

# Acid News

NO. 2, MAY 2003

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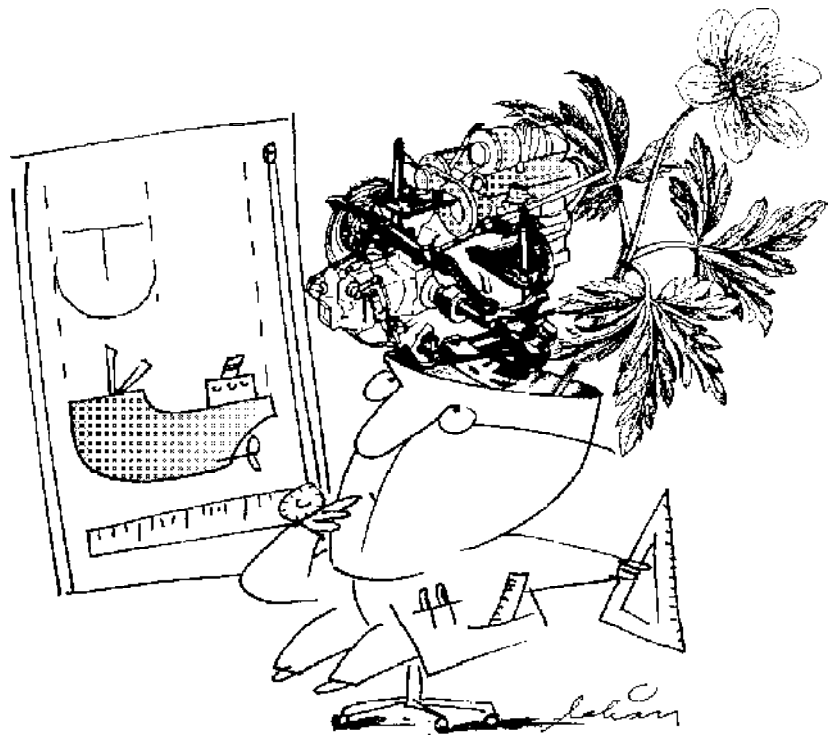
Many more of the world's countries will have to cut their emissions during the next commitment period.

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The Netherlands has found that the most cost-effective way of reducing emissions of primary particles would be to attack those from shipping.

## Air pollution from ships

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ECOSHIP

## Cleaner, better

**It is possible to build ships that are environmentally far superior to present-day types. And they won't need to cost more.**

BASICALLY SHIPS ARE, from the environmental point of view, a good way to transport freight, since they expend relatively little energy. Their main disadvantage is that they let out enormous amounts of sulphur and nitrogen oxides into the air. Emissions per ton-kilometre from an ordinary vessel are many times greater than those from road transportation by truck. See AN 1/02.

But now, by taking a fresh approach, a group of Swedish companies has developed a new type of vessel – called Ecoship – that promises to do away with these disadvantages.

Instead of trying to modify existing types, the designers have started all over again, and ended up with an entirely new one, primarily intended for coastal traffic, with a patented

streamlined hull and an unorthodox propulsion system.

The hull of the Ecoship is rounded, and according to the builders will reduce water resistance by 10-15 per cent compared with hulls of a traditional shape. It will also form less wash, and so lessen the erosion of sensitive shorelines. The reduced resistance will also mean lower fuel consumption and consequently lower emissions of carbon and sulphur dioxides.

Another novelty tending to have a like effect is the substitution of ten diesel engines of the type ordinarily used in trucks for the conventional ship's main and auxiliary machinery. With a total output of 4500 kilowatts, the ten diesel engines generate

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# Acid News

is a newsletter from the Swedish NGO Secretariat on Acid Rain, whose primary 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 Secretariat has a board 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 needed reductions in the emissions of air pollutants. The aim is to have those emissions eventually 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 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 information material.
- Supporting environmentalist bodies in other countries 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 Convention on Long Range Transboundary Air Pollution and policy initiatives in the European Union.
- Acting as an observer at the proceedings involving international agreements for reducing the emissions of greenhouse gases.

EDITORIAL

# Urgent

WHO CARES ABOUT international agreements for the protection of the environment?

The Protocol to the Convention on Long-range Transboundary Air Pollution on the Abatement of Acidification, Eutrophication and Ground-level Ozone is known as the Gothenburg Protocol because it was signed during a meeting in that city in December 1999.

Under it the signatories commit themselves to so reducing their emissions of four air pollutants – sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia – that by 2010 they would not be transgressing the national ceilings that are expressly written into the protocol and are binding.

Although some thirty countries have signed the protocol, so far only four – Denmark, Luxembourg, Norway and Sweden – have ratified it. Ratification implies that the countries' legislatures have accepted the commitments. For it to have entered into force, sixteen countries must have ratified.

Quick ratification is vital for several reasons. It was evident even at the time of the signing of the protocol that its ceilings would not suffice for attainment even of the interim environmental targets that the signers had agreed to, and proceedings for revision of the ceilings cannot take place before the protocol has come into effect.

According to the protocol, too, further much harder ceilings were to be introduced in stages, for example

in 2015 and 2020, the aim being to arrive at a situation where the long-term objective of no exceeding of critical loads would be reached. But here again negotiations have to await the protocol's coming into force.

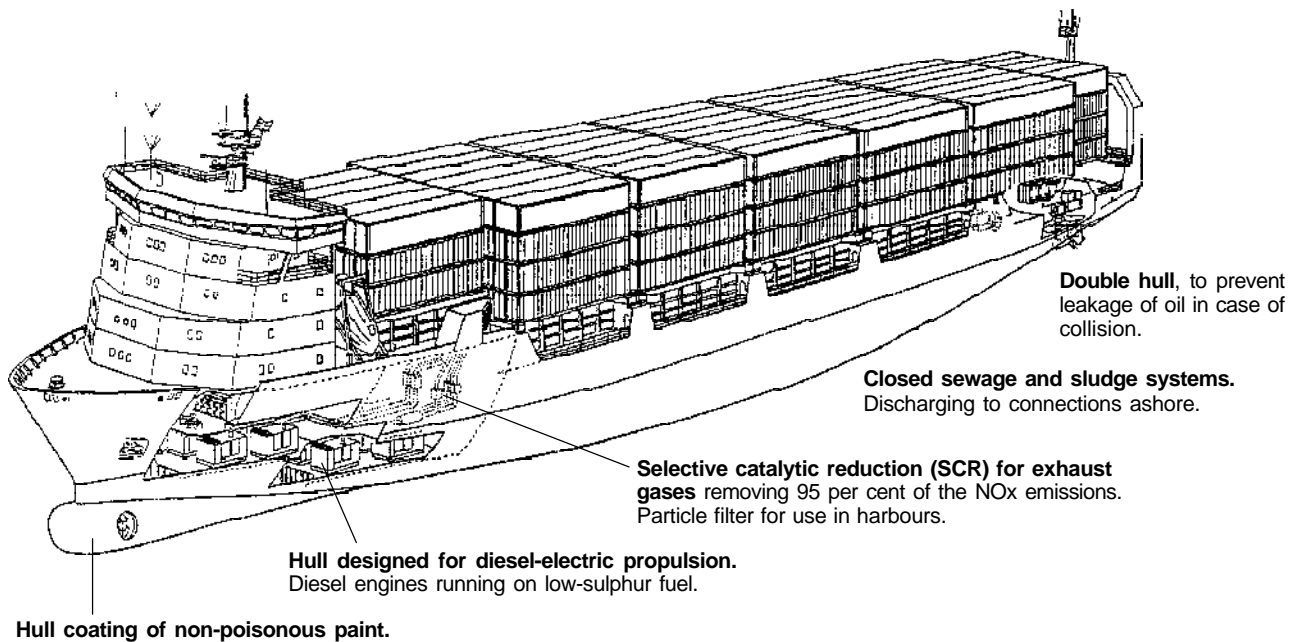
Then, too, there is the question of credibility. Of late the ratification of agreements concerning the environment has tended to be ever more long-drawn-out. That has been the case not only in respect of the LRTAP convention but also of the climate convention's Kyoto protocol and Annex VI under the IMO's MARPOL convention.

