to becoming one of the great sources of the sulphur dioxide in the air over Europe, the efforts of several countries to get an agreement within the IMO to limit the sulphur content of bunker oil have so far been in vain. At the latest meeting in London last July, a majority of countries stuck to 4.5 per cent as a suitable limit for sulphur – despite the fact that the present average of bunker oil in use is barely 3 per cent. A final decision will be made in the autumn of 1997, but there seems to be little hope of any substantial change. The countries that want to achieve some progress will either have to try to bring about bilateral agreements, or do like Sweden by unilaterally introducing differentiated charges that make it expedient to adopt changes in favour of the environment.

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the reductions during that period, varying according to the pollutant.

Provided there is a similar improvement in other sectors, the commission estimates that the targets it has set will be met in most cities. Among the exceptions will be Athens, where slow renewal of the vehicle fleet will mean that the NO_x target can hardly be met even if all new vehicles should be completely "clean" after 2000.

Aware that there will be problems in other cities, too, the commission has pointed out that it may be necessary for central and local authorities to complement EU regulations with supplementary measures such as road pricing, limits on access to city centres, investments in public transportation, or incentives for scrapping old, more polluting, vehicles. Fueling urban fleets with natural gas is mentioned as a further possibility.

The commission's proposals, which in the main accord with the findings arrived at in the auto-oil programme's cost-benefit study, are as follows.

The directive for passenger cars largely follows the lines of the draft that was unveiled last December (see AN 1/96). It involves a tightening of the emission requirements for the various pollutants, from today's lev-

els, by 20-40 per cent (Table 2). The new requirements will be applicable for new vehicle types as from 2000, and from 2001 for all new vehicles. An outstanding difference in comparison with the December draft is that the commission has given way to industry's pressure and eased the requirement for NO_x emissions from diesel cars in 2000 from 0.37 to 0.50 grams per kilometre.

Besides being subject to the new requirements, petrol-engined cars will have to be equipped with an on-board diagnostic system to warn the driver if the exhaust cleaning is not functioning properly.

The next stage of the directive, for application in 2005, is, according to the commission, intended as a forewarning to the automobile industry of things to come. But the figures can also serve as target values for member countries that want to encourage the introduction of better cleaning techniques by means of tax incentives.

The 2005 requirements will reduce allowable emissions by 50-70 per cent, compared with current figures. They have been based on what is considered possible of attainment through the application of techniques now under development, such as the

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Diesel vs petrol 6

The environment is often given as the reason for the EU allowing diesel cars to emit more nitrogen oxides than petrol-driven vehicles. By consuming less fuel, they emit smaller amounts of carbon dioxide. But it is far from certain that a mass move over to diesels would result in lower overall emissions of carbon dioxide.

Cars 2005 7

The EU environment ministers have said the emissions of carbon dioxide from new cars sold in 2005 should average 120 grams per kilometre. In terms of fuel consumption this is however much more than can already be achieved.

Climate change 8

Largely because of a change of attitude on the part of the United States, it could be agreed at the last Conference of the Parties that a protocol under the climate convention should include a legally binding instrument for curbing emissions of greenhouse gases.

Crops and health 10-11

A new critical limit for ozone was set up at a meeting of scientists in Finland last April. The criterion in this case was protection of the vegetation, with a limit admitting a 5-per-cent harvest loss for crops. Almost simultaneously alarms about the effects of ozone to human health caused Britain to call a conference of environment ministers from seven continental EU countries to consider measures for preventing ozone episodes - in other words, to reduce emissions of nitrogen oxides and volatile organic compounds.

Ultraviolet radiation 12

A study of lakes in Canada has shown that a decrease of dissolved organic carbon in the water, caused by climate warming and acidification, is of much more consequence to aquatic life than thinning of the ozone layer.

Threatened sea 13

Extensive eutrophication, due in considerable part to depositions of airborne nitrogen compounds, threatens the Baltic Sea. To check it, much more than is yet envisaged will have to be done to reduce the emissions, especially of nitrogen oxides, from almost all European countries.

Table 1. Air quality targets.

Pollutant	Concentration	Period
Urban nitrogen dioxide	200 µg/m ³	Maximum hourly average
Urban carbon monoxide	10 mg/m ³	Maximum hourly average
Urban benzene	10 µg/m ³	Annual mean
Urban particulates	50 µg/m ³	24-hour rolling average
Tropospheric ozone	180 µg/m ³	1-hour 99 percentile

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de-NO_x catalytic converters for diesel cars and pre-heating of the converters of petrol-driven types. A final decision about the precise figures for 2005 has to be reached at the latest by 1998.

The NO_x emission requirements for petrol-driven cars that will apply in 2000 are among the most stringent anywhere – being comparable with those for ULEV, ultra-low emission vehicles, in California. The proposed EU levels for 2005 are moreover distinctly lower than the Californian. Whereas in California the NO_x requirements are the same both for petrol and diesel cars, the EU allows diesels to emit three times as much NO_x as petrol-driven cars. Consequently EU diesels will fail in 2005 to meet the present Californian standards either for low emission vehicles (LEV) or ULEV.

As regards VOCs from petrol-driven cars, the EU requirements for 2000 and 2005 are far less stringent than those either for LEV or ULEV. For particulate matter from diesel cars the EU requirements for 2000 are about comparable with the present LEV standards, and those for 2005 with the current ULEV.

Analysis carried out under the auto-oil programme showed improving fuel quality to be a cost-effective means to achieving good air quality. Lowering the sulphur content is pointed out as being particularly helpful, lowering the emissions of harmful particles from diesel vehicles, and improving the functioning and longevity of petrol-driven cars' converters.

The directive proposal specifies the permitted amounts of a large number of substances in petrol and diesel fuel, the following especially having been subject to discussion:

Sulphur in petrol. The proposed figure is now 200 ppm (parts per million), as against 100 ppm in an earlier draft. The latter is the present maximum in Sweden and Finland.

Sulphur in diesel. The proposed maximum of 350 ppm represents a lowering of the limit compared with that now entering into force in the Union (500 ppm in October). It is however much higher than the sulphur content of so-called city diesel, widely used in Sweden and some other countries.

Benzene in petrol. The proposed limit of 2 per cent is somewhat lower

than the present market average of 2.3 per cent. Several member countries had previously urged a maximum of 1 per cent, but the commission argues that emissions can be controlled more cost-effectively by improving the vehicle's exhaust cleaning system.

Aromatic hydrocarbons in petrol. Proposal is for 45 per cent as a maximum value, although the current market average is only 40 per cent.

Leaded petrol. Sale should be prohibited as from 2000, with extension

The NO_x requirements for petrol-driven cars are among the most stringent

to 2002 for any country able to prove that a stop would cause "severe social or economic problems" because of the age or composition of its vehicle fleet.

Although the aim is a harmonized market for fuel, member countries would be allowed to tax cleaner fuels at lower rates, as is already being done in Denmark, Sweden, Finland, and Greece. In especially polluted areas they could also restrict sales to fuels that meet exceptional standards. Members would however have to prove to the commission that the situation was especially bad, and that the proposed limits would improve it.

There is no proposal for a Stage 2 for fuels – except for a review clause, which says that the commission must, at the latest by 1998, have evaluated, "on the basis of the Union's air quality objectives and cost effectiveness," the requirements proposed

for 2000. This evaluation is to serve as a guide to the development of fuel standards for 2005. Greatly lowered sulphur contents – down to 50 ppm – may, according to the commission, be needed to ensure the proper functioning of de-NO_x catalyzers and other emission-abating equipment.

Besides the proposed directives on car emissions and fuel standards, the full auto-oil package will include legislation on emission standards for light commercial as well as heavy-duty vehicles. Although no details are available, the commission has already given an indication of the likely reductions below current figures (Table 3). It is expected that the new emissions standards, as well as rules for the inspection and maintenance of vehicles in use, will be forthcoming next year for application in 2000.

Criticism of this first official draft from the commission has come from various quarters. The draftsman of the European Parliament, German socialist Bernd Lange, expressed the view that the package of measures was inadequate and that the parliament would probably demand stricter regulations, especially as regards fuel quality, but also in respect of the NO_x emissions from diesel-engined passenger cars.

"It could have been worse", was the first reaction of Gijs Kuneman, the director of T&E, the European Federation for Transport and Environment. He thought the requirements for petrol-driven cars were good enough, but like Lange, considered those for fuel quality and NO_x emissions from diesels altogether too weak.

Kuneman also thought that the cost of the package, 5.5 billion ecus

Table 2. Passenger-car emission limits (g/km).

