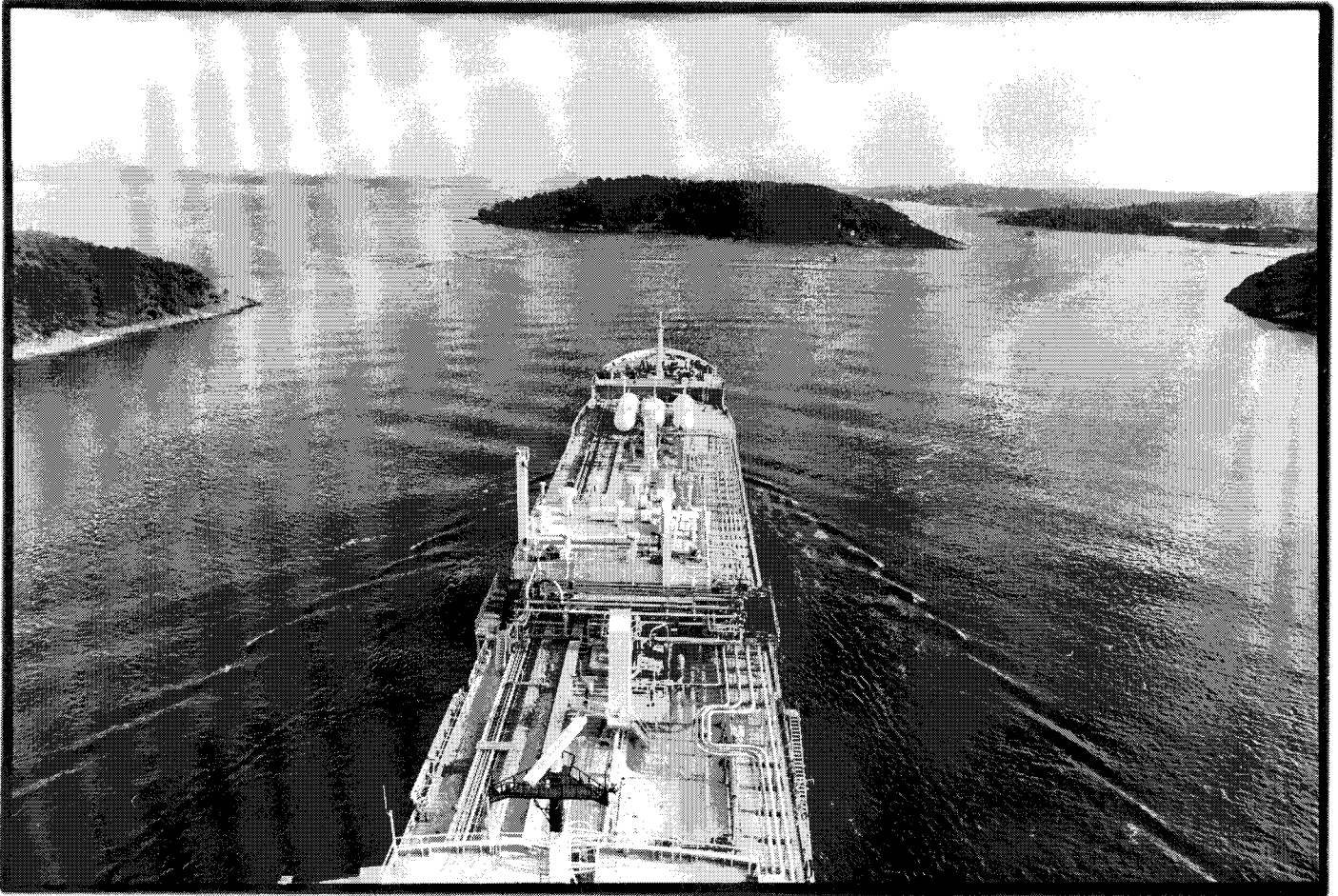


# Acid News



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## IMO CONVENTION

# Annex to curb emissions

AFTER SIX YEARS of negotiations, an international agreement for control of the emissions of air pollutants from shipping may come about next year. If so, it will take the form of an annex to the MARPOL 73/78 framework convention. It will have to be accepted by the Marine Environment Protection Committee (MEPC) of the IMO, International Maritime Organization, a United Nations body.

The next meeting of the MEPC, which will take place on July 1-10, is likely to be the last before a decision has to be made. The emissions of acidifying air pollutants from shipping are considerable (see AN 4/95), and here four matters are of especial importance:

The highest globally permissible content of sulphur in bunker oil.

The possibility of imposing stricter requirements for so-called special areas.

The highest permissible emissions of nitrogen oxides from ships' engines.

The conditions for the annex's coming into force.

Among other matters are the emissions of volatile organic compounds and ozone-depleting substances.

### SULPHUR CONTENT OF BUNKER OIL.

At the last meeting of the MEPC in September, a majority of the countries favoured a global cap of 5 per cent – although there were, according to the official report, “numerous delegations that voiced support for a lower figure ranging from 3 to 4 per cent.” In view of the fact that the average sulphur content of bunker oil

is now around 2.8 per cent, neither alternative would have any real environmental effect.

At the Fourth North Sea Conference in June the attending ministers emphasized the need for “a global cap, resulting in a true reduction of the sulphur content in fuel oil.” But in the written statements to the MEPC meeting in September there was not a single proposal from any North Sea country for a “true reduction.”

Germany proposed a limit of 3.0 per cent, with a five-year adjustment period during which a limit of 3.5-4.0 per cent would apply. Denmark suggested a 3.5-per-cent limit, and Norway 3.8 per cent. The United Kingdom proposed 4.5 per cent, with

*Continued on page 3*

# 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 groups, as for instance in connection with the meetings of the bodies responsible for international conventions, such as the United Nations Convention on Long Range Transboundary Air Pollution.
- Acting as an observer at the proceedings involving international agreements for reducing the emissions of greenhouse gases.

# Letter from the editor

SOME TIME AGO we circulated a letter asking for views on *Acid News*. As well as many expressions of appreciation, we received in reply a variety of suggestions as to how the newsletter might be improved, for which we were also most grateful.

The fact that we have not always replied personally to suggestions should not be taken to mean that they have not been considered. They have, carefully. But the main reason has been that we first wanted to see whether and how the ideas put forward could be accommodated in editorial policy.

As you may have noticed, some of the recurrent ones have in the meantime been taken up. We have, for instance, been able to include more news on eastern Europe, both in the form of articles in *Acid News* and of special publications in our *Air Pollution and Climate* series. We have also been making it easier to find any article quickly through the brief summaries in the contents column. And we are announcing forthcoming events more fully.

A description of the aims and methods of the Secretariat has always appeared in the masthead on the left side of this page. We think it may be of interest if we now dilate and tell of our activities in more detail. In a European context, the principal actors that concern us are the Convention on Long Range Transboundary Air Pollution (CLRTAP) and the European Union. We follow closely the proceedings in each of these forums, so as to keep track of developments and also, if possible, to have some hand in influencing decisions. We therefore often attend those Convention meetings where negotiations for international agreements are going on (reporting as for instance on pp. 5-6 of this issue), as well as the open meetings of the EU at which legislation on air pollution is taking form.

Another outcome of such observation could be seen in two reports published last year in the APC series, the one on air quality and the other on emission standards for large combustion plants. The aim in each case was to show that EU directives could and should be made stricter.

In respect of EU legislation, close cooperation is naturally maintained between the Secretariat and Brussels-based environmentalist associations such as the European Environmental Bureau (EEB) and the European Federation for Transport and Environment (T&E).

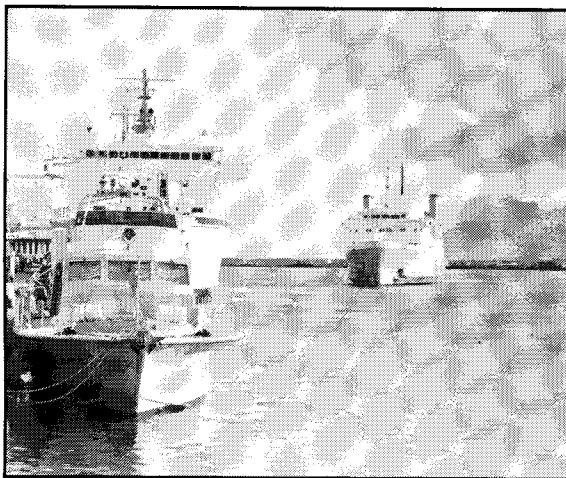
Towards the end of the eighties we also started to develop a contact network with environmentalist groups in central and eastern Europe. This has now come to comprise some fifty organizations in ten or so countries. Although some have an international aspect, most of them are concentrating on local problems of air pollution. The Secretariat has supported them with finance and advice, so that by now special projects for information on air pollution have been set going in most of these countries, often covering a wide spectrum of matters concerning energy and transportation as well.

Since measures to counter climate change must inevitably involve less burning of fossil fuels, and thus reduced emissions of sulphur and nitrogen oxides, the Secretariat naturally supports and participates in the work of the Climate Action Network, organized by European environmentalist groups with the aim of influencing developments. We also regularly attend meetings held under the Framework Convention on Climate Change.