It is, to say the least, a mighty paradox that nations should be willing to expend great resources on bringing about international agreements in this field, and then – after compromise solutions have been reached after great effort and agreements signed – they should either delay ratification or actually ignore it.

Should this trend continue, it will undoubtedly undermine public confidence in international agreements to save the environment – as indeed it has already started to do because several of them have become indefensibly attenuated, and because several countries have neglected to fulfill their commitments.

It is now imperative that those that have not already done so should ratify without further procrastination.

CHRISTER ÅGREN



**Ecoship** *Continued from front page*

enough electricity both for propulsion and auxiliary needs.

Besides making for about 15 per cent more cargo space, using a number of smaller engines, rather than one or two large ones, has several advantages. Low-sulphur diesel fuel can be substituted for high-sulphur bunker oil, with consequent cleaner exhausts. In effect the same diesel fuel can be used as that for trucks, were the cleanest qualities has a sulphur content of less than 10 ppm, as compared with 27,000 ppm or so in conventional bunker oil.

It is moreover relatively easy to clean the exhaust gases from nitrogen oxides and particles by SCR (selective catalytic reduction) for the former and filters for the latter, removing up to 95 and 90 per cent respectively. The particle filters are intended mainly for use when the engines are kept running in port.

There is also an advantage from the point of view of energy use in a system with several small engines. Each separate engine can be kept running at optimal speed for efficiency through a system of advanced power management that starts and stops the engines as required and keeps idling to a minimum.

There are further advantages, too, for operation and maintenance. If one engine breaks down, the ship can still be kept moving, and it is easy to lift out and repair an engine or replace

it with a new one. Since the propellers are electrically driven, the diesel engines could, if the occasion occurs in future, be replaced by fuel cells.

So what more will be needed to improve environmental consciousness among shipbuilders?

The attitude of shipowners will of course be decisive, and an important

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*“A slumbering giant  
market, worth  
billions of kronor”*

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item for them is cost. Largely on account of the propulsion system, an Ecoship is estimated to be 5 per cent more expensive to build than a conventional vessel. But as operating costs can be expected to be lower – despite the fact that diesel fuel is much more expensive than high-sulphur bunker oil – that extra cost could very well be cancelled out within a few years.

As Ocke Mannerfelt, one of the designers, says: “Because an Ecoship can take more cargo, and consumes less fuel, its operational cost will be 5-7 per cent lower than that for a conventional vessel. I maintain that an owner could earn just as much money by ordering an Ecoship as by buying an ordinary tanker.”

Then, too, shipowners may be forced in the future to take more

consideration for the environment. Everything seems to point to requirements for shipping becoming tightened within the EU, and perhaps also globally.

“It is not only because environmental requirements are becoming tougher that interest in this type of vessel is growing so strongly,” says Bertil Arvidsson, chief technical engineer at the Swedish Shipowners’ Association. “Shippers are also starting to ask about the vessels themselves.”

One reason for this interest is that ever more companies are seeking environmental certification (for instance through ISO 14000). To meet certification requirements, they also have to assume responsibility for the way their raw materials and manufactured products are transported.

“Here is a slumbering giant market, worth billions of kronor, which makes the Ecoship concept especially interesting,” declares Bertil Arvidsson.

It is not only the low emissions to the atmosphere that distinguish Ecoships in the environmental view. They also have double hulls, closed systems for waste discharge, and a system for cleaning the ballast water so as to prevent the spread of alien species.

PER ELVINGSON

**Further information:** Ecoship Engineering AB, 205 55 Malmö, Sweden. Tel. +46 40 34 81 40. Internet: [www.ecoship.com](http://www.ecoship.com).

# Parliamentary committee wants much stricter limits

AT THE TIME of the European Parliament's first reading of the Commission's proposal for reducing the emissions of sulphur dioxide from ships, its rapporteur, Alexander de Roo,<sup>1</sup> was urging much more far-reaching measures than those proposed. Whereas the Commission's proposal would have reduced emissions by no more than 10 per cent by 2008, from their level in 2000, the rapporteur would have raised the figure to almost 60 per cent.

The Commission's proposal<sup>2</sup> for reducing the sulphur content of marine fuels used in European sea areas was published in November 2002, as part of a strategy for bringing down ships' outpourings of pollutants to the atmosphere (see AN 1/03, pp. 4-5). Its main aim is to lower the extent to which ships contribute to poor air quality as well as to acidification.

By the time of the vote at the first reading in the parliament's environmental committee on April 29, more than 100 amendments, mostly calling for much greater reductions, had been put forward by members.

The rapporteur proposed reducing the maximum content of sulphur in marine heavy fuel oils in two stages, the first to start twelve months after the directive's coming into force (probably in 2005). As in the Commission's proposal, the sulphur content of fuels used in the North Sea and the Baltic would be limited to 1.5 per cent. Moreover, that limit should also apply to passenger ferries operating in regular service to or from EU ports (in the Commission's proposal, the limit for ferries would have applied only from July 1, 2007).

Then from July 1, 2008 the sulphur content should, in the rapporteur's view, be reduced from 1.5 to 0.5 per cent in the North Sea and the Baltic, on ferries as well as freighters. A limit of 1.5 per cent for sulphur should begin to apply simultaneously for the remaining EU sea ar-



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reas, the Mediterranean and the North Atlantic.

Ships travelling on inland waterways or lying at berth in port would, in the Commission's proposal, have to use to use oil with no more than 0.2 per cent sulphur. The rapporteur suggested extending that limit to fuels used in the member states' territorial waters up to 12 nautical miles from shore.

Several members of the environment committee had proposed measures to reduce the emissions from shipping by 80 per cent. Erik Meijer and Jonas Sjöstedt of the GUE (United Left and Nordic Green Left), Kathleen van Brempt (PSE: socialist), as well as Astrid Thors and Chris Davies of the ELDR (Liberal group) proposed limiting the sulphur content of heavy fuel oil to 0.5 per cent in all Community sea areas, and

make that limit apply as early as six months after the directive's coming into force.

While also proposing an 80-per cent reduction, Anders Wijkman (PPE, Christian Democrat) preferred a slower tightening-up of the requirements, proposing two stages, with the 0.5 limit coming into force in all Community sea areas only in 2010.

After a vote on April 29, the environment committee came out in favour of amendments that would set the maximum limit of the sulphur content in marine fuels at 0.5 per cent in all Community sea areas. The amendments adopted by the committee, as well as others, will be debated and voted in parliamentary plenum in early June. The outcome will represent the parliament's position (it will then have been its first reading). The next step will be for the EU en-

vironment ministers to arrive at theirs, which is likely to be under the Italian presidency next autumn.

CHRISTER ÅGREN

<sup>1</sup> From December 2002 to March 2003 it was Heidi Hautala, the Greens, who was the Parliament's rapporteur, and so responsible for

the report. When she returned to Finland at the end of March, her party co-member Alexander de Roo took over.

<sup>2</sup> Proposal for a directive of the European Parliament and of the Council amending Directive 1999/32/EC as regards the sulphur content of marine fuels. COM(2002) 595 final, 2002/0259 (COD), Volume II.

### Sulphur in fuels – EU regulation

In its present form the directive (1999/32/EC) sets limits for the sulphur in marine gas oils and marine diesel fuels used on inland waterways and EU territorial waters up to 12 nautical miles from shore. It also sets limits to the sulphur in heavy fuel oils and gas oils used in land-based plants, but none on the sulphur content of marine heavy fuel oils (bunker fuel). The limits for fuel used in road and non-road vehicles are prescribed in directive 2003/17/EC.

For lack of any limit on sulphur, the content in marine heavy fuel oils is now very high, averaging from 2.7 to

3.0 per cent, or 27,000-30,000 ppm (parts per million). The limit for heating oil is 2000 ppm in the EU, and 350 ppm for diesel oil used in road transports. In 2005 the maximum allowable content for automotive petrol and diesel fuel will be 50 ppm, and 10 ppm in 2009.

Ships' emissions are now one of the largest sources of sulphur dioxide in the EU. Research recently made for the Commission indicated a likelihood of their equalling 74-86 per cent of those from land by 2010, even when all those from mobile and stationary sources are included (see AN 3/02, pp. 8-10).