Stage	1996/97	2000	2005
Petrol driven			
CO	2.7	2.3	1.0
HC	0.341	0.20	0.10
NO _x	0.252	0.15	0.08
Diesels			
CO	1.06	0.64	0.50
HC+NO _x	0.71	0.56	0.30
NO _x	0.63	0.50	0.25
Particles	0.08	0.05	0.025

Note. The 1996/97 values (which have already been decided, 94/12/EC) have been adjusted to take into account a planned change in the test cycle. In future the measurement of emissions will start as soon as the engine is switched on, not after a 40-second warm-up period.

a year, was low compared with the annual cost of damage caused by air pollutants – 25 to 186 billion ecus, in the commission's estimate – and that further measures would therefore be needed. A marked lowering of the sulphur content of petrol would, for instance, give the average motorist an extra cost of only a couple of ecus a year, but would make for a great improvement in air quality. Like several other environmentalist organizations, T&E is also sceptical of the supposed cost of the proposed measures, which it thinks have been exaggerated by the industry associations. And it fears the commission may have overestimated the efficiency of its proposed measures (see AN 3/96, p.9).

Representatives of Europa, the oil industry's trade association, have said that they were satisfied on the whole, although the proposals may mean the death of some refineries operating on a small margin, of which there are several in southern Europe.

Carlo Cucci, on the other hand, the director of ACEA, the European Automobile Manufacturers Association, was less pleased, complaining of the added costs to his members. "Our chief problem," he said, "is that while we are being asked to do a lot, the oil producers are being asked to do very little. Diesel fuels already meet these standards. It is not a fair burden for us."

Of the total annual cost of the auto-oil package, 5.5 billion ecus (including the cost of the requirement proposals expected in 1997), 4.14 billion is estimated to fall on the automobile industry, but only 0.8 billion on the oil producers. (The remainder will be the cost to the member countries for more extensive vehicle inspections.)

If these costs are passed on to the consumers, they will increase the price of a petrol-driven car by 200 to 290 ecus, and by 380 to 520 ecus for a diesel. Further increases in retail prices can, according to the com-

mission's estimates, be expected on account of requirements that are proposed to take effect in 2005.

The extra cost of fuel will be no more than 0.002 ecus per litre, or about 2 ecus a year for anyone driving 12,600 kilometres. "Much less than the cost of a packet of cigarettes," as Christos Papoutsis, the energy commissioner, expressed it when the draft was presented.

Sweden's environment minister, Anna Lindh, who had previously been critical of the industry associations because of their delaying tactics, declared herself pleased with the commission's proposals. She especially welcomed the rule putting responsibility for the continued functioning of the catalyzer on the manufacturer, which has existed in Sweden since 1989, as now being on its way into EU legislation. This has been a matter of contention between Sweden and the Union, with the latter maintaining that Sweden would have to alter its legislation to comply with EU rules.

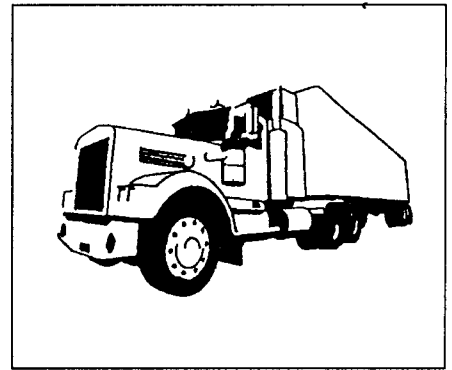
The Swedish government is also satisfied with the proposed requirements in regard to car emissions, but is intending to press for stricter fuel-quality standards, in which it can expect support from Finland, Denmark, and Austria, and maybe Germany and the Netherlands.

Extensive debate can now be awaited within the council of ministers as well as the European parliament – and also between the two, since they share the right of decision on this issue. It is a general belief that there will be no final decision before mid-1998.

Emissions of the most important greenhouse gas, carbon dioxide, are no part of the auto-oil package, but will be the matter of a separate directive. See p. 7.

PER ELVINGSON

* Communication to the Council and the Parliament on a: Future Strategy for the Control of Atmospheric Emissions from Road Transport Taking into Account the Results from the Auto Oil Programme.



More like the cost

TRUCKERS are to be encouraged to use vehicles that pollute less and damage the roads less, and also to use routes that do less harm to people and the environment. That is the aim of proposals from the EU Commission. They are an update of the present so-called Eurovignette directive (93/89) which has rules for road charging in three ways: through vehicle taxes, road tolls, and user charges. This is one of the Commission's first attempts to make the users of heavy vehicles pay for the damage they cause.

It is proposed to range trucks in three categories, according to their emission levels and the damage they do to the environment, with different price bands to reflect their environmental performance. Member states would be allowed, too, to impose additional charges on vehicles passing along "sensitive" routes, as well as a 0.03 ecu environmental charge on top of tolls for bridges, tunnels, and so forth.

The European Federation for Transport and Environment (T&E) has welcomed the Commission's proposal as a step on the way towards a fairer and more efficient pricing of freight transport by road. It thinks however that it is too blunt an instrument, since it gives a trucker no incentive to reduce mileage once he has bought an annual vignette, and further charges will be necessary if the costs of all air pollutants (including climate-warming gases) and noise are to be properly internalized. Even according to the Commission's own estimate the measures now proposed will increase the truckers' average operation costs by only 0.2 per cent. Source: T&E Bulletin No. 50. July 1996.

Table 3. Indicative emission reductions to light commercial and heavy-duty vehicle engine emission standards.

	Reduction compared to current standards			
	CO	HC	NOx	PM
Petrol LCVs	30%	40%	40%	–
Diesel LCVs	40%	65%	20%	35%
HDV and buses	–	–	30%	30%

Petrol vs diesel driven

AS OPPOSED to the United States, for instance, the EU allows diesel-driven cars to emit more nitrogen oxides than those with petrol engines. Environmental arguments are often given as the reason: by consuming less fuel, diesels emit less carbon dioxide. It is however far from certain that a general move to diesel-engined vehicles would lead to lower emissions of carbon dioxide.

The fuel consumption per kilometre of diesels is indeed lower than that of similar petrol-engined cars, as can be seen from the first column of the table, showing how much fuel a petrol-driven car consumes in comparison with the same model with a diesel engine. With the diesel cars' consumption put at 100, it appears that a Peugeot 605 SLi for instance needs 5 per cent more fuel per kilometre (105 versus 100) than the diesel-driven alternative. The petrol-driven Audi A6 2.0 and Volkswagen Passat 1.8 consume a whole 53 per cent more than the diesel models.

The middle column of the table takes account of the fact that every litre of diesel fuel gives rise to a greater amount of carbon dioxide than a litre of petrol. The difference of 13 per cent is due to diesel having a higher density and thus a higher energy content per litre than petrol. The figures show some models to have lower emissions when equipped with petrol engines than with diesels. This applies for instance to Peugeot 405 (7 per cent less). The difference for Audi A6 2.0 and VW Passat 1.8 is however still considerable – the petrol-engined model in each case emitting 33 per cent more carbon dioxide than the diesel.

Engine size also affects the results. Many car models are available in variants with different engine volumes and power. From the centre column it can be seen that a Volkswagen Golf 1.4 emits 8 per cent less carbon dioxide than the diesel Golf, which in turn is 14 per cent better than the petrol-driven Golf with a 1.8-litre engine. There are correspondingly great differences in emissions from the Peu-

geot 605 SLi and the Peugeot 605 SV 3.0, and between the two variants of Citroen Xantia.

There is then the question of which petrol-driven models come nearest to the diesel variants as regards performance. It may also be asked

Far from certain that a move to diesels would reduce CO₂ emissions

whether it is necessary to choose the alternatives with the most powerful engines. For environmental reasons the choice may lie in the first place between a diesel and its less powerful petrol alternative, in which case it will not always be to the advantage of the diesel variant as regards carbon-dioxide emissions.

The total of emissions of carbon dioxide from the car fleet does not depend solely however on the emissions per kilometre. The annual vehicle mileage driven is also of importance – and that will be influenced by the variable costs. Because diesel fuel is taxed lower than petrol in almost all EU countries, an average diesel-driven car will be driven more than if the owner had one with a petrol engine. The EU Commission reckons with a long-term price elas-

ticity of -0.7 for motor fuel used privately, so a price rise of 30 per cent for instance would lead to a reduction in demand of 21 per cent (assuming no change in private incomes).

In Sweden the tax on petrol, including VAT, is about 1.70 kronor higher than that for diesel of environment-class II, and the difference in the price at the pump is about 1.50 kronor (the crude being somewhat more expensive for diesel). The difference is representative of EU countries as a whole, although there may be national deviations.

On the basis of the EU Commission's estimate of price sensitivity, it may be assumed that a general switch from petrol to diesel would in the long run result in an increase in annual fuel consumption of about 13 per cent. If diesel on the other hand were taxed at the same rate as petrol, the consumption of diesel fuel would fall by about 18 per cent.