Much has happened since 1982, when the Secretariat was started. It has for example become evident that those pollutants that cause acid rain also give rise to eutrophication and the formation of ground-level ozone. Equally evident is the connection with climate change. Readers may have wondered why, in view of this, we should not drop the name of *Acid News* for something else. We have indeed considered this, but come to the conclusion that it would entail too great a risk of losing identity.

Let us once again say that we are grateful for comment on *Acid News* as well as our other publications, and will always welcome ideas and information, articles, and pieces intended as letters to the editor.

CHRISTER ÅGREN



*Continued from front page*

the possibility of the IMO tightening the standard in the future if the average sulphur content should exceed a threshold value of 3.7 per cent.

Because of the problems of control and enforcement in special areas, the Netherlands emphasized the importance of a strict global standard, but nevertheless suggested a limit of 4.2 per cent.

The matter of sulphur will be taken up again at the next meeting of the MEPC in July. The difficulty of arriving at a meaningful decision is largely due to the successful infiltration of the proceedings by the oil companies (see AN 1/95).

Provided a global cap was embraced by all countries, leaving competition among shipowners unaffected, the IMO member countries should have little to fear even if the eventual limit should be much stricter than any so far proposed. In most cases the increased cost of running on low-sulphur fuel would only have a marginal effect on the price of the goods that were being transported.

Burning fuel oil with a low sulphur content (i.e. higher quality) would moreover allow distinct advantages in the way of greater operational reliability and less need to use acid-neutralizing lubricating oils.

The oil companies take a different view. Shipping is now one of the few sectors where the absence of environmental standards still makes it possible to sell high-sulphur products. The enforcement of a lower sulphur content in marine fuel oil would, they say, necessitate great investments in desulphurizing equipment at the refineries. The sums they mention are however angled, as they want if possible to

retain the shipping industry as a "sulphur sink."

An increased demand for low-sulphur fuel oils from shipowners – such as might result from special regional requirements and/or the application of financial instruments – would not however necessarily mean that the high-sulphur oils would have to be desulphurized at great cost at the refineries. Many of the big land-based combustion plants now meet the standards by

burning low-sulphur oils – but an increased demand for such products will naturally tend to raise the price, making it worthwhile for the power companies to install desulphurizing equipment and go back to using the cheaper high-sulphur fuel.

The need of the oil companies for a sulphur sink would thereby be met, but with much less bad effect on the environment. Desulphurizing can namely eliminate more than 95 per cent of the sulphur dioxide that would otherwise be emitted from a power plant. At the same time more low-sulphur oil would become available for shipping, without any need for extensive alterations in the refinery processes.

The oil could also be gasified, and the gas burnt in a turbine to produce electricity. In that process more than 99 per cent of the sulphur is removed before the gas is burned. The cost would also be much less than the oil companies have claimed in their propaganda. It seems their resistance to any serious control of sulphur emissions at sea stems more from fear of change than from any real threat to their finances.

**SPECIAL AREAS.** The MARPOL Convention allows the possibility of setting up special areas in places where the environment is especially sensitive, and the matter has come up on the agenda for the air pollution annex. While there is fairly general agreement that 1.5 per cent would be a suitable limit for sulphur in the bunker oil that is burnt in such areas, no special area has yet been defined. It should however be cost-effective to set a lower limit than 1.5 per cent for special areas.

The countries around the Baltic have been trying for many years to get that sea classified as a special

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The greatest threat to Denmark's woods, heaths, and bogs comes from nitrogen emitted in the form of ammonia, most of which has its source in livestock farming.

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Efforts to arrive at a directive for improving energy efficiency in refrigerators and freezers have led practically nowhere, and voluntary agreements have likewise stranded.

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Deregulation and subsidiarity are said to have forced the European Commission to abandon hopes of using legislation as the means of promoting energy efficiency in general.

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In a white paper on energy policy, the European Commission opines that the conflict between competitiveness and environmental aims can be resolved without "major tension," although it does not say how that can be done.

### **More complicated 14**

The mapping of critical loads is becoming more complicated as attention is now turning to preparation of the groundwork for the multi-pollutant protocol noted above.

area under the annex. A decision has however been steadily blocked by other countries demanding more scientific evidence in support of the claim that the Baltic should be declared such an area – although at the North Sea Conference a similar request was made for the North Sea.

In order to get some properly functioning areas established, the Netherlands put forward the idea at the September meeting of the MEPC that two or more countries should be permitted "to propose the designation of a special area of 12 nautical miles off their coasts, without the burden of scientific proof of the necessity of such a measure." Comprising only coastal zones, such special areas, while probably leading to a local improvement of air quality, would have very little effect on total emissions.

But even if the Dutch proposal should be accepted, the problem of enforcement would still remain. Whereas accedence to a global cap can relatively easily be checked in port, it would be much more difficult to ensure that ships were actually using oil with a low sulphur content during a chance passage through a special area.

**NITROGEN EMISSIONS.** The present annex draft calls for a reduction of the emissions of nitrogen oxides from new vessels by 30 per cent from the level of those with the most fuel-efficient engines. It is however possible to reduce emissions by at least 90 per cent both from new and existing ships (see AN 1/94). It would moreover be relatively cheaper compared with similar measures taken on shore.

For existing ships the proposal does not include any requirements whatsoever. Norway has been one of the countries urging effective measures, without however receiving much support. Sweden has excused itself on tactical grounds, saying that imposing NOx standards for existing vessels would probably lead to the annex never being ratified globally.

It says in the report from the last MEPC meeting that Germany, "with the support of several other delegations," wants to hold the door open for the introduction of NOx standards in step with technical improvements for NOx cleaning of the exhaust from existing engines. But as things stand today, that would have no appreciable effect on the total emissions of

nitrogen oxides from shipping during the next few decades.

**ANNEX IN FORCE.** A final matter of importance is what will be needed for the annex to enter into force. As proposed, that would be six to twelve months after it has been ratified by the legislatures in at least [15] member countries, representing at least [20-50] per cent of the gross tonnage of the world's merchant shipping.

The square brackets mean that the issue is not yet settled. The pessimists doubt whether the annex will come into force before 2010, even if it should be ready this year. But if it should become watered down as much as feared, that would hardly matter. Special areas might be of

some use, if properly defined. It is however quite possible that other bodies than the IMO – in combination with market forces in the form of consumer demands for cleaner freight carrying – will be the driving force leading to environmentally friendly shipping.

PER ELVINGSON

Parts of the information in this article come from an account of the last meeting of the MEPC written by Sian Pullen of WWF UK, which appeared in *North Sea Monitor*, December 1995. A useful account of the effects of shipping on the environment and the existing maritime conventions can be found in the WWF Baltic Bulletin No. 2-3, 1995, which is obtainable from WWF, Ulrikdals slott, S-170 71 Solna, Sweden.

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## Environmental charges on shipping

WE CAN'T wait any longer for anything meaningful to come out of the international negotiations concerning the emissions of air pollutants from shipping," says Stefan Lemieszewski, environment officer at *Sjöfartsverket*, Sweden's National Maritime Administration. His agency is about to put forward a proposal to the effect that all ships, foreign as well as Swedish, entering Swedish ports should pay dues scaled in proportion to the amounts of pollution they emit. Assuming sufficient political support, such a system could well, according to Lemieszewski, be in operation as early as next year.

The pollutants taken into consideration would be sulphur and nitrogen oxides. The dues would initially be low, so as to give shipowners time to make the necessary changes in their vessels.

There has lately been talk in Swedish political circles of making bilateral agreements with the countries around the Baltic to curb ships' emissions – since the current global discussions seem unlikely to yield any results that would appreciably affect the environment within a reasonable time. But despite a favourable response from the other countries, no agreements have yet come about. Although they would only concern shipping plying in regular trade between two countries surrounding the sea, it is estimated that the re-

ductions would be relatively great if a fair number of agreements were made.

In an article in the press last October the Swedish ministers of environment and transportation gave the impression that Sweden would be taking unilateral action in this matter. It seems in fact that this is likely to be done without waiting for bilateral agreements to be concluded, although work on the latter will nevertheless proceed.

Weighty reasons for the ministers' desire to act are a) the size of the emissions (shipping accounts for 20 per cent of Sweden's total emissions of sulphur dioxide and at least 20 per cent of those of nitrogen oxides), and b) the fact that such measures would be distinctly cost effective (that is, cheap compared with similar measures taken on land).

Although not yet formally put forward, the Maritime Administration's proposal would put Sweden out in the forefront of nations attempting to curb emissions from shipping. The hope is of course that others will follow suit. To date California is the only state that has unilaterally elaborated a scheme for control of shipping. But according to Lemieszewski that proposal is not so likely to introduce technical improvements as the Swedish.

PER ELVINGSON



# Protocols in the making



© DAN RAPP

AT GENEVA IN FEBRUARY proposals were ventilated for further protocols under the Convention on Long Range Transboundary Air Pollution. This was a consequence of a decision made by the Executive Body of the Convention at its last meeting in November, to the effect that the time had now come for negotiations to start on three new protocols – one covering nitrogen oxides, volatile organic compounds (VOCs), and ammonia, another dealing with heavy metals, and a third for persistent organic compounds (POPs).

The highest priority should, according to the decree of the Executive Body, be given to the first named. This, it was said, should be a so-

called multi-effects and multi-pollutants protocol, and the aim should be to have a draft ready for signing before the end of 1997. It should, in a similar manner to the sulphur protocol of 1994, take consideration of the amounts the environment can withstand without suffering damage: in other words accept the critical loads approach.