UNITED STATES

## New requirements "toothless"

The EPA's new air emissions standards for large seagoing vessels are such as cannot be expected to have any noticeable effect on emissions.

IN MAY 2002 THE US Environmental Protection Agency proposed to change an existing voluntary standard for new ship engines into a federal mandate. That mandate was finalized on January 31, but critics say the action is "toothless."

The mandate promotes, but does not require, new engines installed in US flagged vessels to produce less pollution than older designs.

The new regulation resulted from a lawsuit settlement reached in 2001 by the environmental group Bluewater Network, challenging the EPA's failure to set any standard for smog forming emissions under the Clean Air Act.

"Federal records prove that the EPA attempted to go much farther with this regulation, but the Bush a-2 i12 ration forced the agency to back off both on the stringency of the standards and the deadlines,"

said Russell Long, executive director of Bluewater Network, adding that an important reason for it was heavy lobbying from oil tanker owners, represented by their association Intertanko.

"Dirty foreign flag ships – the lion's share of the problem – will get a free ride until at least 2007 since the rule does not force them to reduce emissions. And engine builders for US ships are already voluntarily meeting the new standards, so on neither count does this regulation actually improve air quality."

Ocean-going vessels represent the fastest growing, least regulated sources of pollution in the US, according to Bluewater Network. Near some port areas such as Santa Barbara, California, these ships are generating equivalent air pollution to all on-road vehicles combined.

Information: [www.bluewaternet.org](http://www.bluewaternet.org)

## Norway: a lot needed

Great effort will be needed if Norway is to meet its commitments under the Gothenburg protocol. While its emissions of volatile organic compounds did indeed drop by 11 per cent from 2001 to 2002, they will still have to be reduced by a further 42 per cent by 2010. The reduction last year was mainly due to the lower quantities of oil that have been transhipped offshore, but also to the fact that it has been done with equipment that captures the VOCs. More than half of Norway's emissions of those pollutants occur during offshore loading and storage, and the oil industry is facing demands to take big steps for improvement at the latest by 2005.

Last year Norway's emissions of nitrogen oxides sank by 3 per cent, but will need a further reduction of 27 per cent to reach down to its emission ceiling by 2010. In 2001 ships and fishing accounted for 39 per cent of these emissions in Norway, road traffic for 22 per cent, and offshore activities connected with oil and gas for 20 per cent.

Emissions of sulphur dioxide and ammonia are also among those covered by the Gothenburg protocol, but no figures are yet available in respect of the latest Norwegian trends. In both cases however the country is already coming close to its national ceilings for 2010.

Source: Press release from Statistics Norway, April 1, 2003.

## Cost-effective at sea

Norway's emissions of nitrogen oxides could be brought down relatively inexpensively through measures directed at coastal and inland shipping. An investment of Nkr 405 (equal to 50 million euros) would suffice to reduce the yearly emissions from 200 or so existing vessels by 27,000 tons. It would entail rebuilding engines, using water emulsion (water in the fuel) and catalytic cleaning (SCR) of the exhaust gases. Measures on new buildings of passenger and cargo vessels would call for a total investment of Nkr 422 million up to 2010, spread over 105 vessels. That would lop off 20,000 tons of NO<sub>x</sub> that would otherwise have been emitted every year. According to the Norwegian Shipping Directorate, whence these figures come, all these measures would be highly cost-effective. To meet its commitments under the Gothenburg protocol, Norway must have cut 67,000 tons from its emissions of NO<sub>x</sub> by 2010.

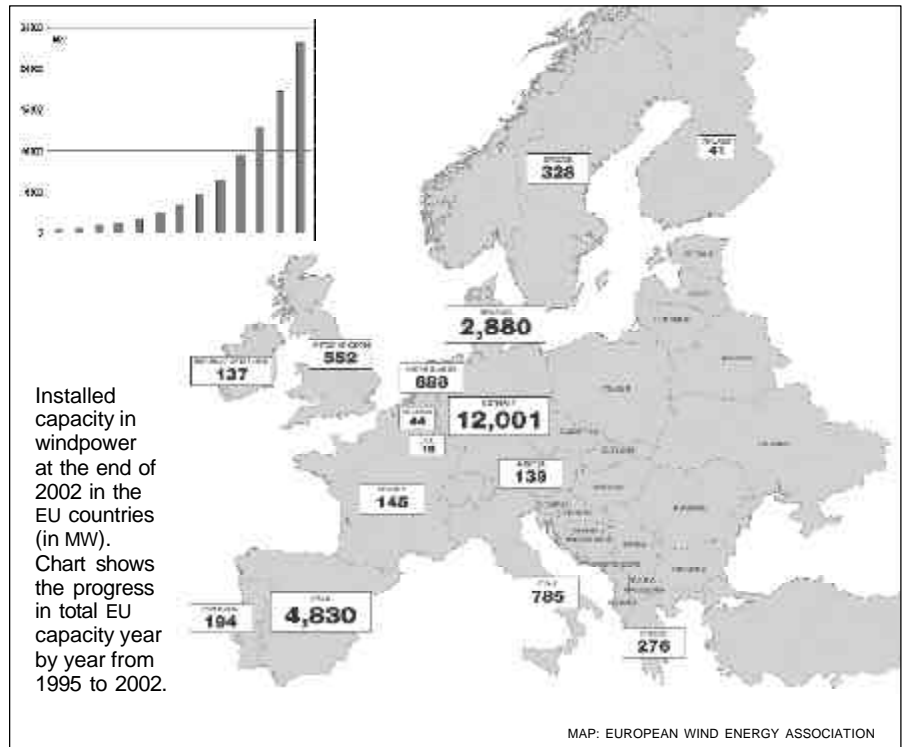
Source: pH-status No. 1, 2003.

## Increased by a third last year

INSTALLED WIND POWER capacity increased by 30 per cent in the EU during 2002, reports the European Wind Energy Association. The three countries that already had the most wind power – Germany, Spain, and Denmark – answered for almost 90 per cent of that increase.

“The industry is capable of continuing these high growth rates, but we need additional political backing beyond Germany, Spain and Denmark. In these three countries, thriving industries and tens of thousands of jobs have been created. These successes could be rapidly replicated in other countries – wind power is a multi-billion euro business sector primed for expansion,” said Corin Millais, CEO of the association.

Outside the EU wind power is a rare occurrence in Europe. Compared with the EU’s clear 23,000 MW, the total in all the other countries is no more than 235 MW installed capacity. Leaders in wind power in the rest of the world are the US and India, with 4700 and 1700 MW respectively. All the same, three-quarters of world wind power in the networks resides in the EU.



### The potential

Today windpower supplies approximately 0.4 per cent of world electricity demand.

In its recently launched strategic blueprint, *Wind Force 12*, the European Wind Energy Association shows that there are no limitations – technical, economic, or in resources – that would prevent 12 per cent of the world’s electricity needs coming from wind power alone by 2020, adding that by 2010 the industry will be capable of attaining 230,000 MW of generating capacity

worldwide, of which 100,000 MW would be in Europe. By that time the annual turnover in the global wind industry could reach 25 billion euros, assuming that there will be a stronger political commitment, with changes in energy policies generally.

By 2020, the association envisages a total global installation of 1.2 million MW, an annual turnover of 67 billion euros, 1.5 million new jobs, and a cumulative reduction of 12 billion tons of carbon dioxide.

For further information, visit: [www.ewea.org](http://www.ewea.org)



### Insulate to cut emissions

Retrofitting Europe’s older building stock with mineral wool insulation would cut energy costs and emissions of carbon dioxide by 42 per cent, according to a report commissioned by the European insulation manufacturers association Eurima.

Buildings account for over 40 per cent of the total emissions of carbon dioxide in the EU and the emissions are rising, according to the report, produced by German consultancy Ecofys.

### Transalpine freight charging

In 2002, transalpine freight carrying by road through Switzerland was 9 per cent lower, in terms of truck movements, than it had been the year before. According to the Swiss environment ministry this was partly due to the system of distance-based truck charging that had been introduced in 2000. Combined road-rail transportation increased by 3 per cent during the same period.