The right-hand column of the table shows how carbon-dioxide emissions would be affected through a switch to diesel resulting, because of the lower tax, in more kilometres being driven annually. It also reveals that the emissions of carbon dioxide from many petrol-driven cars with relatively powerful engines are actually lower than those from corresponding diesel models.

Thus basing the argument on carbon-dioxide emissions does not always fall to the advantage of the diesel vehicles. The differences are small, and hardly a reason to allow their emissions of nitrogen oxides to be three times as high as those from cars running on petrol. In addition the diesels emit a great amount of particulates. Time and again in the last few years research has indicated a strong connection between those emissions and serious effects on health.

PER KÅGESON

The writer is an environmental consultant and former chairman of T&E, the European Federation for Transport and Environment.

Fuel consumption of petrol-driven cars and emissions of carbon dioxide in comparison with those of corresponding diesel models (difference in per cent; the value for the diesel model has been put at 100).

Petrol models	Fuel consump.	CO ₂ emissions/km	CO ₂ emissions/yr
Peugeot 605 SLi	105	91	79
VW Golf 1.4	106	92	80
Peugeot 405	107	93	81
Opel Omega 2.0	118	103	90
Citroen Xantia 2.0	118	103	90
Opel Astra 1.6	119	104	90
Citroen XM 2.0	119	104	90
Citroen ZX 1.4	123	107	93
VW Golf 1.8	131	114	99
Citroen Xantia 2.0	133	116	101
Mercedes C220	136	118	103
Peugeot 605 SV 3.0	136	118	103
Audi A4 1.6	138	120	104
Opel Vectra 2.0	146	127	111
Audi A6 2.0	153	133	116
VW Passat 1.8	153	133	112

Limits for carbon dioxide emissions

THE LIMIT FOR emissions of carbon dioxide from new cars sold in the European Union should be 120 grams per kilometre, said the EU environment ministers in a statement issued last June. In terms of fuel consumption this corresponds to 5 litres of petrol and 4.5 litres of diesel fuel per 100 kilometres – which compared with the average consumption of new cars today would mean a reduction of 30 per cent.

A number of questions were however left open in the statement, the

intention being that these should be clarified in discussions between the European Commission and ACEA, the trade association of the automobile industry, this autumn.

First is the question of how the goal is to be achieved. Among the proposals put forward by the Commission in December 1995 (COM(95)689), the ministers favoured the idea of making voluntary agreements with the car industry as well as introducing a system of labelling to inform buyers of the fuel consumption of the vari-

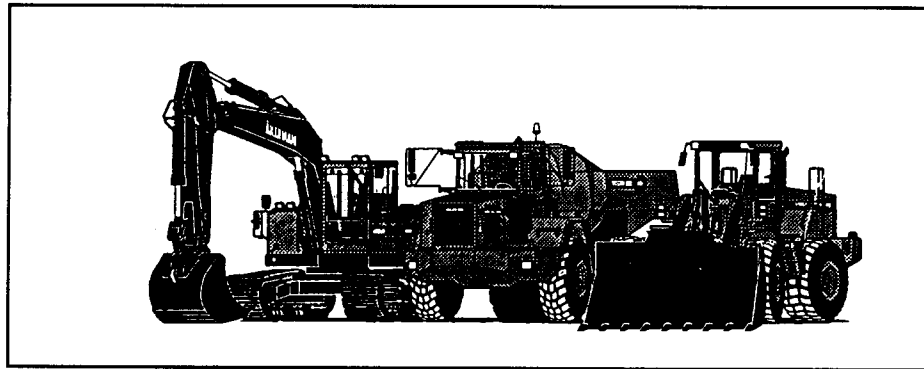
ous makes and models. The only tax measure that was fully approved by the Council was an increase in the excise duty on fuels. Taxing cars according to fuel consumption does not seem to have been much considered.

Then there is the question of how the limit of 120 g/km shall be interpreted. Some hold that it should be the average for all new cars sold in the Union during a certain year, others maintain it should be the average for each country, while a third faction would interpret it as meaning the average for the vehicles sold by each car maker. Companies making mostly small cars naturally prefer the last concept, while manufacturers of big cars consider the EU average to be the proper interpretation.

Thirdly, there is uncertainty about the year in which the limit is to come into effect. The Commission's proposal was for 2005, but in the statement from the Environment Council it says: "Should it appear that it is not possible to fully achieve the objective by 2005, the phasing could be extended, but in no case beyond 2010." This weakening of the Commission's hand in negotiations with the car industry was a result of pressure from the big car-producing countries: Germany, France, Italy, and Great Britain. Several of the small member countries had been striving for 2005 as an absolute deadline.

Among those that are critical of the way things are going is Greenpeace, which can already demonstrate a modified Renault Twingo with a fuel consumption of no more than 3 litres per 100 kilometres. Several manufacturers have also admitted that it is public demand rather than any technical problems that is holding them back from making cars with a better fuel economy.

The idea of attaining the objective through voluntary agreements has also come in for criticism. Even the Council appears to be hesitant, asking the Commission to set partial goals, to closely note developments, and report them to the Council. Further possible measures are also to be considered, and taken up according as the situation requires.



Non-road machinery

THE FIRST EU DIRECTIVE for non-road machinery has now come, setting standards for diesel engines in bulldozers, dump trucks, mobile cranes, and so forth. The new directive, which was passed by the environment ministers in June, is almost identical with the draft that was presented in September a year ago (AN 5/95, p.9).

The standards will be applicable in two stages, the first to take effect in 1998-99, and the second in 1999-2002 (with requirements in both cases varying according to engine power). Makers will be allowed to go on selling engines that fail to meet the new standards for two years after each deadline, provided they had been made previously to that date. Member countries may on the other hand use fiscal incentives to encourage manufacturers to meet the standards ahead of time, so long as they do not conflict with the rules for the inner market.

The equipment covered by the directive is estimated to cause 7 per cent of the EU emissions of NO_x and 1 per cent of the particulates. The

Commission calculates that after implementation of Stage 2 the emissions of NO_x from such equipment will be cut by almost 50 per cent, those of particulates by 67 per cent, and of VOC by 29 per cent. In comparison with the present and proposed standards for similar road-vehicle engines, the requirements for non-road can only be called modest. The ministers did however, at the time of the adoption of the directive, call on the Commission to put forward proposals for a third stage, with more stringent emission limits, before the end of 1999.

The directive does not cover the engines in agricultural and forestry tractors, for which the Commission is to present a separate directive before the end of the year. The requirements in the present one, which have been set in cooperation with the US Environmental Protection Agency, will apply in the whole European Economic Area.

Source: Environment Watch: Western Europe. July 3, 1996.

Source: Environment Watch: Western Europe. July 3, 1996.

Protocol to be legally binding

EU transportation

On June 18, after eight weeks of negotiation, the European Parliament and the Council of Ministers arrived at a compromise concerning the guideline legislation on the Trans-European Networks (TENs) for transportation. The Parliament got some of its demands accepted, such as an article requiring member states to conduct assessments of the environmental impact of all TEN projects. The article also requires the Commission "to develop appropriate methods" of strategic analysis for assessing the environmental impact of the whole network and of corridors.

The article has been portrayed as a victory for the Parliament, especially as the Council did not originally want it included. Its formulation is however somewhat vague and non-committal. Although it says for example that "methods for analysis of corridor assessment" are to be developed, there is no guarantee that they actually will be used. The compromise means that the 250 million ecus set aside in the EU's budget for 1996 for transportation TENs can now be released.

T&E Bulletin No. 50, July 1996. For more information on TENs, see AN 4/94, pp.14-15, 2/96, p.11 and 3/96, p.7.

Energy efficiency

The EU Council of Ministers has departed from the proposals of the Commission by cutting down the allotment to SAVE II, the second program to promote energy efficiency, to less than a third – from 150 to 45 million ecus (see AN 2/96). The Commission says this will make it difficult to achieve the aim of the program, which is to improve energy efficiency within the Union each year by 1 per cent more than would otherwise have been the case. This will in turn affect EU's chances of stabilizing emissions of carbon dioxide. Several of the smaller states have deplored the Council's decision.

ENDS Report 256. May 1996.

Fridges & freezers

Contrary to expectations, the European Parliament accepted the Council of Ministers' "common position" at a second reading of the draft proposal for energy-efficiency standards for refrigerators and freezers (see AN 2/96). This means that such appliances will have to be 15 per cent more energy efficient, compared with 1992, within three years of a directive being adopted. At its first reading last year the Parliament had been demanding a 20-per-cent improvement within three years and a further 20 per cent in the following three-year period.

Environment Watch: W. Europe. June 21, 1996.