Nitrogen oxides add to diverse environmental effects, such as the formation of photochemical oxidants, acidification, and eutrophication, and all are to be taken into consideration in working out a protocol. Hence the multi-effects designation. Since mapping of the critical loads for acidification has been going on in Europe

for some time, the limits are already known. They take into account the acidifying effects of nitrogen in oxidized and reduced forms as well as sulphur – the oxidized nitrogen coming from nitrogen oxides and the reduced forms from emissions of ammonia.

There are also maps of Europe showing the spread of critical loads in respect of eutrophication (see pp. 14-15). The available knowledge is however still insufficient for inclusion of the effects on marine ecosystems, especially in coastal zones. As in the case of acidification, oxidized and reduced nitrogen compounds both contribute to eutrophication.

The role of nitrogen oxides in the formation of photochemical oxidants, and especially of ground-level ozone, will add to the complexity of the negotiations. Contributing to the formation of oxidants are also VOCs, which comprise a wide range of pollutants. To lessen the concentrations of ground-level ozone it will therefore be necessary to reduce the emissions both of  $\text{NO}_x$  and VOCs, and which of these pollutants most urgently calls for action differs in different parts of Europe.

The critical levels for ozone, as regards damage to vegetation, have been scientifically determined through observation of the effects on farm crops and trees, and maps of Europe are now being made accordingly. But ozone can also have direct effects on health. Although in this case no critical levels have yet been worked out, there are the air-quality guidelines published by the World Health Organization, as well as the guide values laid down in an EU directive.

With the fact in view that other air pollutants besides nitrogen oxides must be taken into account, the Working Group on Strategies, which is the Convention's negotiating body, has now started work on a new protocol. Here again, as was the case when the 1994 protocol for sulphur was being developed, computer models will be used to show the likely trend of emissions under various scenarios. It is intended that preliminary

scenarios indicating each country's emissions up to 2010, not only of nitrogen oxides but also of volatile organic compounds and ammonia, shall be presented at the next meeting of the working group in May.

Several computer models are used in the working out of protocols, but especially the one known as RAINS that has been developed by the Institute for Applied Systems Analysis in Austria. Among the information that can be obtained is the cost of various measures for limiting emissions. It is thus possible with the aid of the model to produce scenarios that are cost-optimized for given emission or deposition targets. In other words, the model can help to determine the most cost-effective solutions for Europe as a whole.

Since Convention activities have hitherto mainly centred on sulphur and nitrogen oxides, a lot of new information will be required, especially as regards VOCs and ammonia. Work to this end is now proceeding, with the expectation that most of what is needed will be ready for insertion in the models this next summer. In that case cost-optimized scenarios will be available for the Working Group when it meets again at the end of August. Then, too, it will be possible to start more definite negotiations in regard to each country's undertaking to impose a ceiling on emissions.

A constant source of contention, when protocols are being prepared, is whether and to what extent special requirements, such as standards for large emission sources, should be added to compulsory emission ceilings. Besides emission ceilings, the 1994 sulphur protocol includes standards for sulphur emissions from large combustion plants which are binding for new installations and strongly recommended for existing ones. There are also requirements setting a maximum sulphur content for certain fuels. If similar requirements are to be a part of the coming protocol, as proposed by a group of countries, others can be expected for mobile sources (in particular motor vehicles) as well as for emissions of ammonia from farming.

In preparation for the other protocols, two working groups have been occupied in assembling the necessary background material. They were able as a result to present in February a preliminary outline of the

contents for the two new protocols.

As regards heavy metals, there is already a general agreement that mercury, lead, and cadmium should first be dealt with – with the intention however of later, when a protocol has come into force, including other metals. Although it is felt in most countries that the present store of knowledge is insufficient for basing a protocol on critical loads, that concept might well be applied later when

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### *Special requirements a constant source of contention*

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it comes to a revision of the protocol. At this stage it is mainly binding requirements in the form of emission standards for stationary installations, and a phasing out of some metal-emitting industrial processes that are being considered.

As part of the preliminaries to the development of a protocol on persistent organic compounds much effort has gone to deciding on the criteria that are to apply in selecting the substances whose emissions are to be the first that must be cut back by international agreement. The out-

#### **The protocols**

Previous protocols under the Convention on Long Range Transboundary Air Pollution (CLRTAP) have been:

- That of 1984 on the long-term financing of EMEP, the European Monitoring and Evaluation Programme (in force 1988).
- The 1985 protocol for the reduction of sulphur emissions, which came into force in 1987.
- The 1988 protocol for control of the emissions of nitrogen oxides, in force 1991. Signatories undertook to restrict their emissions after 1994 at least to 1987 levels or preferably lower.
- The 1991 protocol applying to emissions of volatile organic compounds (VOCs). So far ratified by thirteen of the twenty-three signatories, it needs three more to come into force. In most cases signatories have undertaken to reduce their emissions by 30 per cent between 1988 and 1999.
- The 1994 protocol for further reduction of the emissions of sulphur. Still lacks thirteen ratifications, having been ratified by only three of the twenty-eight signatories.

come has been that priority should be given to compounds that can travel long distances (are transboundary) and being persistent can become accumulated in living tissue, whether vegetable, animal, or human, and in general are considered most damaging. Accumulation in fatty tissue can for instance give rise to cancer, and damage the reproductive system.

A background document lists about twenty such substances, including pesticides such as aldrin, DDT, toxaphene, dieldrin, pentachlorophenol, and chlordane, as well as contaminants/byproducts such as dioxins, furanes, polycyclic aromatic hydrocarbons (PAHs), and some chemicals such as polychlorinated biphenyls (PCBs) and hexabromobiphenyl.

There is some difference of opinion between countries as to which and how many POPs should be included at first. The minimum number would in any case be twelve – those sometimes known as the “dirty dozen.” There is however a general agreement that no matter how many may be selected initially, others can be added later.

It is likely that a POP protocol will require countries to take a variety of measures, depending on the source of the pollutant. For some substances it may mean prohibition both of production and use, but for others only specified restrictions. It may also mean the destruction of existing stocks, and the imposition of emission standards for certain types of industrial plant.

International measures are in any case in the making for certain kinds of POPs. Last May the UN Environmental Programme set its sights on twelve such substances, and the same body is speculating that the fact of a lead having been taken under the Convention will open the way for measures with a global application.

CHRISTER ÅGREN

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#### **Pays off handsomely**

A new grid-connected wind turbine will make up for the energy going into its manufacture within three to four months, according to a Danish study. Producing, operating, and scrapping a turbine of 600 kW capacity takes 3 terajoule (TJ) of energy. Given Danish wind conditions, its annual output of electricity would be 9.3-11.5 terajoule.

Sustainable Energy News No. 12, March 1996.

# The problem of ammonia



© PER ELYNGSON

Heather with anemones (*Pulsatilla vulgaris*). Even if the Danish emissions of ammonia were halved, 96 per cent of the heathland and all of the country's bogs would still be exposed to a greater supply of nitrogen than they can withstand in the long run.

THE AIR POLLUTANT that constitutes the greatest threat to Denmark's woods, heaths, and bogs is ammonia. Emissions could, according to the country's National Environmental Research Institute, be halved at a low cost, but even that would not suffice to bring depositions under the critical loads.

The country's own emissions of ammonia, by far the greater part of which stems from animal husbandry, are estimated to give 110,000 tons of nitrogen per annum (equivalent to 134,000 tons of ammonia). Calculated as nitrogen that comes to somewhat more than the figure for nitrogen oxides, emitted mainly from transport and combustion plants. European emissions of nitrogen divide about equally between ammonia and nitrogen oxides, but in all cases there is a margin of uncertainty of about 30 per cent.

Normally as much as 30 per cent of the nitrogen in animal manure evaporates in the form of ammonia – the losses chiefly occurring in handling

indoors, in storing, and in spreading on the fields (see table).

After evaporating, the ammonia gradually becomes converted in the air to ammonium particles ( $\text{NH}_4^+$ ). The term ammonium nitrogen refers to the combination of ammonia and ammonium. Every year 59,000 tons of ammonium nitrogen are deposited on the land in Denmark, 75 per cent coming from domestic sources. According to computer models, the depositions have trebled since 1870. Annual deposition on the sea in the Kattegat amounts to 9600 tons, of

which 53 per cent is traceable to Danish sources. Denmark thus contributes some 20 per cent of all the nitrogen falling into the Kattegat, and the country's airborne exports of ammonium nitrogen are about five times greater than its imports.

Added to the ammonium nitrogen depositions over Denmark are those of nitrate nitrogen, which are about half as large, so that the total depositions average 21 kilograms of nitrogen per hectare a year. Because ammonia is usually deposited relatively close to the source, there can however be great local variations – with depositions amounting in some cases, around large sources, to as much as 100 kilograms of nitrogen per hectare a year.

The most threatened ecosystems in Denmark are raised bogs and heaths – comprising in both cases environments adapted to a low supply of easily available nitrogen.