*Environment Daily*, March 11, 2003.

### Non-road petrol engines

A directive extending the air pollution limits on diesel-engined non-road machines to petrol-engined types became law when published in the EU Official



Journal on February 11.<sup>1</sup> Member states must transpose the directive by August, 2004, when the first in a series of emission limits affecting different engine types will also come into effect. By that date, the Commission is required to issue a report, possibly accompanied by legislative proposals, concerning the emissions of particulates from the affected machines.

<sup>1</sup> *Official Journal L 035*, 11/02/2003, available at <http://europa.eu.int/eur-lex>.

# Common minimum levels will have little effect

ALTHOUGH it has been said time and again that environmental taxes will be important if the EU is to attain its environmental objectives and start on the way to sustainability, when the ministers of finance had to decide, on March 20, on a directive to set minimum levels for taxes on energy, the result was so meagre as to be practically without effect. That at any rate is the view of EEB, the European umbrella organization for environmentalist groups, which is highly critical of the low levels for those taxes, as well as of the number of loopholes in the directive.

While the directive does indeed set minimum levels for taxes on electricity, coal, oil, and natural gas for the next ten years, the ministers have greatly weakened it in comparison with the Commission's proposal of six years ago, which had later been subject to repeated negotiation.

All that was decided for mineral oils was that the tax level agreed in

1992 should be adjusted for inflation, and that for other products the minimum levels should be very low. There is a long list of escapes, such as special rules for the taxation of diesel fuel in trucks operating internationally, and for the taxation of energy-intensive industry. There is to be no revision of the levels before 2012.

An evident explanation of this meagre outcome is that all agreements concerning Community taxes require full unanimity, and the fact that the European Parliament has virtually no influence over such matters.

PER ELVINGSON

For more information, see <http://europa.eu.int/rapid/>, where the directive, its minimum levels, and escape clauses are described in a press release from the Commission, dated March 21, 2003.

The European Environment Bureau, EEB, is campaigning for a green tax reform within the EU. See [www.ecotax.info](http://www.ecotax.info)

## Public concern for the environment increasing

THE COMMISSION'S environment directorate has canvassed some 16,000 inhabitants of the EU on their attitude to various matters concerning the environment. The last time such a survey had been made was in 1999.

As then, public confidence turned out to be the greatest for environmentalist organizations, this time with a show of 48 per cent. Next came scientists and consumer associations. Trust in the EU itself was much lower, only 13 per cent noting it, as against 12 per cent for national governments and 10 per cent for political parties in general. Only 1 per cent was shown to have any trust in business corporations.

Public concern over environmental issues has grown since 1999, 44 per cent of respondents being "very

worried" about air pollution, as against 35 per cent in the previous survey. Climate change was now worrying 39 per cent.

A new trend this year was that southern Europeans were worrying more than their counterparts in the north, with Greece topping the poll in this case, followed by Italy (also Luxembourg). Least concerned were people in the Netherlands, and then in Finland and Sweden – although people in these northern countries did feel that they were on the whole well informed on environmental matters.

*To find out more:* The whole survey, **Eurobarometer 58.0: The attitudes of Europeans towards the environment**, is available at [http://europa.eu.int/comm/environment/barometer/barometer\\_2003\\_en.pdf](http://europa.eu.int/comm/environment/barometer/barometer_2003_en.pdf)

## No binding terms for biofuels

In March the EU Parliament voted not to oppose the Council by demanding binding terms for the use of biofuels in the transport sector, agreeing instead to indicative requirements of 2 per cent for 2005 and 5.75 per cent for 2010.

A main reason for this change of attitude was that the ministers had threatened to block a parallel directive on tax relief for biofuels if parliament persisted in demanding binding terms.

*Environment Daily*, March 12, 2003.



## New standards for pleasure craft

A conciliation committee of representatives from the Council of Ministers and the European Parliament agreed in March on a new directive limiting noise and polluting emissions from pleasure boats.

The Commission has estimated that the exhaust emissions of carbon monoxide, hydrocarbons, nitrogen oxides, and particulates should be reduced on an average by more than half. The emission limits had not been changed since the Commission's original draft (see AN 1/01). The new standards should take effect from January 1, 2005, although formal approval will still be required from Council and Parliament.

*Further information:* European Parliament conciliation committee, [www.europarl.eu.int/code/default\\_en.htm](http://www.europarl.eu.int/code/default_en.htm)

## Sulphur-free fuel law in force

Directive 2003/17/EC, limiting the sulphur content of road fuels to 10 ppm from 2009, became law when published in the Official Journal on March 22. Such fuels must be generally available within the union already from 2005.

**Official Journal L 076, 22/03/2003**, available at <http://europa.eu.int/eur-lex>.

# Stricter standards in the offing

Rapid developments in technology and a reassessment of the risks are now starting to force the pace in the EU.

ALTHOUGH THE TECHNIQUES for cleaning diesel exhausts have developed faster than expected, the adverse effects on health, especially from particles, are now attracting ever more attention.

A tightening up of the EU standards can therefore be expected. When those for 2008 (Euro V) were set for nitrogen oxide emissions from heavy vehicles, they were thought to be stretching things to the limit. The Commission was therefore instructed to have reviewed the situation before the end of 2002 to see if they would in fact be technically feasible. Its preliminary conclusion was that they would be, and the question is now being raised as to whether they might not be made even tighter.

The technique mainly favoured for attainment of the Euro V standard for NO<sub>x</sub> is SCR, selective catalytic reduction, which will however need a supply of urea, and efforts are now being made by industry to arrive at a common standard and distribution system for it.

Things have also moved fast in regard to particulates. When the Euro IV requirements for them were first put forward for 2005, it was generally assumed that particulate filters would be needed for all diesel engines, in cars as well as trucks. But most of the manufacturers are now aiming to produce vehicles that will

meet the requirements without any need for a filter. So although they would make it possible to meet the coming standards for particles by a wide margin, filters will probably not be used to any great extent.

But pressure is now building within the EU to require, or at least allow, member states to provide incentives for these PM control systems. About a year ago, Sweden requested the EU to get that provision

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*A serious push is about to begin to tighten the limits for all vehicles*

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of the directive amended which prohibits incentives for requirements that go beyond the EU standards. Although that request was denied, France and Germany have now raised the following points in a letter to the Commission:

◆ Despite the significant improvement in emissions from diesel vehicles, problems still remain in respect of PM and NO<sub>x</sub>. The writers note that the World Health Organization, the EU Commission, the US National Research Council, and the EPA have all assigned high priority to the problem of fine particles, on account of

their role in causing respiratory and heart disease, with premature mortality.

◆ Measurements of air quality have shown the number of particles in sizes from 0.01 to 2.5 µm to be high, without any decline during the past six years. From German estimates it appears that 45 to 65 per cent of the particle load in the air around heavily trafficked areas emanates from vehicles.

◆ The proportion of new diesel car registrations has more than doubled in the EU during recent years, now amounting to approximately 40 per cent. While this will have advantages in terms of lower CO<sub>2</sub> emissions, it will result in PM emissions being 60 per cent higher than previously estimated for the year 2020.

◆ NO<sub>x</sub> reductions are also urgently needed to reduce the formation of ground-level ozone. A modern diesel passenger car discharges about eight to ten times as much NO<sub>x</sub> as a petrol-fuelled car.

◆ It now appears that Euro 4 for cars and Euro V for trucks can largely be met without PM filters, but a further tightening of the limit values will be needed if this highly efficient technology and its associated health benefits are to become general.

◆ Particle filters have been demonstrated to be available and effective

EU emission limits (g/km) for cars.<sup>1</sup>

	Euro 3 (2000)		Euro 4 (2005)	
	Petrol	Diesel	Petrol	Diesel
Carbon monoxide (CO)	2.3	0.64	1.0	0.5
Hydrocarbons (HC)	0.20	-	0.10	-
Nitrogen oxides (NO <sub>x</sub> )	0.15	0.50	0.08	0.25
HC+NO <sub>x</sub>	-	0.56	-	0.30
Particles	-	0.05	-	0.025

<sup>1</sup> Note that diesel vehicles are permitted to emit three times as much NO<sub>x</sub> as petrol-driven ones. Only diesels have to meet requirements for particles, despite the fact that the emissions from petrol engines with direct injection are also considerable.