In the Netherlands, the sea can be kept out by building dykes. In other places, the problem may be insurmountable if sea level rises, as predicted, in consequence of climate warming.

IT HAS AT LAST been generally agreed that a protocol under the climate convention shall include "legally binding, quantified objectives" for limiting the emissions of carbon dioxide. The breakthrough came at the second Conference of the Parties at Geneva in July, after the United States – the country that emits the most greenhouse gases of all – had changed its stance.

The UN Framework Convention on Climate Change was adopted at the Earth Summit in Rio de Janeiro 1992. Its ultimate aim is to bring about a stabilization of greenhouse gases at a level that "will prevent dangerous anthropogenic interference with the climate system." Developed nations are obliged under the convention to stabilize their emissions of greenhouse gases at 1990 levels by 2000. So far 159 nations have signed the convention, which was to take effect from March 1994.

The first Conference of the Parties to the Convention, which was held in Berlin in March 1995, was characterized by long-drawn-out discussions and few tangible results (see AN 3/95, p.16). The resulting document, the Berlin Mandate, is vaguely formulated, merely calling on the

parties to begin discussions for reducing emissions after 2000.

Of greater account was the presentation in December 1995 of a second assessment report by the Intergovernmental Panel on Climate Change (IPCC). See AN 1/96, p.9. Here it was stated outright that "the balance of evidence suggests a discernible human influence on the global climate," and that "stabilization of atmospheric concentrations [of greenhouse gases] at twice preindustrial levels will eventually require global emissions to be less than 50 per cent of current levels."

At the Geneva meeting the ministers of more than a hundred states backed a declaration recording their belief that "the findings of the IPCC's second assessment report indicate dangerous interference with the climate system." They also instructed their representatives "to accelerate negotiations on a legally binding protocol or other legal instrument to be completed by COP 3."

That third Conference of the Parties is to be held in Kyoto, Japan, in December 1997. The negotiators now have a mandate, in consequence of the Geneva declaration, to work out a legally binding instrument – an

advance that it is largely due to the change of attitude on the part of the United States. After having previously opposed binding agreements, the United States spoke up at Geneva for one that "sets a realistic, verifiable and binding medium-term emissions target," adding that it would be necessary to continue working towards a longer-term concentrations goal (say for the next 50-100 years).

The Under-secretary for Global Affairs, Timothy Wirth, who led the US delegation, said that his country favoured national solutions and market-based approaches, such as tradeable emissions permits. He also dismissed the criticism of IPCC findings that has been coming ever more aggressively from industrial lobbying groups and oil-producing states, saying "Let me make clear the US view: the science calls upon us to take urgent action; the IPCC report is the best science we have and we should use it."

No figures for the size of reductions or the years for fulfillment have yet been forthcoming. Wirth made it clear however that the 20-per-cent reduction between 1990 and 2005 on the part of the developed countries that AOSIS, the Alliance of Small Island States wanted, was unaccept-

able to the United States. Alternative proposals put forward by Germany and Britain suggested reductions of 15-20 and 5-10 per cent respectively, by 2010.

While most observers considered the outcome of the Geneva meeting to be a genuine breakthrough, a number of matters still remain to be clarified before the COP 3 meeting next year. Besides the size of the emission reductions and the time schedule, there are the questions of the allotting of commitments among different countries, the possibilities for allowance trading, and the procedure for adoption of the protocol.

Fourteen countries, many of them members of the oil producers' organization OPEC, abstained from supporting the Geneva declaration, and two – Australia and New Zealand – were opposed to the part about legally binding objectives. The Ad Hoc Group on the Berlin Mandate, on which responsibility rests for working out a new protocol, will have its next meeting in Geneva on December 9-13.

PER ELVINGSON

Principal sources: ENDS Report 258, July 1996. Environment Watch: Western Europe, August 2, 1996. Europe Environment No. 482, July 23, 1996.

Warnings from others too

AMONG THE VARIOUS reports and statements on matters related to climate warming that were presented at the time of the COP 2 meeting, in July, were the following:

A joint report¹ from the World Health Organization (WHO), the World Meteorological Organization (WMO), and the UN Environmental Programme (UNEP) stated that changes in climate and stratospheric ozone could directly or indirectly affect health issues such as heat stress, vector-borne diseases, agricultural productivity, and human nutrition – by way of extreme weather events, rises in sea level, and effects related to ultraviolet radiation. The report recommends that scientists promote and assist the global adoption of precautionary policies to balance current social needs against "serious, perhaps unacceptable, risks."

A group of close on sixty big insurance companies, assembled at the instance of the UNEP, called for "early and substantial" reduction of the emissions of carbon dioxide and other greenhouse gases, because of weather effects related to climate change. No indication was given of the size of the proposed reductions, and

officials said the insurance companies had no immediate plans for withdrawing their investment funds from the oil and energy sectors.

In Britain the Climate Change Impacts Review Group has warned in a report² of the possibility of extreme climate events, including droughts, flooding, and severe storms, which could become more common in the UK as a result of climate change. It conjectures a total increase in the country's rainfall of 10 per cent by 2050, with the southeastern parts becoming drier and the northwestern wetter. During this period there would be an increase of 1.6°C in the average temperature. Among possible consequences there would be crop losses and northward migration of farming zones, natural habitats, and wildlife species.

¹ *Climate Change and Human Health*. Available from WHO, 1211 Geneva 27, Switzerland. Fax +41-22 791 4857.

² *Review of the Potential effects of Climate Change to the UK*. Can be ordered from HMSO, P.O. Box 276, London, England SW8 5DT. Fax +44-171 873 8200.

Recent publications

OECD Environmental Data, Compendium 1995

Compendium published every two years, giving internationally comparable data from the OECD countries and parts of central and eastern Europe. It includes a description of the state of the air, inland waters, land, forests, wildlife, etc., and documents sectoral trends in industry, agriculture, transport, and energy.

306 pp. Bilingual (English, French). Obtainable from OECD, 2, rue-Andre-Pascal, 75775 Paris Cedex 16, France. Fax +33-1 45 24 80 03.

Environmental Funds in Economies in Transition (1996)

Report by the OECD Centre for Cooperation with Economies in Transition, examining the function of funds established to mobilize resources for environmental purposes in the Central and Eastern European countries.

126 pp. US\$26.00. Can be ordered from OECD, address as above.

Implementation Strategies for Environmental Taxes (1996)

Environmental taxes are increasingly used or envisaged in a number of countries. But how should they be designed? What is their possible impact on income distribution and international trade? The report reviews these issues and gives recommendations to policy makers.

94 pp. Obtainable from OECD, address as above.

OECD Environmental Performance Reviews

Peer reviews of environmental conditions and progress in each member country. The analyses presented are supported by a broad range of economic and environmental data. Recent reviews include United States (January 1996), Bulgaria (May 1996), and Sweden (October 1996). A review of New Zealand will be published later this autumn.

Available from OECD, address as above.

Climate Change Policy Initiatives: 1995-96 Update (1996)

Volume II. An IEA study detailing in a standard format the actions that twenty non-IEA countries are taking under the UN Framework Convention on Climate Change. Provides information on the development of national strategies, along with detailed data regarding greenhouse gas emissions from energy sources. Volume I, describing developments in the OECD countries, was published in 1994.

Both are available from OECD, address as above.

Resetting critical levels

A MEETING of scientists in Finland last April* has set new critical levels for ozone as regards its effects on vegetation. The outcome is likely to influence the negotiations for a new protocol – under the Convention on Long Range Transboundary Air Pollution – for controlling the emissions of nitrogen oxides and volatile organic compounds.

In the generally accepted definition, critical levels are “those concentrations of pollutants in the atmosphere above which direct adverse effects upon receptors, such as plants, ecosystems or materials, may occur according to present knowledge.”

In the view of the scientists, the critical level as regards the effects of ozone on vegetation is best expressed as the cumulative exposure over the threshold concentration of 40 parts per billion (ppb). This exposure index, referred to as AOT40 (accumulated exposure over 40 ppb), is calculated as the sum of differences between the hourly concentrations in ppb and 40 ppb for each daytime hour when exposure exceeds 40 ppb. The scientists were careful to emphasize, however, that 40 ppb should not be regarded as a level under which no damage will occur. This threshold figure was selected more as a means of obtaining a statistically secured connection between exposure and the effect.

For agricultural crops the AOT40 value was set at 3000 ppb-hours in daytime during three months (May to July). According to the available data, such an exposure will result in a loss of yield for wheat of about 5 per cent. The new level, which is lower than the previous one, is judged to protect other grains as well as managed grasslands. It is not clear, however, what the effect will be on a number of high-value crops that are known to be ozone-sensitive, such as rapeseed, cotton, tobacco, tomato and soybean.