In the Netherlands, which has the largest deposition of nitrogen per surface area in Europe, a third of the

#### Danish sources of ammonia emissions 1992 (tons of nitrogen/annum).

Manure from animals in barns	34,000
Storage of manure	19,000
Spreading of manure	31,000
Manure from grazing animals	4,000
Artificial manure	7,600
Ammonia treatment of straw	9,000
Evaporation from vegetation (potential)	10,000
<b>Total</b>	<b>115,000</b>

heather heaths have become converted to grassland, with a great impoverishment of biodiversity as a result. Similar changes are discernible in Denmark. It is definitely proven that an oversupply of nitrogen is an important factor in the spread of grasses at the expense of heather.

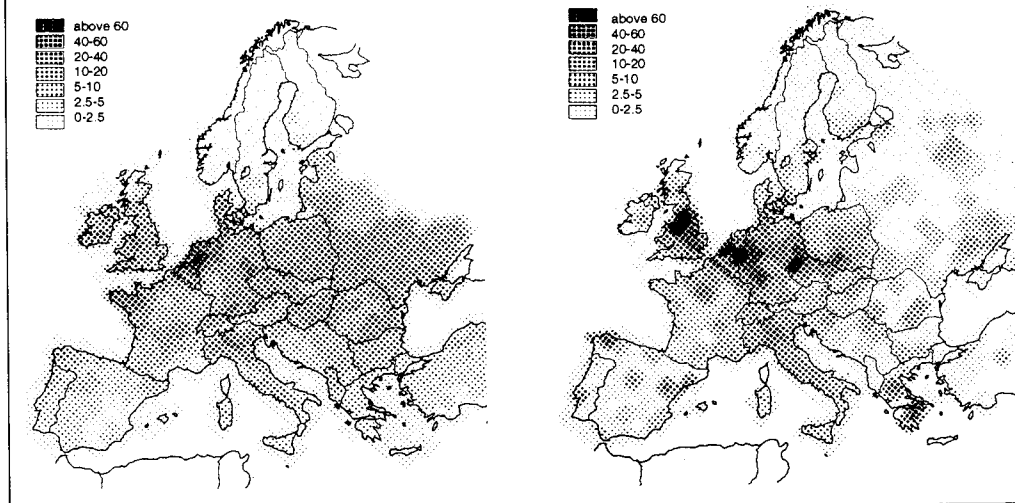
Extensive drainage and peat cutting have meant that raised bogs have almost disappeared as a natural feature in Denmark, there now being only eight left with an area of more than five hectares, compared with 670 around 1920. Raised bogs are unique in obtaining their nutrient supply entirely from the air, thus constituting an ecosystem that is adapted to extremely low amounts of nitrogen. The remnants of Denmark's raised bogs are now threatened with extinction from a continuous oversupply. A steady increase has been observed in the number of nitrogen-loving species, driving out the characteristic types, such as certain *Sphagnum*s.

The critical loads for nitrogen have been estimated to be 5 kilograms per hectare a year for raised bogs and 10 kilograms a year for heathland. They are being exceeded in all the ecosystems of these kinds in Denmark, the worst affected being the bogs, where the limit is being exceeded by more than 10 kilograms per hectare per year on 87 per cent of the total area. Even if the Danish emissions of ammonia were halved, all the bogs and 96 per cent of the heathland would still be exposed to a greater supply of nitrogen than they can withstand in the long run.

Much of the woodland, too, is getting an oversupply of nitrogen. The critical loads are being exceeded on 90 per cent of the area where needle trees are growing. Although the situation is somewhat better for beech and oak, half of the area with such trees is still getting too much nitrogen.

The research institute makes plain that an enormous reduction of nitrogen emissions will be needed, both within and outside Denmark, if all ecosystems are to be saved. And even if emissions were reduced enormously, buffer zones would still have to be established around particularly sensitive places. Since ammonia is to a

Emissions of ammonia (left) and nitrogen oxides (right) in Europe 1989 (kg N/ha/year).



large extent deposited near the sources, local improvement could be achieved by strong measures in the vicinities.

The effect of atmospheric nitrogen as regards eutrophication of the sea is also considered in the research institute's report. It is said to contribute "considerably" to algal blooms and oxygen-deficient bottoms.

The only countries in Europe that have made any definite decisions to reduce emissions of ammonia are the Netherlands and Sweden. According to a Dutch plan of action, emissions are to be reduced by 70 per cent, as from 1985, by the year 2000. Sweden was aiming at a 25-per-cent reduction during the period 1990-1995, but according to the latest data emissions have increased, mainly due to greater numbers of livestock.

### Effects can be various

Eutrophication and its consequences for ecosystems are considered the most serious results of the spread of ammonia in Denmark. In some circumstances ammonia can however also contribute to the acidification of soil and water – as will happen for instance if ammonium ions become nitrified, that is, converted to nitrate ( $\text{NO}_3^-$ ), giving off hydrogen ions in the process. There will be no net acidification if the nitrate is taken up by vegetation, but the soil will become acidified if it leaches out.

Evaporated ammonia can also cause direct damage to vegetation. But that can only happen if the concentrations of ammonia in the air are very high, which in fact will only occur in the immediate vicinity of large emission sources.

As concerns Denmark itself, numerous proposals have been put forward for coming to grips with the problems of ammonia. It is in any case considered quite possible to bring about a 45-per-cent reduction of the evaporation within a few years at an acceptable cost.

The research institute proposes the following measures, over and above ensuring that the current requirements for manure storage are met.

Altering the methods of manure spreading, such as by ploughing under more quickly and an increased use of trailing hoses, or by injecting the manure into the ground. Losses to the atmosphere are greatest during spreading, 31,000 tons N/year. Measures of the above type are often exceptionally cost effective, since the more efficient use of nitrogen becomes an item on the credit side in the farmer's budget.

Ceasing to treat straw with ammonia would lead to a reduction of emissions by 9000 tons of nitrogen a year.

Altering the composition of animal feed. By adapting the feed more closely to the animal's real needs, the nitrogen content of the excreta can be reduced. Of the potential 15,000 tons of nitrogen that could thus be eliminated, 8000 tons have already been dealt with at a little or no cost. Removing the remaining 7000 tons would however be more costly.

Barns should be designed with a view to holding back the evaporation of ammonia.

Emissions can also be reduced, although to a lesser extent, by lessening the use of artificial manure. This



applies especially to urea, from which evaporation is relatively high.

No exact figure is given of what it would cost Danish farmers to halve the evaporation of ammonia. From information from the Netherlands it can be seen however that improved ploughing-under is one of the most cost-effective ways of reducing such evaporation (said to cost 0-1 ecu per kilogram of eliminated nitrogen). Switching to feed with a lower nitrogen content is more expensive (8-10 ecu/kg), and filtering barn air the most costly of all (30 ecu/kg).

Compared with the findings of previous studies, the potential reduction of 45 per cent at a low cost in the Danish estimate is relatively high. Others have suggested a 30-per-cent reduction at reasonable cost as more likely for Europe as a whole. Countries practising intensive farming, such as Denmark and the Netherlands, can achieve much more at a low cost than others with a less mechanized agriculture. Emissions from the latter are on the other hand smaller.

The mapping of European emissions, which has so far been poor, is about to be improved. Intensive work to this end, with the aim of including ammonia in the new nitrogen protocol, is now going on within the Convention on Long Range Transboundary Air Pollution (see pp. 14-15).

PER ELVINGSON

**Ammoniakfordampning fra landbruget.** Miljøprojekt nr 283. Miljøstyrelsen 1995. Danish only.

## Gains from a change

By changing the composition of pig feed, the flow of ammonia to the soil can be reduced by 40 per cent, and the actual evaporation by 60 per cent, according to a British study which was basically aimed at tracing the emissions from agriculture of the greenhouse gases methane and nitrous oxide.

In the trials the pigs were given a modified diet containing 25 per cent less crude protein than ordinary feed, but with more readily available amino acids such as lysine. After the excreta had been spread on the fields, the emissions of methane and nitrous oxide were found to have been lowered by 53 and 28 per cent, in addition to the above reductions of ammonia. There was also noticeably less smell. The pigs' rate of growth was unaffected.

Source: ENDS Report 252. January 1996.

## LITHUANIA

# Toying with a dirty fuel

A MAIN REASON for the Lithuanian government wanting to start using orimulsion is that the country is now dependent on imports from Russia for 98 per cent of its fuel needs – and orimulsion had seemed an affordable alternative. But orimulsion, an emulsified product from the bitumen reserves of Venezuela's Orinoco Belt, is an extremely dirty fuel, with a high content of sulphur and other pollutants (see AN 5/95, pp. 14-15).

The idea of using orimulsion in the Lithuanian power plants first came up in 1994. Then in June 1995 the government signed a contract with Bitor Europe Ltd, representing the Venezuelan producer, for a supply of unspecified quantities during the eighteen years to 2012.

The decision, which had not been preceded by any study of the effects on health and the environment, was severely criticized not only by environmentalists, but also by economists, energy experts, and opposition parties. Consequently the government changed its plans, and said it would start with a trial firing of 25,000 tons in one of the boilers at Elektrenai, a state power plant that mostly serves as a standby for the Ignalina nuclear facility.

The aim of the trial, which lasted for a couple of months in the autumn of 1995, was said to be to identify and find solutions for any problems that might come to light. But officials of the ministries of environment and energy had already announced, even before the results were made known (in January this year) that the use of orimulsion would start again in a 300 MW boiler at Elektrenai, as soon as electrostatic filters had been installed.