EU emission limits (g/kWh) for heavy vehicles.<sup>1</sup>

	Carbon monoxide	Non-methane hydrocarbons	Nitrogen oxides	Particles
	Euro III (2000)	5.45	0.78	5.0
Euro IV (2005)	4.0	0.55	3.5	0.03
Euro V (2008)	4.0	0.55	2.0	0.03
EEV <sup>2</sup>	3.0	0.40	2.0	0.02

<sup>1</sup> The table is a simplification. The limits are those deriving from the ETC, the European transient test cycle. There are also limits for methane. The alternative (higher) limit for particles is for some types of small diesel engine.

<sup>2</sup> EEV = Environmentally enhanced vehicles.



under practical conditions. More than 270,000 cars and 50,000 commercial vehicles are currently so equipped.

♦ The future US limits for commercial vehicles are lower by approximately 90 per cent for NO<sub>x</sub> and 60 per cent for PM than the Euro V ones. For passenger cars the US limit values for NO<sub>x</sub> and PM that are to be gradually phased in from 2004 (Tier 2) will be approximately 80 per cent lower than the Euro 4 limits. Japanese limits for PM come close to zero.

France and Germany have called upon the Commission to submit, by mid 2004, suggestions for updating the regulation, with the aim of further reducing emissions of NO<sub>x</sub> and PM by using the possibilities of the particle-filter technology. Germany and France say they will support this work in every way.

All seems to point to the Commission now considering the possibilities of a further tightening of the requirements. One would be to develop standards for enhanced environmentally friendly vehicles, which would enable the member countries to use tax incentives to encourage the early introduction of vehicles with PM filters.

Another possibility would be to develop Euro 5 limits for light-duty vehicles which would include lower NO<sub>x</sub> levels and possibly a PM number limit. PM and/or NO<sub>x</sub> limits for heavy-duty vehicles could also be tightened as part of the Euro V technology review.

In summary, it appears that a serious push is about to begin in Europe to so tighten NO<sub>x</sub> and PM limits for all categories of vehicles as to require the introduction of PM filters on all diesels. In parallel with this EU wide effort, there is also a strong campaign in Germany to modify the tax incentive scheme for early introduction of Euro 4 limits, to make it apply only to vehicles that are equipped with PM filters.

Adapted from Car Lines No.1, February 2003.

## Latest developments

Germany and France brought up the issue of stricter exhaust standards for diesel-driven vehicles at the meeting of the EU environment ministers on March 4. Sweden, Denmark, and Austria backed the move, but Italy opposed it. It all ended in a request to the Commission to report on the matter at the next Council meeting.



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NO<sub>x</sub> FROM TRUCKS

# Tests show unexpected increase in emissions

CHECKS MADE BY the Umweltbundesamt, the Federal Environment Agency, showed that trucks running on German roads were emitting far greater amounts of nitrogen oxides that they should have done according to current legislation. The agency has tested a great number of vehicles that had been certified according to the Euro 2 standard from 1995, both by the cycle used for certification and also under more realistic driving conditions.

When engines were run at speeds prescribed for the cycle, emissions came out lower than the required level. But at other rpms they were definitely higher. The agency thinks this is clear evidence of manipulation of the engines' electronic systems by the vehicle manufacturers – since fuel consumption will be lower if NO<sub>x</sub> emissions do not have to be constrained.

According to agency estimates, this has led to an increase of 140,000 tons per year in NO<sub>x</sub> emissions in Germany alone. Euro 2 engines were calculated to be emitting 10 per cent

more NO<sub>x</sub> per kilometre than the older Euro 1 engines, when they ought, according to the test cycle, be emitting 25 per cent less.

Vehicles that are now being certified according to the Euro 3 rules are subjected to a new driving cycle with several different rates of engine revolution, which allows less opportunity of improving fuel consumption at the expense of increased emissions of NO<sub>x</sub>. The outcome has however yet to be evaluated.

Something similar to the German experience also occurred a few years ago in the United States. There the EPA took the matter to court after deciding that the truck makers' adjustment of the software was illegal, with the result that the makers had to pay fines and in addition take a whole row of steps to reduce emissions further than the law actually demanded.

*Further information:* A summary (in German) is available at [www.umweltbundesamt.de](http://www.umweltbundesamt.de), under the "Presse" heading.

# Made traffic start to flow again

Success in London appears likely to cause other European cities to follow suit.

THE WORLD'S BIGGEST experiment in congestion charging began in London on February 17. Since then anyone entering a defined zone in the centre of the British capital by car between 07.00 and 18.30 on weekdays has to pay a one-day charge of £5 (€7.50) or face a fine of £80 (€120).

The effects were being closely watched not just by Londoners, but by authorities from elsewhere in Great Britain as well as in the EU and the rest of the world. Among the EU cities reportedly ready to introduce similar schemes are Copenhagen, Helsinki, Stockholm and Lisbon.

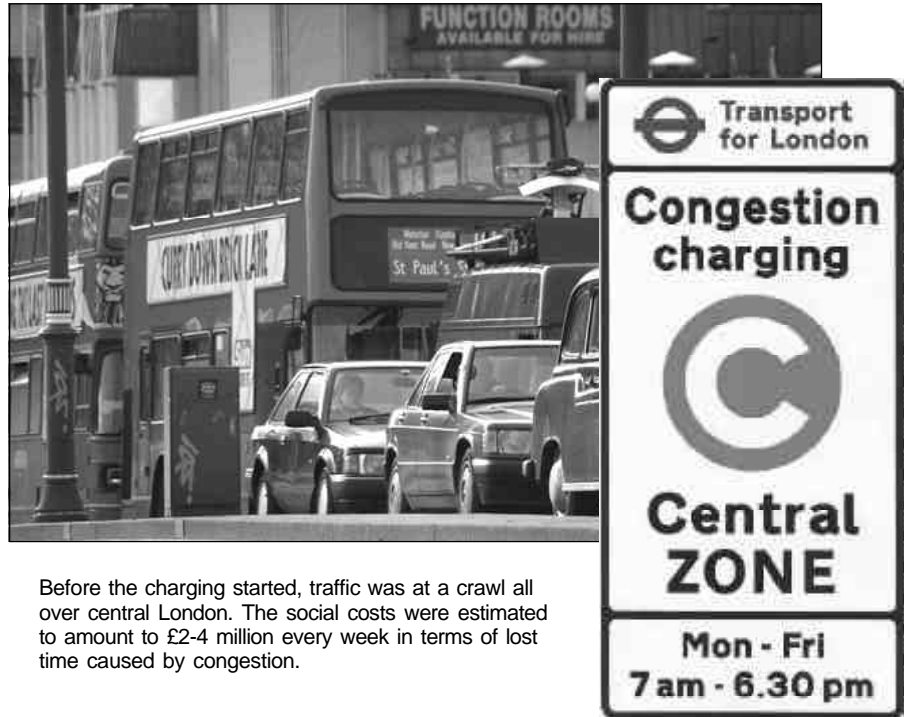
It has been shepherded into action by Ken Livingstone, London's controversial mayor. He has faced considerable opposition, including two failed legal challenges claiming he was not empowered to introduce the charge, and newspapers and Conservative politicians have been fiercely critical.

Such was the unpopularity of the scheme before it started that one bookmaker was offering odds of 4-1 that the charge would be abandoned by the end of the year, and 10-1 that Livingstone would resign before his term ends in 2004.

Livingstone himself expected things to go wrong. He predicted the first day could be "very bloody," and when a computer error sent out 45 fine notices for non-payment before the charge had started, there were many who felt it could have been a disaster.

But the first few days passed off much better than expected – perhaps partly because the schools' midterm holiday meant less rush-hour traffic than usual. The news media was out in force on day one, looking for congestion both inside the zone and on the periphery, where it was feared there would be gridlock as drivers looked to avoid the charge. But it didn't happen, and one BBC reporter in a helicopter said: "We've been looking for jams and can't find any."