The workshop also warned against the assumption that recordings of concentrations above the threshold value could be translated directly into crop losses, saying that they should rather be regarded as “an indication of the degree of risk.”

Since they are just as resistant as the most sensitive farm crops, the AOT40 value is deemed to be applicable to the most sensitive natural plant species too. Too little is known however about such things as what might happen in the ecosystem as a whole. Even slight differences in sen-

Safe limits are now being exceeded over a greater part of Europe

sitivity between species may for instance lead to one species driving out another.

As regards trees, the deciduous species are thought to be more sensitive to the effects of ozone than conifers. Experiments especially with beech (*Fagus sylvatica*) have been employed to determine the critical concentration of 10,000 ppb-hours in daytime (above the 40-ppb threshold value) during a period of six months. Now that the ppb-hours are only counted in daylight, a somewhat longer exposure than previously is permitted for trees in managed forests.

In the debate on reduction of the emissions of gases that give rise to ground-level ozone – nitrogen oxides and volatile organic compounds – a

matter of interest has been the receptor that shall be used to set the limit for concentrations of ozone. Hitherto the need to protect human health has been the toughest criterion. In a proposal put forward by the Swedish Institute of Environmental Medicine earlier this year, no exceeding of 40 ppb as a one-hour average would be allowable (see AN 3/96, p. 10). But as already seen, in the case of crops the 40-ppb threshold can be passed for 3000 ppb-hours in daytime during a period of three months.

There is a difference however that the limit for effect on health has been set so as to protect even the most sensitive persons, whereas that for crops allows a reduction of 5 per cent in harvest yield. It is therefore difficult to make any direct comparison of the sensitivity of plants and humans to ozone. It is nevertheless clear that in both cases the safe limits are now being exceeded over a greater part of Europe (see opposite page).

PER ELVINGSON

* Kärenlampi, L. and L. Skärby (Eds.) 1996: *Critical Levels for Ozone in Europe: Testing and Finalizing the Concepts*. UN ECE Workshop Report. Available from the publisher: Department of Ecology and Environmental Science, University of Kuopio, P.O. Box 1627, 70211 Kuopio, Finland. Fax +358-17-163230.

The cost of ozone

IN YEARS with high concentrations, ground-level ozone can cost Danish agriculture and forestry up to DKK 2 billion. The cost in a normal year is said, in a fresh report* from the National Environmental Research Institute, to be about 1 billion kroner.

In its calculations, the Institute has concentrated on wheat, pasture, and forest, proceeding from records of ground-level ozone in Denmark and established data on the connection between ozone concentrations and plant growth. The latter have been obtained through experiments in so-called open-top chambers.

Wheat, which is highly sensitive to ozone, was found to account for about two-thirds of the harvest loss, while

pasture – the calculations for which depend on the sensitivity of clover – stood for a quarter. The rest of the loss referred to commercially valuable trees.

While not concealing uncertainties in their figures – it is not known for instance how far the findings from open-top chambers can be applied to field conditions – the Danish scientists maintain that it all points to an economic problem of national proportions.

* Strandberg, M.T. et al. (1996): *Mapping effects of ozone on yield of agricultural crops and forest production in Denmark*. Arbejdsrapport fra DMU No. 24. Available from the National Environmental Research Institute, Vejlssøvej 25, P.O. Box 314, DK-8600 Silkeborg, Denmark.

Taking action...on ozone

In Belgium the prices of train tickets were reduced by 25 per cent during July and August as a means of encouraging people not to use their cars. Regular commuters were given even more favourable treatment. During summer, too, speed limits on motorways were controlled extra carefully. The government is moreover proposing a new law to limit the amounts of organic solvents in paints and other consumer goods. These measures are all a part of a government package aimed at holding back the formation of ground-level ozone. Their effect will be evaluated at the end of the year.

Environment Watch: W. Europe. June 21, 1996.

...sulphur dioxide

One of the big forest product companies, AssiDomän, is to start using bunker oil with a maximum sulphur content of 1 per cent for all shipments by sea – thereby reducing emissions of sulphur dioxide by 500-600 tons a year.

"We are contributing all we can to reducing acidification," says Nippe Hylander, company environment officer. "It is one of the most serious threats to forests, and it is important that AssiDomän, as one of the world's biggest forest owners, should take the lead and show that emissions of sulphur can be reduced at a reasonable cost."

According to Hylander analyses have shown that the emissions from transportation are about as great as those from all the rest of the company's operations. A survey of the emissions from land transports will now follow the decision to go over to low-sulphur bunker oils at sea.

Pays to protect

States and regions with strong rules for protection of the environment have benefited with stronger economies and more jobs, according to an analysis of studies on economic growth and environmental protection that has been released by the California Senate Office of Research.

The report, entitled *Myths of Jobs vs Resources: Environmental Protections and Economic Growth*, concludes that contrary to conventional wisdom, the effect of strong environmental laws and regulations in the way of closures of manufacturing plant has been minimal, nor has such legislation caused businesses to relocate to countries where laws are laxer. In fact strong laws for environmental protection have actually spurred the creation of a large number of private-sector jobs.

Car Lines. M.P. Walsh. No. 3, May 1996.

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Agreeing on episode prevention

IN SUMMER, all over Europe, the concentrations of ozone at times reach levels that can be injurious both to health and vegetation. It has been estimated that in Britain half of the recorded ozone originates in domestic emissions of the nitrogen oxides and volatile organic compounds that cause it. The other half derives from emissions on the European continent.

It was this transboundary nature of the problem that led the British Environment Secretary, John Gummer, to call a conference in London last May of environmental ministers from Germany, France, the Netherlands, Belgium, Ireland, Denmark, and Luxembourg. The aim of the meeting was to put the matter back on the political agenda.

It was agreed that current policies do "not yet promise sufficient improvement," and that further action at the national and international level "should be urgently pursued." The ministers also expressed support of efforts at the EU level and within the United Nations Economic Commission for Europe, to establish a coherent, pan-European framework for the prevention of ozone episodes.

They were in any case agreed that their countries should "now take measures designed to eliminate ozone episodes" within the region by 2005 – yet without defining what was meant by an ozone episode. According to the British Department of the Environment the aim should be not to exceed an hourly average of 180 $\mu\text{g}/\text{m}^3$ (90 ppb), which is the "infor-

mation threshold" set in the 1992 EC Directive on ozone. To achieve that, the emissions both of nitrogen oxides and VOCs in Europe would, in the estimate of the European Environment Agency, have to be reduced by more than 60 per cent.

The ministers' concept of a safe level is distinctly less stringent than those set in the WHO guideline for air quality and the health-based standards proposed for Britain and Sweden (see AN 3/96, p.10). The UK standard of 50 ppb, expressed as an eight-hour running average, is broadly equivalent to an hourly average concentration of 60 ppb, and reductions of 75 to 85 per cent, both in VOCs and NO_x , would be needed to meet it. The Swedish proposal, for 80 $\mu\text{g}/\text{m}^3$ (40 ppb) as an hourly average, would call for still greater reductions.

The London conference noted that a pan-European framework could not be expected before the end of 1997 at the earliest, and that it would take still longer for any subsequent measures for abatement to take effect. It was therefore agreed to resort to a number of short-term measures – although their effect on the emissions of nitrogen oxides and VOCs will be doubtful.

The ministers promised to cooperate in evaluating the effectiveness of these measures, which might include temporary curbs on traffic or other sources of ozone precursors "in certain situations."

Source: ENDS Report 256. May 1996.

Finds it pays to clean up

THE BENEFITS arising from the Clean Air Act during a period of twenty years have exceeded the costs attributable to the act by more than \$6 trillion, according to a draft report from the US Environmental Protection Agency. "In 1990, Americans received roughly 20 dollars of value in reduced risks of death, illness and other adverse effects for every one dollar spent to control air pollution," the report says.

The Agency has used "control" versus "no-control" scenarios to assess the effectiveness of the act in reducing air pollution. It found that the emissions of sulphur dioxide, for instance, were 40 per cent lower, mostly as a result of utilities installing scrubbers and going over to using low-sulphur fuels. Nitrogen oxide emissions were 30 per cent lower by 1990 than they would have been in the absence of controls, mostly because of cars having been equipped with catalytic converters. The control of emissions from cars had also been responsible for reducing the overall emissions of volatile organic compounds by 45 per cent, and those of carbon monoxide by 50 per cent.

The cost of all the measures under the act between 1970 and 1990 is estimated to have been \$436 million. The benefits, amounting to \$6.9 trillion, were established through evaluation of the gains in health resulting from reduced emissions. The measures had resulted in 79,000 fewer deaths and 15 million fewer cases of respiratory illness in 1990 alone. Every avoided death was assessed at \$4.8 million, while the value of avoiding heart attacks and strokes was put at \$587,000 per case.