The authorities claim that with the filters they will be meeting EU standards. But that would only apply to particulates, and there are no plans for dealing with the emissions of sul-

phur, which are likely to be very great, or of any of the other pollutants. The sulphur content of orimulsion is 2.7 per cent by weight, which means that because of the low energy value, its use will be equivalent to burning heavy fuel oil with a 4-per cent sulphur content.

Not only will there be an increase in air pollution from the burning of orimulsion, but also a risk of damage to the marine environment – especially sensitive in

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*Should have been  
comprehensive studies  
before contract was signed*

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the Baltic. Being emulsified with water, orimulsion will not remain floating on the surface like ordinary oils in the case of spills, but will disperse throughout the waterbody in the form of small particles, to the detriment especially of life in the sea floor.

While it is naturally desirable to lessen Lithuania's dependence on Russian fuel, the disadvantages of orimulsion also need to be set against the risks of continued operation of the nuclear plant at Ignalina. But neither of these reasons can excuse the haste with which the matter has so far been handled. There should have been comprehensive studies covering the environment, health, the national economy, and the energy supply in general before any long-term contract was signed.

LINAS VAINIUS

Project Coordinator, Energy and Air  
Pollution Information Center

The centre is run by the Lithuanian Green Movement with financial support from the Swedish NGO Secretariat on Acid Rain. It has been carrying on a campaign concerning orimulsion since May 1995, producing factual material, lobbying politicians, and participating in meetings and press conferences. Last November a symbolic action was arranged outside the government building, with demands for public participation, access to information, and transparency in the decision process in regard to orimulsion.

## Leaving their cars

Traffic jams are costing the European Union 120 billion ecus per year, which is four times as much as the amount invested in public transport. In a bid to find means of getting away from over-dependence on the private car, which paradoxically reduces mobility in towns and cities, the European Commission published on January 23 a green paper entitled *The Citizens' Network*. The document seeks to stimulate a public debate on the best ways of promoting public transport in the EU. According to transport commissioner Neil Kinnock, it should be seen as a complement to an earlier green paper, on external costs (see AN 1/96, p. 7), because "it is impossible to get motorists to leave their cars without offering the choice of an alternative efficient system."

**Europe Environment**, February 6, 1996.

## Making trucks pay

EU transport commissioner Neil Kinnock has outlined plans for allowing governments to raise road-use charges for heavy trucks. As a part of his campaign to internalize the external costs of transport, Kinnock intends to propose allowing the current charge of 1250 ecus a year to be doubled. Governments could in addition levy an extra 1500 ecus a year for passage through transport corridors that are considered to be particularly sensitive from the environmental point of view.

Kinnock also wants to allow governments to charge road tolls that reflect all external costs, not just infrastructure costs as at present. Today only Denmark, Germany, Luxembourg and the Netherlands impose the annual 1250 ecu flat-rate charge.

**Environment Watch: W. Europe**, March 1, 1996.

## Curbing VOC emissions

A new draft (the eighth in a row) of a directive for limiting the emissions of volatile organic compounds from the solvents used in industry may soon be expected. The last one, which was presented in May 1994, had been halted in expectation of a directive on Integrated Pollution Prevention Control. Now however the Commission hopes to be able to present a new draft in September. It is said to differ from previous ones in that it represents a shift towards product standards for a handful of sectors such as dry cleaning, vehicle refinishing, and bus and truck coating, where there are many small businesses and the processes used are not readily amenable to control by emission limits.

**ENDS Report 253**, February 1996.



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## CITIES

# Call for stricter standards on vehicle emissions

FOLLOWING a preliminary report on the air quality in fifteen European cities, the European Commission has come under increased pressure to produce stricter vehicle emission standards.

The study, entitled *Air Pollution on Health: A European Approach* (APHEA), had concluded that air pollutants – in particular nitrogen oxides, sulphur dioxide, and particulates – lead to premature death from respiratory and cardiovascular diseases for 30-50 people a year in Lyon and 260-350 in greater Paris.

The findings brought considerable interest from the media in France. They were still preliminary when they were published in *Le Monde* in February, just one day before the minister for environment, Corinne Lepage, was to present an air quality bill to the French parliament.

Shortly afterwards the minister announced that an additional 200 million francs (35 million ecus) would be made available for monitoring air quality. This is however less than 20 per cent of the amount she had originally wanted to raise through small additions to petrol and diesel taxes, a proposal that had been blocked by the budget ministry.

The preliminary APHEA findings also showed that northern cities were

in general less polluted than those in southern Europe – the levels for sulphur dioxide, for example, being lower in the north. On the other hand those of particulates were almost the same in all fifteen cities.

The problem with particles is especially sensitive in France, where the state has encouraged the use of diesel vehicles by means of tax incentives. In France, 50 per cent of the new cars registered are diesel-driven, as compared with an average of 20 per cent in the European Union generally. And the emissions of particulates from diesel engines are, on an average, fourteen times greater than those from petrol ones.

Formal publication of the APHEA study will take place shortly. In the meantime the European Commission has continued its work on stricter emission standards for vehicles and fuel quality (see AN 1/96, p.6) – drafts of which will probably be presented in May.

Sources: **T&E Bulletin** No. 46. March 1996. **Europe Environment** No. 471. February 20, 1996.

The fifteen cities in the APHEA report are Amsterdam, Athens, Barcelona, Bratislava, Cologne, Krakow, Helsinki, Lodz, London, Lyon, Milan, Paris, Poznan, Rotterdam, and Wroclaw.

## No easy progress for appliances

LAUNCHED FIVE YEARS AGO as a major plank of a policy to promote energy conservation and reduce emissions of carbon dioxide, the European Commission's plan for a series of directives for bettering energy efficiency in household appliances has so far made little progress.

A draft directive for refrigerators and freezers was given a first reading in the European Parliament last October. It contained a target for manufacturers by which they were to improve the minimum energy efficiency of these appliances by 10 per cent by 2000 – a proposal that was derided as “astonishingly unambitious.” The Parliament voted for an amendment calling for a minimum 20-per-cent improvement, over 1992, within two years following adoption of the directive, and as a second target a 40-per-cent improvement within five years.

In a revised draft presented to the Energy Council in December, the Commission then proposed a 15-per-cent improvement within two years – with the idea that a second target should be considered during a review of the legislation within three years.

The common position that was then agreed by the energy ministers

would have required a 15-per-cent improvement, but only after three years. An amendment put forward by Spain at the last minute threatens however to undermine even this agreement. It would allow derogation from the target for refrigerators and freezers intended for sale in the countries of southern Europe, where the climate calls for appliances with more powerful compressors and other features that involve a greater consumption of energy.

This opens a loophole for manufacturers to claim exemptions, saying they are making refrigerators and freezers for these markets, while actually selling them all over Europe.

It is thought that the requirements could well have been stricter than those agreed, but that the ministers caved in to intense industry lobbying. A Greenpeace study of 1993 has shown that a 50-per-cent reduction of energy consumption would be fully possible, and that a 10-per-cent reduction (as was then proposed by the Commission) would have occurred in any case, even without a directive.

The directive will now be returned to the Parliament for a second reading. The Maastricht treaty, requiring a co-decision procedure for the adoption of some EU legislation, in this case gives the Parliament equal weight with the Council, and it is hardly likely that the Parliament will agree to the directive in its present form.

For the last year the Commission has been discussing with industry representatives the possibility of a voluntary agreement for improving energy efficiency in dishwashers, washing machines and driers – which also account for a large part of household electricity consumption. Nothing has come of similar discussions concerning refrigerators and freezers, and few people believe that the Commission will be any more successful in continuance.

PER ELVINGSON

Sources: **ENDS Report 244, 250 and 252.** May and November 1995, and January 1996. See also AN 1/94, p.5 and 5/94, p.11.

## Proper assessment called for

A STRATEGIC environmental assessment is needed of the European Union's plans for TENs, trans-European transport networks. In a joint communique, three European environmentalist bodies – Birdlife International, Greenpeace, and the European Federation for Transport and Environment (T&E) – insist that any new infrastructure must be made to harmonize with the commitment to sustainable development set forth in the Maastricht treaty and to the EU's Fifth Environmental Action Programme.

While strategic environmental assessments for TENs have been debated for years, nothing definite has yet come out of the discussions. In the meantime some portions of the proposed networks are being built that will, say the environmentalists, cause irreversible damage to valuable areas of natural interest. Several of them have actually been classified as special protection areas under the EU directive on wild birds (79/409/). Examples are Saltholm, an island in the Öresund between Sweden and Denmark where the bridge is now being built, the Tagus estuary in Portugal (another bridge), lakes Volvi and Langada in Greece (endangered by the Via Egnatia motorway), and the Aspee and Ossau valleys cut by the Pau-Sagunto motorway between France and Spain.

The three organizations are asking the Council of Ministers and the European Commission for a clear definition of the aims of the projected networks. They want to know what the effects are expected to be as regards the movements of passengers and freight, the environment, and the development of regions in the European periphery.

The TEN program comprises 140 road schemes, eleven railway links, fifty-seven projects for combined transportation and twenty-six inland waterway connections. For details see AN 4/94, pp. 14-15.

Further information: T&E, Rue de la Victoire 26, 1060 Brussels, Belgium. Fax. +32-2 537 73 94.