After three days, overall traffic



Before the charging started, traffic was at a crawl all over central London. The social costs were estimated to amount to £2-4 million every week in terms of lost time caused by congestion.

levels were down by around 25 per cent, yet there had been no significant increase in public transport use. City-centre shops said their sales were down around 12 per cent on the same week last year, but retail analysts thought only a small part of that could be due to the congestion charge.

It seems from a check made by London's transport authority in mid-April that traffic within the zone had settled down to a decrease of about 20 per cent, or definitely better than the expected 10-15 per cent. But that will also mean that the income from the scheme, which has been earmarked for investment in public transportation, will be less than expected.

Polls have shown that before the start of the scheme, Londoners were about equally divided for and against, but after it had been in operation for about a month, opinion had swung strongly in favour. A first annual report will be published next spring. A separate report will analyse its longer-term environmental and economic impacts.

*Main source: T&E Bulletin* ([www.t-e.nu](http://www.t-e.nu)).  
*Further information:* London congestion charging web pages: [www.cclondon.com](http://www.cclondon.com). A seminar on road charging was organized by T&E in March. For a summary please visit [www.t-e.nu/urban\\_road\\_pricing\\_seminar.htm](http://www.t-e.nu/urban_road_pricing_seminar.htm)

## How it works

It costs £5 per day to bring a car into central London on Monday to Friday between 7am and 6.30pm.

The charge can be paid in various ways, such as by Internet or mail, and in many shops.

It must either be paid in advance or at latest by midnight the same day. There is a £120 fine for non-payment.

Cameras record each car's registration number, which is subsequently checked against payments in a computer.

Residents within the zone get a 90-per-cent rebate. Taxis, emergency vehicles, and two-wheelers are totally exempted.



THE GREAT LONDON SMOG

## Death toll may have been much greater

WHAT ACTUALLY HAPPENED in London during that week in December fifty years ago? When a thick peasoup fog descended on the city. What was the death toll? And how about the aftereffects?

The matter has been taken up by various writers in a book published last December, just fifty years after the Great London Smog.<sup>1</sup> There professor Peter Brimblecombe gives a lively version of the event that started with an inversion on December 5, 1952. Sight rapidly worsened and the air became thick with pollution. Smoke and sulphur dioxide concentrations mounted to 4500 and 3800 micrograms per cubic metre, and a stream of people suffering from respiratory troubles started coming to the hospitals.

The smog ended on December 9. The number of deaths in the week while it lasted is estimated to have been 3500-4000 more than normal. More people than normal also died during January and February in the following year – as it was thought, because of an influenza epidemic. But Professor Brimblecombe suggests that this might have been an aftermath of the smog. “These deaths,” he says, “may have been incorrectly assigned to influenza, so that the number of deaths resulting from the Smog could easily triple.”

However that may be, the Great Smog set off a series of inquiries that eventually led to the passing of the Clean Air Act in 1956, which in time brought a considerable improvement in the quality of London’s air as well as that of other UK cities (the problem had by no means been confined to the capital).

This was however just when road traffic was beginning to swell, bringing new trouble from air pollution. According to the National Society for Clean Air and Environmental Protection (NSCA), ten times more people now die from air pollution in the UK, than from road accidents. A modest estimate puts the figure at 35,000 per year.<sup>2</sup>

Health, particles, and ozone are other aspects of the problem that are treated by experts in the NSCA book, as are effects on the ecosystem and likely developments in the energy and transportation sectors.

PER ELVINGSON

<sup>1</sup> **The Clean Air Revolution: 1952-2052.** National Society for Clean Air and Environmental Protection, NSCA. Can be ordered from NSCA, 44 Grand Parade, Brighton, UK BN2 9QA. Internet: [www.nasca.org.uk](http://www.nasca.org.uk)

<sup>2</sup> **Air pollution deaths “double official estimates.”** NSCA press release December 5, 2002. Can be read at [www.nasca.org](http://www.nasca.org).

### Cars’ air conditioning

It is becoming ever more common for cars to be equipped for air conditioning, with the result that their emissions of climate gases are increasing in two ways. On the one hand there is always some leakage of the cooling medium, the highly potent greenhouse gas HFC-134a, the effect of which on the climate can be 1300 times greater than that of carbon dioxide, calculated per molecule. Then there is the compressor’s need for energy, which has to come from the car’s engine, thus adding to fuel consumption and so to emissions of carbon dioxide.

The emissions of climate gases arising from air conditioning were not included in the car makers’ agreement with the EU Commission to cut down emissions of greenhouse gases. Those from air conditioning are however estimated to amount to 10 per cent of the total from a car so equipped.

It is now expected that as part of a proposal for cutting down the emissions of fluorinated gases, the Commission will be pressing for stricter rules for controlling leakage of the cooling medium and for its recovery when cars are scrapped.

### Out by the back door

Although Denmark is committed to reducing its emissions of greenhouse gases by 21 per cent, from 1990 to 2008-12, so far nothing has happened. The country is, according to its own environment protection agency, risking overrunning its ceiling by a whole 45 per cent.

Noting that the task is formidable and likely to be costly, the government is proposing, in a newly formulated strategy, to adopt the least expensive measures in the first place – which will mean buying emission credits from abroad. Domestic attacks on the problem are however also envisaged, and a special climate commission is to be appointed.

The Netherlands, which is only committed to a 6-per-cent reduction, had already announced that it would be achieving half of the required cut in emissions through resort to the so-called flexible mechanisms of the Kyoto protocol.

Under eighteen projects launched in March, it will be providing financial aid for the build-up of renewable energy in developing countries, and in return count the gains so made as though they were its own. If carried out, and approved by the CDM Executive Board, the scheme would match a reduction in the Netherlands of 18 million tons a year.

# Still a lot to be done

Financial problems and the use of low-quality coal are causing sulphur emissions from a huge energy complex to remain the highest in Europe.

BY FAR THE LARGEST emitter of sulphur dioxide in Europe is the Maritsa East energy complex in central Bulgaria. Construction had started in the late 1950s near the town of Stara Zagora, some 200 km east from Sofia. The complex is located in a coal-mining basin containing some four-fifths of the country's reserves of lignite, which is used as fuel in the Maritsa plants.

The complex, consisting of power plants, a plant for processing lignite, and opencast mines, covers an area of nearly 1000 sq.km. It has a total installed thermal capacity of 2790 MW, and produces nearly 40 per cent of the country's electricity.

The first plant to be commissioned was Maritsa-East I with capacity of 500 MW, the first block of which started operating in 1960. Construction of the largest plant, Maritsa-East II, capacity 1450 MW, was begun in 1963, and the last block was commissioned in 1995, thanks to funding from the EU. The construction of the 840 MW Maritsa-East III followed in 1974, the first energy block being commissioned in 1978 and the others several years later.

Originally, the three power plants were combined in a state-owned complex, but after the events at the end of the 1980s they were made into separate companies: Brikel Ltd (Maritsa-East I), Maritsa-East II Ltd and Maritsa-East III Ltd.

## SO<sub>2</sub> emissions largest in Europe

Maritsa-East is one of the biggest polluters of the atmosphere not only on a national but also on a European scale. The operation of the complex also involves many other environmental problems such as serious pollution of water and soil, land degradation, health problems, and risks for the region's population.

The main reason for the high emissions of atmospheric pollutants such as sulphur, nitrogen and carbon oxides is the low-quality coal that is being burned in the thermal plants. The lignite from the Maritsa-East

coalfield has a low calorific value (1060-1850 c/cal) and high ash (29.4%) and sulphur (3.5-4%) contents. Other reasons are the old technology used in the plants and the lack of modern cleaning facilities.

For environmental reasons, in the late 1980s two 150 MW blocks were decommissioned in Maritsa-East I, and filters installed in the other plants for cleaning of the fly ash. But nothing was done for reduction of the numerous other pollutants and the



level of atmosphere pollution from Maritsa-East remains very high.

The information from the Regional Inspectorate of Environment and Waters (RIEW), Stara Zagora, on the emissions of sulphur dioxide in 2001 shows the scale of the problem:

**Maritsa II Ltd: 492,578 tons/yr**

**Maritsa III Ltd: 268,529 tons/yr**

**Brikel Ltd: 51,781 tons/yr**

In October 2002 flue-gas desulphurization (FGD) facilities were installed at Maritsa-East II. Two units were put in at blocks NN 7 and 8 at an overall cost of US\$70 million. These all use the wet-limestone method with a theoretical rate of sulphur-dioxide reduction of more than 90 per cent.