The Agency has not attempted to estimate any other economic gains from the reduction of emissions, such as would come from reduced corrosion of materials, reduced effects on yield in agriculture and forestry, and reduced damage to natural ecosystems, which would have further increased the sum of benefits.

Source: **Car Lines**. M.P. Walsh. No. 4, July 1996.

Ultraviolet penetration of lake water

ACIDIFICATION, climate warming, and the thinning of the ozone layer are phenomena that are usually considered separately. But now four Canadian scientists, writing in *Nature* magazine, report that acidification and climate warming increase the exposure of aquatic organisms to harmful UV-B radiation much more than ozone depletion.

Between 1971 and 1990 the Canadians had made close observations of a number of lakes in the north-western part of Ontario. In that time the UV-B radiation increased by 10 per cent, probably as a result of depletion of the ozone layer. The harmful effect of such radiation on freshwater organisms has been well demonstrated in experiments. In clear lakes the radiation can penetrate to depths of several metres, and dramatic changes in the ecosystems have been shown to take place with only moderate increases in radiation intensity.

The depth to which UV-B radiation can penetrate depends on the amount of dissolved organic carbon (DOC) in the water. Most boreal lakes have DOC concentrations of several milligrams per litre, which limits the ultraviolet penetration to a few centimetres. In other words, DOC provides effective protection against exposure to harmful UV-B radiation.

The depth of UV-B penetration increases exponentially however with the decline of dissolved organic carbon in the water – and this is where climate warming and acidification enter the picture. Both act to lower the concentrations of DOC.

During the twenty-year period of their observations the scientists noted an average climate warming of 1.6°C. Whether part of a natural trend or not, this rise, they say, gives a useful glimpse of the consequences of global warming for boreal lakes. Along with the increase in air temperature, precipitation decreased by 25 per cent, while evapotranspiration increased by 35 per cent.

Among the consequences were reduced inflows from the catchment areas and thus lesser amounts of

DOC entering the lakes. Processes within the lakes also contributed to reducing the DOC in the water, causing concentrations to decline on an average by 15-20 per cent. This in turn enabled the UV-B radiation to penetrate 22-63 per cent deeper. It may be noted that the 10 per cent increase in the intensity of the radiation during the period only led to a 2-per-cent increase in the UV-B penetration in a lake with a relatively small amount of DOC in the water.

In lakes that were deliberately acidified for experimental purposes, the decline of DOC was much more extreme than in reference ecosystems. Similar observations have often been made in lakes acidified by rain both in Europe and North America.

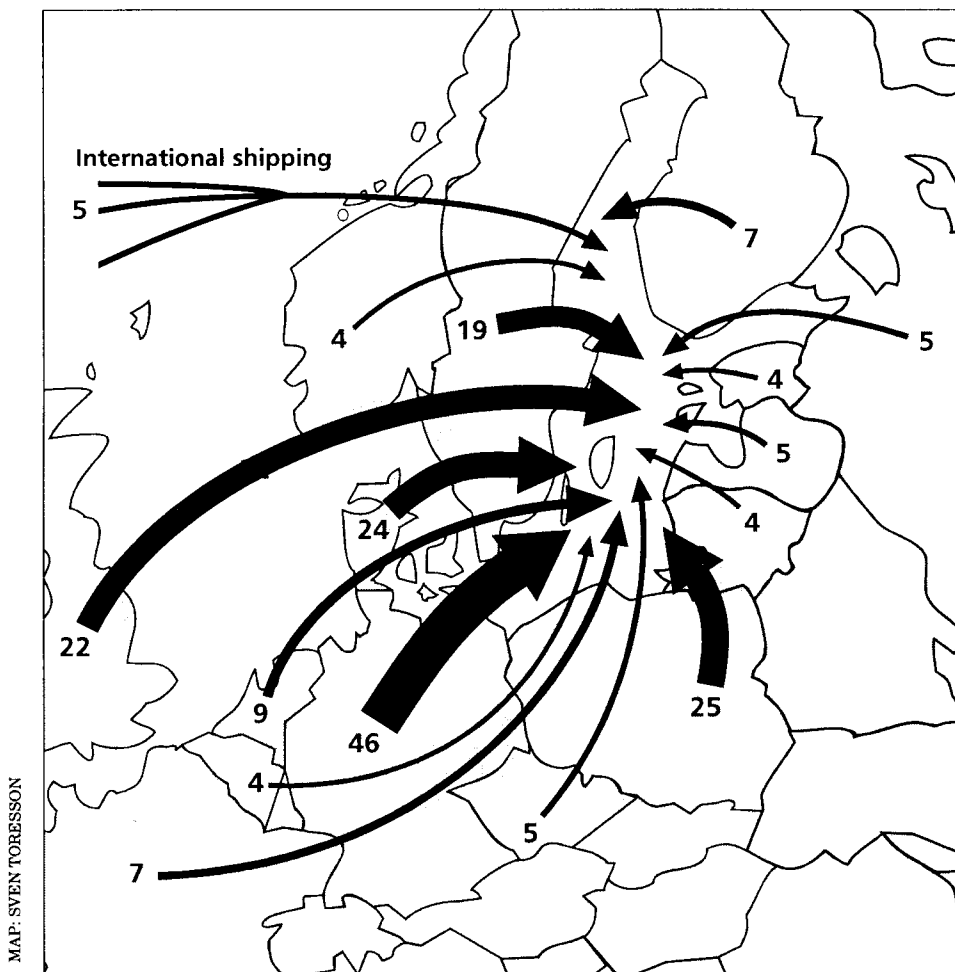
The decline of DOC in the acidified lakes meant that the UV-B radiation penetrated still deeper. In the most extreme cases the volume of water exposed to UV-B radiation was eight times greater than before the decline. Of nearly 700,000 lakes in eastern Canada the authors of the report say the DOC concentrations in about 140,000 may be low enough for UV-B penetration to be of concern, and that the highest concern must be for clear, shallow lakes, streams, and ponds, where even modest declines of DOC may eliminate the small regions that are deep enough to provide refuges from damaging UV-B radiation.

Alpine lakes are also at risk, since they may receive incident UV-B that is more than 50 per cent higher than that at sea level. High altitude species of trout have been shown to suffer sunburn patterns, increased fungal infections, and higher mortality rates at environmentally realistic exposures of UV-B.

The Canadian scientists conclude that in clear oligotrophic lakes the decreases in DOC caused by climate warming and acidification should be of much more concern with respect to UV-B exposure than depletion of the stratospheric ozone.

* Schindler, D.W. et al. *Nature*, Vol. 379, p.705 ff. (1996).

Hit by airborne nitrogen



Direct depositions of nitrogen compounds (both oxidized and reduced) onto the Baltic Sea. Annual depositions (averages for 1992-94) expressed as 000 tons N.

NITROGEN COMPOUNDS emitted to the air in the form of nitrogen oxides and ammonia are a large cause of eutrophication in the Baltic. Almost a third of the total inflow of nitrogen to this semi-inland sea comes through the direct deposition of air pollutants. Much of the rest arrives in the run-off from the surrounding land areas on which pollutants have fallen.

Nitrogen oxides and ammonia are transboundary air pollutants which can be windborne over great distances. Since nitrogen oxides remain longer in the air than ammonia, they can however be carried much farther before being deposited.

The map shows which countries contribute most to the direct deposition of airborne nitrogen compounds onto this sea. While five of them – Germany, Poland, Denmark, Britain, and Sweden – together account for more than half of the total, other

countries contributing significant amounts are the Netherlands, Finland, and France.

The nitrogen oxides come mainly from road traffic and shipping. It is estimated that transportation accounts for almost two-thirds of the nitrogen oxides that are emitted in the fifteen EU member countries. Most of the rest comes from combustion plants for the generation of power and heat. A reverse situation probably prevails however in central and eastern Europe, with a smaller pro-

portion for transportation and a larger one for combustion plants.

According to official statistics, for Europe as a whole in 1980 the emissions of nitrogen oxides totalled 22 million tons, in terms of nitrogen dioxide (NO₂). By 1989 the figure had risen to 25 million, after which it fell again, to just over 20 million tons in 1994.

The chief source of ammonia is farming, which is estimated to account for 95 per cent of the emissions – from livestock and the storage and spreading of manure. In 1980 the emissions, expressed as NH₃, came to 9 million tons, and just over 7 million tons in 1994. It should be noted however, that there may be errors in the data on emissions of nitrogen compounds in general, and ammonia in particular.

As concerns eutrophication it is the actual input of nitrogen that is of main interest. Calculated as pure nitrogen, the emissions of nitrogen oxides and ammonia in 1994 were both 6.1 million tons.