### Payoff seen

By 2010, the United States will be spending \$2.4 billion on controlling emissions of sulphur dioxide. But according to a study by the Environmental Protection Agency, the benefits will be much greater, with a saving of \$12 to \$40 billion as a result of the reduced effects of acid rain on health and the environment.

It was the effects of acid rain on the environment that led to the 1990 Clean Air Act, forcing industries and utilities to reduce their emissions of sulphur dioxide. But the EPA study finds the benefits to human health just as significant. Sulphur dioxide in the air aggravates respiratory ailments such as bronchitis and asthma, as well as contributing to heart disease. The EPA calculates that 88 per cent of the predicted savings will be due to fewer premature deaths, with the rest coming from a fall in hospital admissions and fewer people taking sick leave, leading to an increase in productivity.

New Scientist, January 6, 1996.

## Breaking a deadlock

A TAX ON ENERGY and/or carbon dioxide has now been debated within the European Union for nearly four years, yet without result. To break the deadlock the Dutch minister of environment, Margaretha de Boer, invited her counterparts from Belgium, Luxembourg, Germany, Austria, Denmark, Sweden, and Finland to a meeting at The Hague on January 31. The participants, whose countries are all in favour of such a tax, were unanimously agreed that a request should be made to the European Commission and the Italian presidency of the Council to bring the matter up again for discussion.

All the countries of this group, except Germany, are inclined to favour a voluntary tax, even if no other countries should impose one. Finland, Sweden, Denmark, Belgium, and the Netherlands already have some kind of energy and/or CO<sub>2</sub> tax, but to bring in a general EU tax would require a consensus in the Council, and several of the member countries – Great Britain, Ireland, Spain, Portugal, and Greece – are outspokenly opposed to such a tax. Germany for its part continues to insist on “all or none,” which last May stopped a draft directive with rules for the introduction of non-unified, voluntary taxes.

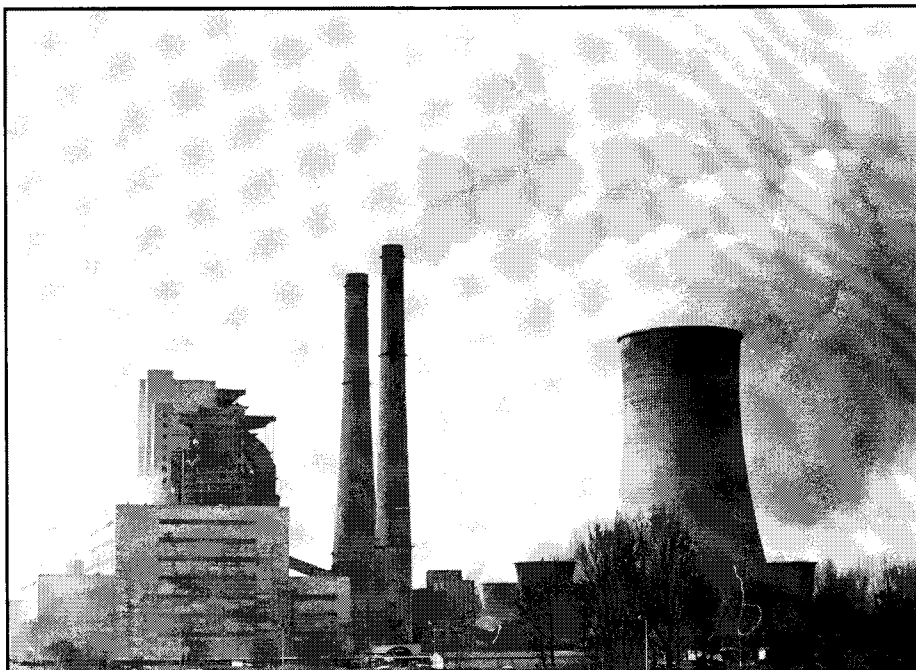
While the Italian presidency has stated that a CO<sub>2</sub> tax is on the Council's agenda for this half year, it is not yet on the agenda for the Finance Council. A ministerial conference, focusing on “green” tax instruments, is however to be held in Italy this May.

**Europe Environment**, February 20, 1996.

### Giving up

Stabilization of the country's emissions of CO<sub>2</sub> was a target set by the Norwegian parliament in May 1989. Now the same body has voted, by a wide majority, to rescind its decision. The assumption is that with present plans, Norway's emissions will increase by 16 per cent between 1990 and 2000. Much of the rise will be due to increased oil production together with the two gas-fired power plants that are planned for exporting electricity. Norway is the first country to openly renounce the aim of stabilizing its CO<sub>2</sub> emissions.

**Environment Watch: W. Europe**, March 1, 1996.



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### ENERGY EFFICIENCY

## Events put a check on EU programs

BECAUSE OF DEREGULATION and subsidiarity, the European Commission has had to renounce using legislation in its proposal for a second five-year program to promote energy efficiency – and to rely instead on voluntary agreements with equipment manufacturers as well as on funding to overcome barriers to measures for bettering energy efficiency.

The Commission's first program of Specific Actions for Vigorous Energy Efficiency (SAVE) was proposed in 1992. The EU had previously declared its intention of bringing about an improvement in energy efficiency of 20 per cent between 1985 and 1995, and had committed itself to stabilizing emissions of carbon dioxide at 1990 levels by 2000. The first draft of the program included proposals for legislation to step up energy efficiency in a number of sectors, from power generation, buildings, and vehicles to household appliances. But when the program was adopted in 1993, all proposals for legislation had either been watered down or excised.

The Commission blames the limited success of the first SAVE program on a lack of political will among the EU member states, combined with the collapse of energy prices (as a

result of deregulation), as well as on the introduction of subsidiarity – restricting the possibilities of using EU legislation and standards to guide developments.

It is now proposing a successor, SAVE II, with a budget for the next five years, 1996-2000, of 150 million ecus, which is four times more than for the first program. The increase is defended on the grounds that the EU had not even got halfway towards a 20-per-cent improvement in energy efficiency, and there will now be more pressure to deliver cuts in carbon dioxide emissions. Then, too, promotional activities, on which SAVE II will largely rely, cost more than legislation.

The new program does contain the specific target “to contribute as much as 1 per cent point more than expected as an improvement to the energy intensity of final demand.” It is estimated that the EU had been achieving an improvement of 1 per cent per year since 1986. The aim is therefore to double that rate. It is however possible that both the target and the budget will be altered when the EU energy ministers meet in May.

Source: **ENDS Report 253**, February 1996.



## White paper exposes conflicting aims

IN A WHITE PAPER on energy policy,\* the European Commission puts forward three cogent reasons for harmonizing the member countries' energy markets during the next twenty-five years. These are: The need to keep the EU competitive, to secure energy supplies, and protect the environment. It fails however to prescribe a solution for settlement of the conflict between a liberalization of energy markets, with lower prices as a likely consequence, and the ability to reduce emissions of carbon dioxide.

According to the Commission's reckoning, the use of energy will increase by 1 per cent a year up to 2020. The demands from industry will stabilize at present levels, while the domestic sector will show a slight decline. Transportation will go on using steadily more energy, despite improvements in vehicle efficiency. Gas consumption will double between now and 2020, coal and nuclear power will lose market shares, but combined-heat-and-power will, together with some renewables, gain somewhat.

Failing any "strong policy interventions," the emissions of carbon dioxide are deemed likely to show a "substantial increase" during the period. Noting that this would be in

contradiction to EU's international commitments, the Commission may yet be widely underestimating the problem. The EU is committed to stabilizing its emissions of CO<sub>2</sub> at 1990 levels by the year 2000, and international discussions are already under way for reductions by 2005-2010. The Commission is nevertheless of the opinion that the conflict between improved competitiveness (considered to mean lower energy prices) and environmental aims can be resolved without giving rise to any "major tension". But how that can be done is not explained. The white paper remarks, in another place, that with lower energy prices there will be less inducement to save energy.

It is assumed that fossil fuels and nuclear power will continue to be the dominant sources of energy. Ways of achieving a more sustainable energy policy – such as by a more efficient use of energy and turning to renewable sources – are only briefly dealt with. These are however matters that will be brought up for discussion in a series of documents from the Commission during the next three years.

Source: **ENDS Report** 252, January 1996.

\* COM(95)682: An energy policy for the European Union.

### ALLOWANCE TRADING

## Maybe not so good

FOR SOME TIME the British government has been planning to set up a market for trading in emission allowances for sulphur, after the American model. The argument has been that such a scheme would guide investments in emission-cutting equipment to plants where they would be most cost-effective.

But the most cost-effective investments would not necessarily be the most ecologically effective. A study published by the Institute of Terrestrial Ecology, *English Nature*, and others has shown that the effect of emissions on SSSIs (sites of special scientific interest) in the United Kingdom will depend very much on the location of the sources.

In England, 38 per cent of the SSSIs are getting more acid rain than they can compensate. In Wales it is more than 60 per cent. "The danger is that allowance trading could transfer large amounts of sulphur pollution from areas where it does little damage to where it does much more," notes Andrew Farmer of *English Nature*, one of the authors of the study.

In *ENDS Report* the study is described as "a blow to the government's sulphur trading scheme," with the comment that it is unlikely for several reasons that a trading system will actually be established

Sources: *New Scientist*, November 25, 1995, **ENDS Report** 253, February 1996.