According to representatives of environmental groups, the technol-

ogy of the FGD installations still needs improvement and they are not working with their projected capacity. "So far, the operation of the FGD facilities shows that very often they have technological problems and the systems have to be switched off for some periods," says Petko Kovatchev, executive director of the Centre for Environmental Information and Education, an environmentalist organization.

Nevertheless, analysis of the actual emissions data provided by RIEW shows that after the commissioning of the FGD facilities there has been a reduction of SO<sub>2</sub> emissions. See table below.

## Plans for the future

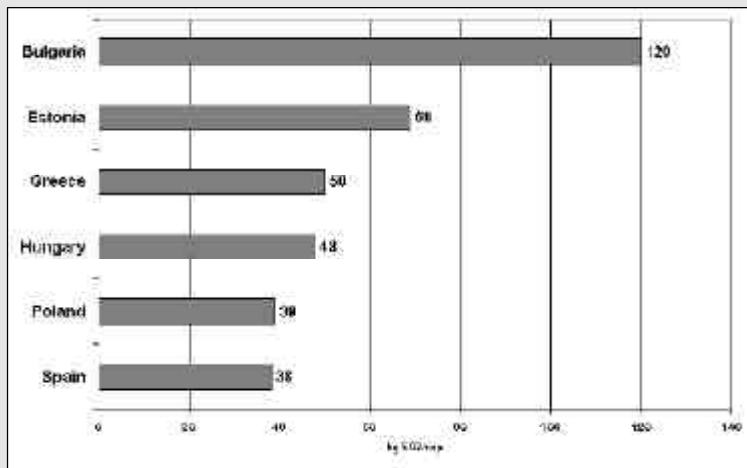
Bulgaria's aim of joining the EU in the near future will make it necessary to comply with EU standards and legislation for pollution, especially with regard to the large combustion plants directive. However, the installation of cleaning facilities will require considerable investments, which will make the process difficult. Since the greatest part of the necessary funding is not available in the Bulgarian energy sector, different projects for plant rehabilitation and installation of cleaning facilities are being developed in order to attract international investors or creditors.

### *Brikel Ltd (Maritsa-East I)*

Brikel Ltd was created several years ago by unifying the Maritsa-East I power plant and the plant for processing coal for domestic use. According to information from RIEW the power plant will be allowed to operate in its current state until 2006

**Emissions from the Maritsa-East complex in 2001 and 2002 (kg/h).**

	Sulphur dioxide		Nitrogen dioxide		Dust (ashes)	
	2001	2002	2001	2002	2001	2002
Brikel Ltd	15063.0	8104.8	307.2	-	203.86	44.68
Maritsa II Ltd	54439.9	49731.8	725.7	-	181.7	90.09
Maritsa III Ltd	19034.0	24186.1	206.3	-	89.4	175.18



In 2000, Bulgaria was by far the greatest emitter of sulphur dioxide per capita in Europe, despite having halved its emissions since 1990.

and no additional cleaning facilities are planned.

The lack of plans for such facilities is due to the government's plan for closing the present plant and constructing replacement facilities. The intention is to build new replacement capacity for 660 MW on the site of Maritsa-East I, two units of 330 MW each with corresponding FGD facilities. Alstom is the preferred main contractor for the project and possible funding sources are the EU and the European Bank for Restructuring and Development (EBRD). The project is expected to start in 2003, but some remaining administrative and financial problems make the future of the plant unclear.

#### *Maritsa-East II*

Construction of FGD facilities is planned here for blocks NN 1-6. The Ministry of Energy and Energy Resources has developed a project for the commissioning of FGD facilities at blocks NN 5 and 6 that will reduce SO<sub>2</sub> emissions from them by up to 90 per cent. The total investment needed is 60 million euros, of which Maritsa-East II should provide 6 million euros; another 30 million will be needed from the EU program ISPA through application procedure and negotiations have been started to secure 24 million euros from international credit institutions. The decision of the governing committee of ISPA on the project and eventual funding is expected in 2003.

Another project was also developed for Maritsa-East II for the construction of a pilot electron-beam installa-

tion for flue gas treatment. It is said to reduce emissions of sulphur and nitrogen oxides by 90 and 70-80 per cent respectively. The total investment cost would be US\$8 million. The original intention was to get the installation commissioned by the end of 2002, but still there are many financial and administrative problems, which are holding the matter up.

#### *Maritsa-East III*

The future of Maritsa-East III power plant is more clear because a project is being implemented for its refurbishment. This is being done through the involvement of the National Electric Company of Bulgaria (NEKEAD) and Entergy Power Development Corporation, USA, on the basis of a Joint Development Agreement signed in 1998.

The intention is to build four FGD systems for the four generating units at the plant that would result in a 90-per-cent reduction of SO<sub>2</sub> emissions from each one of the boilers so equipped.

All the financial agreements have been completed and the total investment for the project is 518 million euros, of which Bulgarian banks will provide 75 million euros. The project is to be implemented in three years, starting in the spring of 2003. As a result, the plant will not only become cleaner, but its life will be prolonged by 15 years.

The Entergy Power Development Corporation plans to invest roughly 100 million euros for the installation of FGD facilities in the plant, which will significantly contribute for the

reduction of SO<sub>2</sub> emissions.

#### **Financing the key issue**

Despite all the good intentions, there are many difficulties in securing the necessary finance, as well as the problems with the practical realization of the projects.

For various reasons the two first FGD installations at Maritsa East II were for instance commissioned after a delay of a year and a half. The decision to install a pilot electron-beam installation for flue gas treatment at the same plant was made in 1998, but still the future of this and many other projects is unclear.

Consequently no real reduction of emissions will be possible in the near future without a more efficient functioning of the existing FGD facilities at Maritsa-East II and realization of the project for rehabilitation of that plant according to schedule. Even so, no real reduction of the emissions of SO<sub>2</sub> can be expected before 2006. Until then, the Maritsa East energy complex will still be one of the greatest air polluters in Europe.

TEODOR TODOROV

TIME – ECOPROJECTS FOUNDATION

#### LATEST NEWS

### **Cleaning up**

A Japanese company, Mitsui, will modernize the four oldest units at Maritsa-East II. The capacity will be increased from 520 to 700 MW and the pollution reduced as to meet EU emission standards, according to the Bulgarian energy ministry. A 226 million euro deal was signed in April. The project is said to be financed with a loan by the state-run Japan Bank for International Cooperation.

Source: Reuters, April 4, 2003 (www.planetark.org)

### **Closing down?**

On April 22 the Turkish government decided to stop the import of electricity from Bulgaria, great deal of which is coming from Maritsa. This decision led to the immediate shut down of two 200 MW units – one at Maritsa II and one at Maritsa III. The expected loss for the National Electric Company is about \$130 million. It is still unclear whether and when the shut units will start to operate again. It could however lead to a considerable reduction of the emissions of atmosphere pollutants from the Maritsa-East energy complex.

TEODOR TODOROV

# Signs of increasing concentrations

While the emissions of ozone-forming substances have been decreasing in Europe, background levels, fed by emissions from all over the northern hemisphere, are on the way up.

ALTHOUGH it was not uncommon in the UK to have peak levels of ground-level ozone in excess of 200 parts per billion during the seventies and eighties, they have since been steadily going down, so that in the nineties it was concentrations over 100 ppb that were becoming unusual. And now the number of times that they are exceeding the limit set by the country's Expert Panel on Air Quality Standards – 50 ppb ten times a year, 8-hour rolling mean concentration – on ever fewer occasions.

An examination of the record for the last decade, 1990 to 2000, has shown the annual maximum 8-hour concentration to be declining by 2-3 ppb per annum at several rural sites in the south and east of the UK. Announces a report in the Clean Air Revolution,<sup>1</sup> concentrations over 200 ppb “are a matter of historical record and are unlikely to be seen again.”