While it is always difficult to foretell the future, some indication of the way matters may develop during the next 10-15 years can be gained on the one hand from the countries' own forecasts and on the other from international scenarios. The figures in the table are the preliminary results of an analysis made in 1995 by the International Institute for Applied Systems Analysis (IIASA), involving three different scenarios for the period from 1990 to 2010.

The first (Current Reduction Plans) reveals the expected changes in national emissions, as announced by individual countries adhering to the Convention on Long Range Transboundary Air Pollution.

The second, the Current Legislation scenario, simulates the implica-

Future emissions of nitrogen oxides (NO_x) and ammonia (NH₃) according to three different scenarios. Changes in per cent from 1990. Source: IIASA.

	CRP	2000 CLE	MFR	CRP	2010 CLE	MFR
NO _x	-16	-32	-50	-18	-48	-66
NH ₃	-4	n.a.	-40	-5	n.a.	n.a.

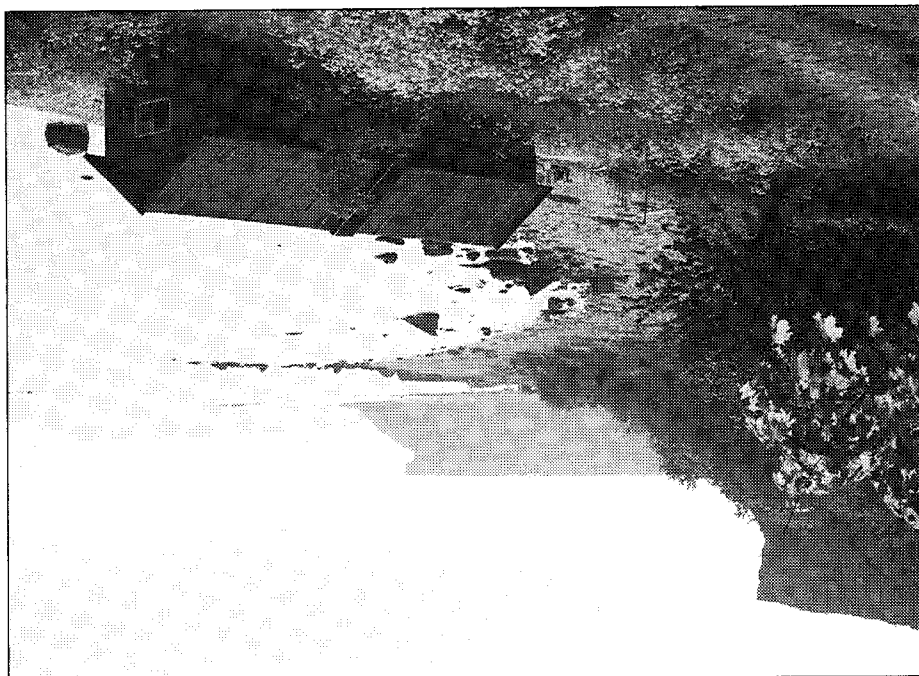
CRP = Current Reduction Plans. CLE = Current Legislation. MFR = Maximum Feasible Technical Emission Reductions. n.a. = not available.

tions of expected as well as existing national legislation and international regulations in respect of emission standards, fuel quality, etc. The assumptions concerning energy use were based on officially submitted projections, where such were available.

The third, the Maximum Technically Feasible Emission Reductions scenario, gives an estimate of the maximum reductions that could be attained by the use of commercially available technologies for emissions control. As the name indicates, it only considers technical measures, such as firing modifications and flue-gas denitrification at combustion plants, and stricter emission standards for cars and heavy vehicles as from the year 2000. It takes no consideration for structural changes, such as fuel switching, other modes of transport, or greater efficiency in the use of energy. The projected energy use is as in the second scenario.

It is evident from these scenarios that the measures to reduce emissions of nitrogen oxides that have already been decided upon, or can be expected the next few years, will not suffice to halt the environmental damage that these emissions are causing. If other environmental problems are taken into account, besides eutrophication – such as the formation of ground-level ozone, in which nitrogen oxides are also implicated – even greater reductions than those envisaged in the third scenario will be necessary. To bring them about, and to do so cost effectively, it will be necessary to combine more stringent technical requirements with structural changes, especially in the transportation and energy sectors.

It is also evident that ammonia has not been given the attention it should be getting. Among its effects,



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besides contributing to eutrophication, is to promote the acidification of soil and water. Although it has been known for more than ten years that ammonia plays a part in both of these environmental problems, few European countries have even attempted to make accurate estimates of their national emissions. And still fewer have decided on or proposed action to reduce them. At the EU level there are as yet no directives in regard to ammonia, nor are there any being drafted.

There seems to be little in the way of technical solutions that might be available for reducing the emissions of ammonia at a reasonable cost – so there is obviously a need here for structural measures, which would mean changes in agricultural policy.

If anything is done will depend whether decision-makers – both in the European Union and in central and eastern Europe – choose to put

protection of the environment before the unrestricted movement of cars and – in the EU – subsidized overproduction of meat. It is a question of whether environmental argument can prevail over the efforts of the powerful road, car, and farm lobbies.

CHRISTER AGREN

Adapted from an article in *Enviro* magazine No. 20, April 1996 (theme issue on the Baltic Sea). *Enviro* is published by the Swedish Environmental Protection Agency, S-106 48 Stockholm, Sweden. Subscription free of charge.

Note. The emission figures in the map on previous page are from EMEP, the Co-operative Programme for Monitoring and Evaluation of the Long Range Transmission of Air Pollutants in Europe. The latest EMEP statistics, covering emissions, exports and imports of air pollutants, are contained in the EMEP/MS-CHE Report 1/96, *Transboundary Air Pollution in Europe*, K. Barrett et al. The EMEP operates under the Convention on Long Range Transboundary Air Pollution.

Enter politics

Alongside the efforts that are now being made to promote the security and economic development of the Baltic region, environmental matters are being held steadily to the fore. The environment was in fact high on the agenda prior to the meeting of Baltic countries' prime ministers and high EU officials at Visby on the island of Gotland at the beginning of May. Watching that meeting – officially named the Baltic Sea States Summit 1996 – were the region's environmentalist organizations, who held their own press conferences and issued

an extensive statement of their views concerning ways to sustainable development of the region.

In a commentary to the official declaration from the conference, the environmentalists expressed satisfaction at the prospect of a coherent Agenda 21 for the region now being started and at the proposed strengthening of the Baltic Sea Joint Comprehensive Programme. They were critical, on the other hand, of the shift in focus from sustainable development, as promised before the meeting, to expansion of the EU and unsus-

tainable development as concerns energy and transportation in particular.

At a subsequent press conference arranged by the Baltic-Nordic NGO Network for Sustainable Energy, emphasis was laid especially on the energy and transport sectors. As has been brought out in the above article, the emissions of nitrogen oxides from just these sectors are a greatly contributing factor to the eutrophication of this sea.

For further information on the environmentalist network, please contact the Swedish NGO Secretariat on Acid Rain.

Further publications

Acid Rain: Facts about Swedish Policy
Factsheet briefly describing the problem of acidification, action taken in Sweden, and Swedish strategy within the European Union.

8 pp. Available free of charge from the Swedish Environmental Protection Agency, S-106 48 Stockholm, Sweden. Fax. +46-8 698 1515.

Impact of Air Pollutants on Processes in Small Catchments (1996)

Results from monitoring of the effect of air pollutants born over long distances on unmanaged forest ecosystems. Gives information on ion mass balances, nitrogen leaching, budgets for heavy metals, and effects of atmospheric pollutants on epiphytes and understorey vegetation in the catchments.

40 pp. Report No. 4524. Published by the Swedish EPA, address as above.

Alternative road transport fuels: A preliminary life-cycle study for the UK (1996)

A study by the Department of Trade and Industry, comparing energy use and emissions from the production, distribution, and end use of alternative fuels with those from petrol and diesel.

Vol. I, £11.95. Vol. II, £29.95. Obtainable from HMSO, Publications Centre, P.O. Box 276, London, England SW8 5DT.

Auto-Umweltliste '96

A survey of the German car market from the point of view of environmental performance. An important criterion for the ranking of the various models was fuel consumption, and two Fiats, Cinquecento 0.9 i.e.S and Punto 55 SX 6-Gang, came out top.

Published by the Verkehrsclub Deutschland, Postfach 170160, 53027 Bonn, Germany. Fax. +49-228-9858510.

Air Pollution Project Europe 1995-96

Report from the European School project aimed at increasing school children's knowledge of air pollution (described in *Acid News* 4/95, p.8).

Obtainable from Friends of the Earth Norway, Postboks 2113 Grunerløkka, 0505 Oslo, Norway.