## BRIEFS

### For cleaner cars

The latest of the European Commission's proposals for a directive to reduce the emissions of carbon dioxide from new cars (AN 1/96, p.7) was discussed at a meeting of the environment ministers on March 4. Practically all the member countries are reported to favour specific emission requirements, rather than percentual reductions. Most of them, too, voted for the figure of 120 g CO<sub>2</sub>/km proposed by the Commission (corresponding to 5 litres per 100 kilometres for petrol-driven cars and 4.5 l/100 km for diesels). Opinion differed however on the possibility of achieving this aim as early as 2005. There was no agreement either as how it should be brought about. Some countries would prefer to have standards, others voluntary agreements with the car makers.

It is expected that as a result of this preliminary discussion, a clear ministerial position will be forthcoming in time for the next meeting of the Council on June 25-26, as well as instructions to the Commission to present a formal proposal.

**Europe Environment** No. 472, March 7, 1996.

### Off-road vehicles

The environment ministers also discussed the proposal for a directive on emissions from non-road mobile machinery (see AN 5/95, p.9). Many of the member countries wanted farm tractors and machines used in forestry to be included, but the Commission thinks it will be technically more simple to deal with these separately, holding forth the promise of a draft directive before the end of the year. Some countries also urged the extension of the directive to include non-diesel engines and small vehicles under 18 kw. But these are not the only matters needing to be sorted out before the ministers can arrive at a common position and hand a proposal to the European parliament for a second reading. Among the others are the exact emission limits and the dates for their coming into force, as well as the possible use of economic instruments.

**Europe Environment** No. 472, March 7, 1996.

### Climatic disasters

Munich Re, a top German reinsurance company, says the number of victims of natural disasters throughout the world nearly doubled in 1995 and climate change is increasingly to blame. According to a study by the company, gradual climatic changes are contributing to a growth in the number of natural disasters, especially of floods and storms. The 600 natural disasters recorded in 1995 killed nearly 18,000 people compared with 10,000 in 1994, and the total cost of the associated damage is put at \$180 billion.

**T&E Bulletin** No. 45, February 1996.

## Mapping is becoming more complicated

### Does what the cat can't

When started cold, cars emit great quantities of poisonous fumes. It makes no difference if they have a catalyzer, since it normally takes 1-2 minutes for the catalyzer to get warmed up to working temperature. Preheating has been tried, but now Saab Automobile has come up with a completely new concept. During the first thirty seconds after start the exhaust pipe is closed off and the exhaust gases sent into a bag, for return to the engine after the catalyzer has become warmed up. The system has been tested in three turbo-charged cars and found to easily pass the California requirements for ULEVs, Ultra Low Emission Vehicles. The reason is that it also deals with the sudden pulses that the catalyzer cannot manage, for instance at every gear change. Saab hopes the system will be in mass production within two or three years – just when the ULEV requirements will be enforced in California and some other states.

*Ny Teknik*, No. 10, 1996.

### Less road building

The British government has cut 60 per cent of its roadbuilding program. In an announcement in the finance ministry's annual budget, the government said it was abandoning or postponing 117 projects, including all its motorway widening schemes.

*T&E Bulletin* No. 44, December 1995.

### Using ever more fuel

In America, gas-guzzling cars are back. Fuel economy, which meant something to car buyers after the oil crisis of the seventies, does not seem to bother people any more. Today's gas guzzlers bear little resemblance however to those of the fifties. The popular vehicle types are now jeeps, land cruisers, and range rovers.

But it is not only the cars themselves, but also the distances and speeds at which they are driven that are causing fuel consumption in the United States to go on rising. Last year the federal – and fuel efficient – 55 mph speed limit was discarded. The individual states can now set their own speed limits, so that traffic is often streaming along at more than 75 mph. The average number of miles travelled per vehicle in the US last year was more than 12,000, compared to fewer than 10,000 in 1980.

A significant factor in this development is of course the cost of fuel. With an average price of \$1.34 per gallon (\$0.30 per litre) for unleaded petrol, it is the lowest it has been in real terms since the second World War.

*The Times*, February 21, 1996.

CRITICAL-LOAD maps – showing the amount of a certain pollutant that ecosystems can withstand without suffering damage – were important to the development of the Second Sulphur Protocol under the Convention on Long Range Transboundary Air Pollution.

But to map the critical loads for just one pollutant, sulphur, and determine the extent to which its emissions will have to be reduced for dealing with one problem, acidification, is almost child's play compared with what is now having to be done to arrive at a new, so-called multi-effects/multi-pollutants protocol, aimed at curbing the effects of nitrogen oxides, volatile organic compounds, and ammonia. The effects in this case will be acidification, eutrophication, and the formation of ground-level ozone (see pp. 5-6).

In the working out of the second protocol for sulphur, computer models were developed to show the extent to which emissions would have to be reduced, country by country, in order to confine acidification to a given level at the lowest overall cost. Similar calculations will now be needed to bring about the greatest possible improvement for Europe as a whole as regards the new set of pollutants, again at the lowest possible cost.

The vast work of mapping is organized by the Coordinating Center for Effects of the Convention, which has just presented a first attempt at combining the critical loads for acidification and eutrophication in single maps for the whole of Europe. The data fed into the computer models is primarily that supplied individually by member countries. The lacunae have been filled in by using the CCE's own data base.

The first step involved mapping the critical loads, square by square. As regards sulphur, which only acidifies, the limits have been set for forest land and surface waters. For nitrogen oxides and ammonia the effects both of acidification and eutrophication are taken into account. In most cases the critical load for eutrophication has been calculated according to the

sensitivity of forest ecosystems, but for some countries – Estonia, Switzerland, and Great Britain – the effects on heaths and raised bogs have also been included, since they constitute ecosystems that are especially sensitive to a superabundance of nitrogen (see pp. 7-9).

The standard method that has been adopted for mapping the critical loads involves eliminating the most sensitive 5 per cent of the ecosystems from each square. This form of presentation, known as a 5 percentile, indicates that if the actual load in any square equals the critical load, 95 per cent of the area will be protected. The advantage is that it prevents a small fraction of extreme values from placing practically every square in the most sensitive class. But the method also means that sensitive ecosystems are automatically excluded if their area is less than 5 per cent of that in any square.

A comparison of the maps showing the critical loads for acidification and eutrophication with those for the atmospheric fallout on each square gives an idea of the reductions that will be necessary if the critical loads are not to be exceeded. It is however no longer possible to express the needed reduction simply as the difference between the critical loads and actual loads, since the same protection against acidification and eutrophication can be obtained by various combinations of the reductions of the fallouts of sulphur and nitrogen.

The extent to which the critical loads are being exceeded is shown instead by that proportion of the ecosystem in each square that will be protected at a given deposition. Also shown is which pollutant or pollutants that must be reduced to ensure 95-per-cent protection. The report gives illustrations of the protection levels with various combinations of the depositions of sulphur and nitrogen. Examples of the resulting maps are shown opposite.

A trial has also been made of comparing the critical loads for acidification and eutrophication with the concentrations of sulphur and nitrogen dioxides in the air. From the

# Recent publications

## Acidification in Sweden. What do we know today? (1995)

Edited by U. Bertills and P. Hanneberg. An accessible summary of Swedish acidification research over the last decade. Describes how acidification affects water, soil, plants, and animals, and deals with the concept of critical loads and the role of international agreements, environmental levies, and liming in the fight against acidification.

106 pp. Report 4422. Available from the Swedish Environmental Protection Agency, S-106 48 Stockholm, Sweden. Fax +46-8 698 10 00.

## Acidification of forest soils on glacial till in Sweden (1995)

Edited by E. Karlton. Report describing the soil chemical status and acidification processes in relation to environmental conditions. Concludes that forest soils in southern and central Sweden have become acidified to considerable depth as a result of atmospheric deposition.

76 pp. Report 4427. Obtainable from the Swedish EPA, address as above.

## Critical Loads of Acidity to Swedish Forest Soils (1995)

By P. Warfvinge and H. Sverdrup. Describes the methods and results of calculating the critical loads for acid depositions on Swedish forest soils.

104 pp. Reports in ecology and environmental engineering 5:1995. Can be ordered from Department of Chemical Engineering II, P.O. Box 124, S-221 00 Lund, Sweden.

## Integrating Environment and Economy. Progress in the 1990s (1996)

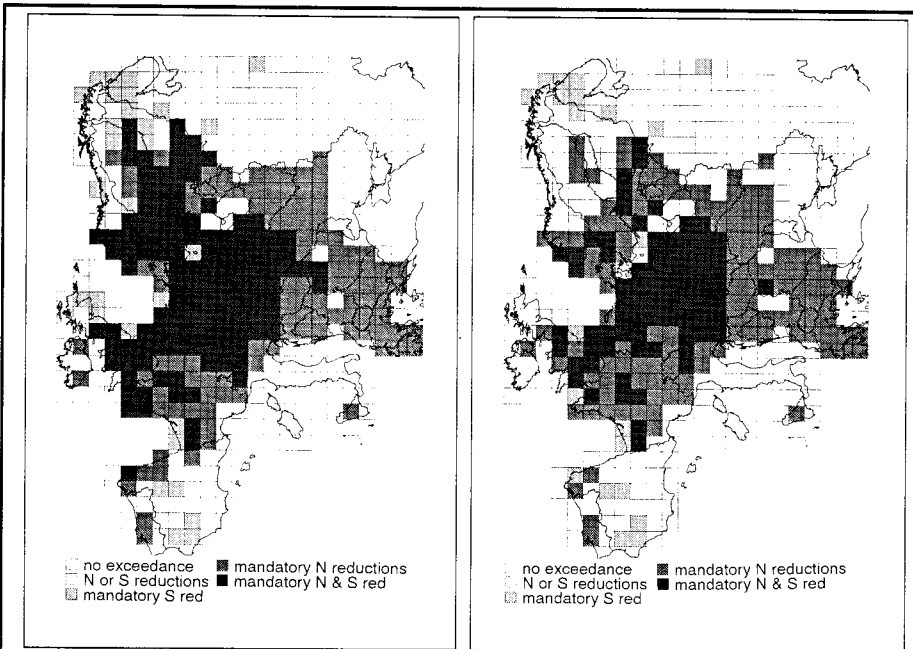
Report focusing on energy, transport, and agriculture sectors, with special emphasis on how environmental policy links with fiscal, employment and trade policies. It also examines the evolution of analytic tools for measuring progress, and reviews recent institutional changes aimed at better policy integration.

62 pp. Available from OECD, 2, rue André-Pascal, 75775 Paris Cedex 16, France. Fax +33-1 45 24 80 03. E-mail: news.contact@oecd.org

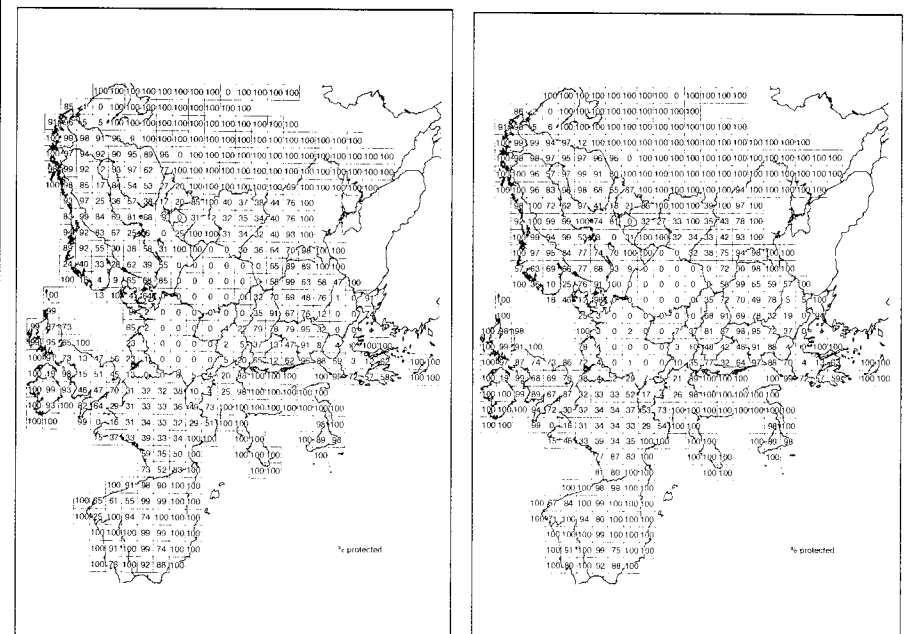
## Environmental Performance in OECD Countries. Progress in the 1990s (1996)

A summary of what has been learnt so far from OECD reviews of the environmental performance in its member countries.

66 pp. Obtainable from OECD, address as above.



The extent to which emissions need to be reduced in order to protect 95 per cent of the ecosystems in each square both from acidification and eutrophication. Left: From the emission levels of sulphur and nitrogen in 1990. Right: From the levels expected in 2010 for sulphur according to the second sulphur protocol and for nitrogen according to ECE figures for current national reduction plans.



Proportions of the ecosystems where the critical loads will not be exceeded as regards either acidification or eutrophication, if sulphur and nitrogen emissions are in accordance with the above assumptions.

preliminary results it appears that it is the acidifying effect that sets the proper limit for sulphur emissions – in other words, if emissions are so reduced as to meet the critical load, the WHO guidelines for air quality will also be met. The exception is the Mediterranean region, and in particular Greece, where air quality remains poor despite the acidification targets being met.

Eutrophication appears to set the limit for nitrogen oxides. No account

has been taken however of the fact that nitrogen oxides also contribute to the formation of ground-level ozone, which naturally adds a further complication.

PER ELVINGSON

**Calculation and mapping of critical thresholds in Europe. Status report 1995.** 198 pp. Obtainable from the Coordination Center for Effects, RIVM, P.O. Box 1, 3720 BA Bilthoven, The Netherlands.

## CLIMATE CHANGE

# Disagreement in way of a protocol

IT WAS CLEAR, halfway through the third meeting of the Ad Hoc Group on the Berlin Mandate in Geneva in March, that difference of opinion on almost all matters was holding up efforts to reach an international agreement for reducing the emissions of greenhouse gases.

The group had been formed at the first Conference of the Parties to the UN Framework Convention on Climate Change, in Berlin last year, to negotiate a protocol or other legal instrument to enforce the convention.

Not much progress was apparent at the Geneva meeting, despite the fact that the scientific advisory body to the convention, the Intergovernmental Panel on Climate Change, had recently confirmed that human activities were indeed tending to cause a rise in the average temperature of the globe (see AN 1/96, p.9).

The chairman of the Ad Hoc Group, Raul Estrada, admitted at a press conference that there were sharp differences on most of the issues. While the urgency of the situation

was recognized by most countries, he said, a small number were reluctant to accept that, adding: "We are building consensus. We could easily get some countries to agree on strong measures now, but we have to bring in the big actors."

At Geneva, Germany advocated setting a binding reduction target of

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*Easily get some countries  
to agree but have to  
bring in the big actors*

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10 per cent for each country, from 1990 levels, by 2005, and 15-20 per cent by 2010 – claiming that a flat rate reduction had "proven worth, simplicity, and practicality," and that concentrating on CO<sub>2</sub> would allow for "greater precision" than dealing with all greenhouse gases at the same time.

The proposal was given a mixed reception. Some countries thought a

protocol should cover all greenhouse gases, not only CO<sub>2</sub>. Others – in particular Australia – argued that new targets should be differential and shared among industrialized countries, according to factors such as their gross domestic product, other economic indicators, and emissions.

The European Union, supporting action going beyond "no-regrets" measures, announced that it was investigating eleven areas where new policies and measures might possibly be chosen. Among these were renewable energy, energy efficiency, labeling, transportation, and economic instruments.

The EU aims to report back at the next AGBM meeting in July, which will coincide with the second Conference of the Parties. Germany's proposal will then again be considered, too. The Ad Hoc Group is due to finalize its proposals in time for the third Conference of the Parties in 1997.

Sources: **Environment Watch: Western Europe**, March 15, 1996. **Natur&Miljö Bulletin**, March 22, 1996.

## Coming events

**Car Free Cities Conference. Copenhagen, Denmark, May 6-7, 1996.**

*Inquiries:* Car Free Cities Club, Eurocities, Boulevard de Waterloo 27, 1000 Brussels, Belgium. Fax. +32 2 5134322.

**Natural Gas Vehicles at the Crossroads: Growing the Market. Basel, Switzerland, May 8-10, 1996.**

*Inquiries:* European Gas Vehicle Association, Spaklerweg 28, 1096 BA Amsterdam, Netherlands. Fax +31 205973000.

**Climate Action Day. May 15, 1996.**

*Inquiries:* Scottish Youth Forest Action, P.O. Box 1707, Edinburgh, United Kingdom EH1 1YB. Fax +44 131 557 9222.

**European Union Wind Energy Conference and Exhibition. Gothenburg, Sweden, May 20-24, 1996.**

*Inquiries:* WIP, Sylvensteinstr. 2, 81369 Munich, Germany. Fax +49 897201291.

**Road Transport and Sustainable Development. Budapest, Hungary, May 22-24, 1996.**

*Inquiries:* International Road Transport Union. Fax +41 22 918 2741.

**Sustainable Interregional Transport in Europe. Kouvola, Finland, June 10-12, 1996.**

Organized by ICLEI and City of Kouvola.  
*Inquiries:* City of Kouvola. Fax +358 0 4762 4250.

**World Renewable Energy Congress IV. Denver, Colorado, USA, June 15-21, 1996**

*Inquiries:* AAM Sayigh, World Renewable Energy Network, 147 Hilmanton, Lower Early, Reading, England RG6 4HN. Fax +44-1734 611365.

**EU Council of Environment Ministers. Luxembourg, June 25-26, 1996.****Ninth European Bioenergy Conference. Copenhagen, Denmark, June 24-27, 1996.**

Conference and technology exhibition.  
*Inquiries:* DIS Congress Service Copenhagen A/S, Herlev Ringvej 2C, 2730 Herlev, Denmark. Fax +45-44 925050.

**Urban Ecology: The City as an Organism. Copenhagen, Denmark, July 1-6, 1996.**

*Inquiries:* Danish Organization for Renewable Energy (OVE), Blegdamsvej 4, 2200 Copenhagen N, Denmark.

**IMO Marine Environmental Protection Committee, 38 session. London, England, July 1-10, 1996.****Second Conference of the Parties to the Framework Convention on Climate Change. Geneva, Switzerland, July 8-19, 1996.**