Sustainable Transport in Central and Eastern European Cities

Motor vehicle traffic is growing dramatically in many Central and Eastern European cities, resulting in congestion, air pollution, and other problems. At the same time the public transport systems are adapted to meet changing requirements and severe budget constraints. In this report, containing the proceedings from a workshop organized by OECD and the European Conference of Ministers of

Transport in 1995, expert analyses and case studies give a variety of policy initiatives and policy recommendations for addressing these problems.

428 pp. Published by OECD, 2, rue Andre-Pascal, 75775 Paris Cedex 16, France. Fax +33-1 45 24 80 03.



Acid Reign '95? (1996)

Proceedings of the 5th International Conference on Acidic Deposition, held in Göteborg, Sweden, June 26-30, 1995. Edited by P. Grennfelt et al. Approximately 420 of the presentations at the conference appear in this volume, which is divided into four books.

2768 pp. £310.00. Published by Kluwer Academic Publishers, P.O. Box 322, NL-3300 AH Dordrecht, The Netherlands. Fax. +31-78-6546474.

Einkaufsverkehr – Nahversorgung versus Einkaufszentren (1996)

Quoting statistics showing that more than 200 villages in Austria have no food shop because those that were there have been driven out of business by edge-of-town shopping centres, this report investigates ways of reducing shopping traffic and gives examples of where this has been done successfully.

In German. 180 Schilling. Available from Verkehrsclub Österreich. Fax +43-1-893 2431.

Blueprint 5: The True Costs of Road Transport (1996)

By O. Johansson, D. Maddison and D. Pearce. A book quantifying the external costs of road transport, and suggesting new measures, such as road pricing and financial incentives, to pave the way to a sustainable transportation system.

176 pp. £10.95. Available from Earthscan, 120 Pentonville Rd, London, England N1 9JN.

World Directory of Environmental Organisations (1996)

Edited by T.C. Trzyna and R. Childers. Fifth edition, describing over 2600 organizations in more than 200 countries.

232 pp. £50.00. Published by Earthscan, address as above.

Renewable Energy Strategies for Europe (1996)

By M. Grubb, head of the energy and environmental program at the Royal In-

stitute of International Affairs. The subject is covered in a series of five volumes: *The Foundations and Context* (£12.95, 128 pp.), *Electricity Systems and Primary Electricity Sources* (£12.95, 128 pp.), *Heat and Biomass Energy Sources* (£12.95, 128 pp.), *Synthesis, Instruments and Prospects* (£12.95, 128 pp.) and *Summary Report and Index* (£10.00, 80 pp.).

All five volumes are available as a set for £50.00. Published by Earthscan, address as above.

Breathtaking – premature mortality due to particulate air pollution in 239 American cities (1996)

By D. Sheiman Shprentz, Natural Resources Defence Council. \$14.00. Available from NRDC Publications, 40 W 20th St, New York 10011, USA.

Air pollution control for coal-fired power stations in Eastern Europe (1996)

By Tim Jones. Examines the status of coal-fired generation in Bulgaria, Romania, Hungary, the Czech Republic, Poland, Ukraine, and Russia. Describes different options for improving environmental performance of large combustion plants.

Can be ordered from IEA Coal Research, Publications Dept., Gemini House, 10-18 Putney Hill, London, England SW15 6AA. Fax. +44-181-780 1746.

Acid Precipitation in Quebec: A Status Report (1996)

Tells of a marked reduction of the emissions of sulphur in the province (down in 1991 by 65 per cent from 1980), and what transboundary pollution means for the precipitation (estimates say 50 per cent is imported from the US). Also includes information about the effects on lakes and forest ecosystems, and the estimated changes in depositions if current commitments are fulfilled.

50 pp. Can be ordered from Ministère de l'Environnement et de la Faune, 150, boulevard René-Lévesque Est (10ième étage), Quebec, QC, Canada G1R 4Y1.

Acid Rain Deposition Monitoring Network in East Asia (1996)

As a follow-up to the Earth Summit in Rio de Janeiro in 1992 it has been decided to establish an acid deposition network in eastern Asia. Here are presented the agreements that have so far been made to this end. One of the main aims in setting up the network has been to prepare the ground for measures to curb the emissions of transboundary air pollutants.

62 pp. Published by the Environment Agency, 1-2-2, Kasumigasei, Chiyodaku, Tokyo, Japan.

BRITAIN

Managing nevertheless

A REPORT that British policy concerning acidification was beginning to take on a new aspect appeared in the last issue of Acid News. It was there stated that according to a recent review of the authorizations for power stations under the regulations for Integrated Pollution Control in England and Wales, the emissions of sulphur dioxide from those plants should decrease by 85 per cent between 1991 and 2005. Similar reductions in Scotland and Northern Ireland would come from revision of the authorizations for plants in those areas in the next few years.

Under the second sulphur protocol to the Convention on Long Range Transboundary Air Pollution that was signed in 1994, Britain committed itself to successive reductions of sulphur emissions from 50 per cent by 2000 to 70 per cent by 2005 and 80 per cent by 2010, as from the 1980 level. Because of apparent problems on account of the country's coal industry, Britain was unwilling to go anywhere nearly as far as several other countries, which had undertaken to carry out all these reductions already by 2000.

From a consultation paper* recently issued by the Department of the Environment, it appears that Britain might have managed a much tighter program than the one adopted. According to DoE estimates, the terms for 2000 and 2005 will in any case be met even without further measures being taken, while the 2010 objective will be missed by no more than 1-2 per cent.

The consultation paper contains no proposals for additional measures to meet the figure for 2010, the Department considering it sufficient for the time being to observe developments – an attitude that has been criticized by several environmentalist groups. Britain's emissions of sulphur may however be affected by coming decisions within the European Union, where a strategy for dealing with acidification is currently being developed, for presentation in mid-1997.

***Reducing National Emissions of Sulphur Dioxide: A Consultation Paper.** Available from the Department of the Environment, Room B354, Romney House, 43 Marsham Street, London, England SW1 3PY.

Coming events

World Congress on Air Pollution in Developing Countries. San José, Costa Rica, October 21-26, 1996.

Inquiries: ProEco, Apdo 3959 Tegucigalpa, Honduras. Fax +504 31 33 41.

Traffic and Urban Environment. Copenhagen, Denmark, November 4-5, 1996. *Inquiries:* Ingeniörföreningen, Vester Farimagsgade 29, DK-1780 Copenhagen V. Fax. +45-33 15 88 54.

Executive Body for the Convention on Long Range Transboundary Air Pollution (CLRTAP). Geneva, Switzerland, November 25-29, 1996.

Energy 21. North Berwick, Scotland, November 28-29, 1996. This conference, organized by Friends of the Earth Scotland, will focus on opportunities for sustainable energy and Agenda 21. *Inquiries:* FoE Scotland, 72 Newhaven Rd, Edinburgh, Scotland EH6 5QG. Fax. +44-131 554 8656.

EU Council of Environment Ministers. Brussels, Belgium, December 9-10, 1996.

Fifth Session of the Ad Hoc Group on the Berlin Mandate. Geneva, Switzerland, December 9-18, 1996.

Two new publications from the Secretariat

Attacking air pollution. Critical loads, airborne nitrogen, ozone precursors.

A state-of-the-art presentation of scientific knowledge concerning the critical loads for acidifying and ozone-forming air pollutants. Comprises the principal papers read at the Fourth European NGO Seminar on Air Pollution, held in Göteborg, Sweden, in April 1995, as well as the statement issuing from the seminar, in which the European environmentalist organizations present as a body the measures considered necessary for achievement of a cleaner atmosphere.

Doing more than required. Plants that are showing the way.

By A-K Hjalmarsson. Survey revealing that in many cases at large European combustion plants the requirements are

already being met, and by wide margin, which are now figuring as the "best available technique" in the discussions for a revision of the EU large combustion plants directive.

Also available in the Secretariat's Air Pollution and Climate Series:

The 100 worst sulphur emitters (1995)

By M. Barrett and R. Protheroe. A study mapping the 100 largest point sources of emissions of sulphur in Europe shows that these hundred are responsible for almost half of the continent's total emissions of this pollutant.

To clear the air over Europe (1995)

By M. Nilsson. Besides surveying the present situation, the report puts for-

ward proposals for revision of the system of guidelines and standards for air quality, as well as proposing a general tightening of air-quality standards in order to ameliorate the effects on health and the environment.

Large combustion plants. Revision of the EC directive (1995)

By F. Lundberg and C. Ågren. In this report the 1988 directive on large combustion plants is critically examined, and proposals made, on the basis of the best available technology, for the admission of stricter standards both for new and existing plants.

Single copies of these reports can be obtained free of charge from the Secretariat. Please call for quotation if more copies are required.