This is just what might have been expected as a result of the European emissions of volatile organic compounds going down by a third during that decade. There are nevertheless signs of ozone concentrations rising in the UK, both in urban areas and at remote sites.

Peak levels in cities are now reaching those at rural sites – after having been kept down by the great volume of emissions of nitrogen monoxide (NO) from road traffic. In conversion to nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>) gets turned into oxygen (O<sub>2</sub>). As vehicles have become cleaner, however, this “ozone consuming” effect has lessened, with the result that ozone levels have risen. But in the most polluted parts of cities the concentrations of ozone are still markedly lower than at rural sites.

The increasing concentrations at rural sites have a more large-scale explanation. Analyses of the ozone content of the air masses coming across the Atlantic to western Ireland during the last fifteen years

have shown it to have been increasing at a rate of 0.48 ppb per annum, to 39 ppb in 2001 from 32 ppb in 1988. At Mace Head, the most remote site in the British Isles, the consequent increase in background concentrations has been greater than the reduction due to lower emissions of ozone-forming substances in Europe

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*Any increase in background concentrations will have to be met by reductions in Europe*

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– which has brought a decline in concentrations at more polluted sites.

Rising background levels can be noted all over the northern hemisphere as a result of man-made emissions of methane, carbon monoxide, nitrogen oxides, and volatile organic compounds. The amount of ozone in the lower air levels, the troposphere, is estimated to have doubled since pre-industrial times as a result of human activities.

The way ozone concentrations will

develop over Europe in future will depend mainly on two factors:

1. Whether the emissions of ozone-forming substances will go on decreasing. Most of the European countries have made commitments under the Convention on Long-range Transboundary Air Pollution which are expected to result in reductions of the emissions of nitrogen oxides and volatile organic compounds by 40 and 48 per cent between 1990 and 2010. But what will happen after that?

2. The trend in the northern hemisphere generally.

Lower emissions in Europe will lead to less regional formation of ozone, with fewer high peak levels in consequence.

But in nine out of ten of the scenarios for developments up to 2100, worked out by IPCC, the Intergovernmental Panel on Climate Change, the concentrations of ozone are likely to increase in the northern hemisphere, and in some cases very greatly.

Any increase in background concentrations resulting from increased emissions of ozone-forming substances in North America and Asia will have to be met by continued reductions in Europe, if concentrations

## FACTFILE: OZONE

Ozone is a reactive gas, the concentrations of which exceed every summer the level where damage occurs to vegetation, humans, and material structures. There will be greater effects from long-term exposure than from brief periods with high levels.

Ozone is formed in the atmosphere through the reaction between nitrogen oxides, volatile organic compounds, carbon monoxide, and methane. Since the reactions are driven by sunlight, concentrations are highest in summer. Ozone can be transported

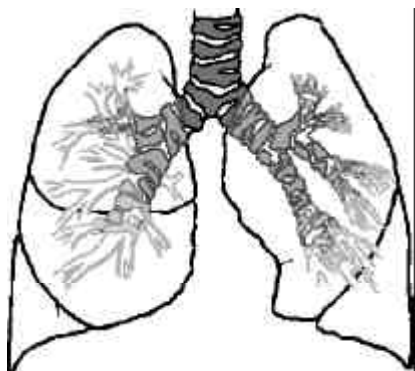
over great distances by winds, and thus can constitute regional or even global problems.

In heavily polluted areas ozone formation will depend principally on the extent to which VOCs are present. This is why the decline in peak levels in the UK can be ascribed primarily to lower emissions of VOCs on the continent. Where the air is cleaner, as in Scandinavia, it is mainly the presence of nitrogen oxides that determines the extent of ozone formation.

there are not to start rising again. But all will depend of course on what will actually be done to control the emissions of air pollutants – in particular in Asia, where most of the scenarios indicate the greatest increases.

PER ELVINGSON

<sup>1</sup> This article is based mainly the chapter entitled *Pollutants – Ground-level ozone*, by R.G. Derwent, P.G. Simmonds, and A.J. Kent. **The Clean Air Revolution: 1952-2052** is published by the National Society for Clean Air and Environmental Protection (NSCA). Available from NSCA, 44 Grand Parade, Brighton, UK BN2 9QA. Internet: [www.nasca.org.uk](http://www.nasca.org.uk)



HEALTH EFFECTS

## Long-term exposure can damage lungs

IT HAS LONG BEEN KNOWN that exposure to ozone can have acute effects on health. The relation between high concentrations and the number of patients admitted to the hospitals' acute receptions is evidence enough. Ozone is a highly reactive gas that causes, among other effects, irritation of the airways and lung tissue.

But it now appears from research carried out in the US that serious effects can result from long-term exposure even at low concentrations. Young apes that have been exposed alternately to peak concentrations and normal levels have been shown to develop the same symptoms as human asthmatics. Moreover their lungs did not develop properly, the number of airway branchings remaining at nine instead of the normal thirteen. There were also changes in the lungs' immunology.

"If the changes observed in the young monkeys occurred in humans, and they were permanent, they

should be manifested in breathing tests." They are, say the American scientists, referring to tests of children and teenagers who had been exposed to varying concentrations of ozone while growing up.

"These and other recent studies suggest that over time, ozone permanently and irrevocably alters the lungs themselves," is their conclusion. "In effect, merely because they are breathing, children develop lungs that are functionally smaller and stiffer than they should be, with lesions and scars not unlike those found in tobacco smokers. They bear many of the hallmarks of asthma, handicaps that they may well carry for their entire lives."

*Further information:* **Health & Clean Air Newsletter**. Fall-Winter 2002. Available at [www.healthandcleanair.org](http://www.healthandcleanair.org), but can also be ordered in printed format from Health & Clean Air Newsletter, 1100 Eleventh Street, Suite 311, Sacramento, CA 95814, USA.

NON-ROAD DIESEL ENGINES

## Stricter standards proposed

IN APRIL THE US environment protection agency proposed reducing the emission limits for particulates and nitrogen oxides from non-road diesel engines by more than 90 per cent. The new limits would apply gradually from 2008 to 2014, so as to arrive at a level corresponding to that for heavy road vehicles in 2007.

It is estimated that after full implementation the proposal will yield annual reductions of 825,000 tons of nitrogen oxides and 125,000 tons of particles. Non-road diesel engines are now estimated to account for about 44 per cent of diesel PM emissions, and about 12 per cent of those of NO<sub>x</sub> from all mobile sources in the US.

To meet the proposed requirements, engines will have to be equipped for advanced exhaust cleaning, which will need low-sulphur fuel for proper functioning. The proposal therefore involves a lowering of the sulphur content of diesel fuel from the present 3400 ppm to 500 ppm in 2007 and 15 ppm in 2010.

The EPA estimates that among the benefits accruing from its non-road program by 2030 would be the prevention of more than 9600 premature deaths, 8300 hospitalizations, and almost a million lost working days.

The cost of reducing the sulphur in diesel fuels to 500 ppm is estimated to average 2.5 cents per gallon and 4.8 cents per gallon for 15 ppm fuel. Since cleaner fuel will reduce maintenance costs, however, the added cost of the last will actually only be 3.3 cents per gallon. Estimates vary as to the additional cost of making cleaner engines, but in the EPA view it would be no more than 1-2 per cent in the case of most vehicle types.

Praise of the EPA's proposal has been forthcoming from environmentalist and health organizations, although both would like to see it implemented more rapidly. The deadline for presentation of opinion is August 20, and the agency hopes to have final rules ready by next year.

*Further information:* [www.epa.gov/nonroad](http://www.epa.gov/nonroad)

# Beyond Kyoto

Many more countries will have to undertake to cut their emissions in the next period.

THE INDUSTRIALIZED countries signing the Kyoto protocol have agreed to reducing their emissions of greenhouse gases by 5.2 per cent, from their 1990 levels, by 2008-2012 (as an average for those five years). But the US defection, together with the clause allowing countries to take carbon sinks into account, has so attenuated the protocol that instead of reducing their emissions the developed countries will be increasing them by 9 per cent, even assuming that they all live up to their commitments.

The International Energy Agency, which has come to this conclusion,<sup>1</sup> points especially to the great loophole allowing countries to take advantage of existing "managed forests" as carbon sinks. That alone will reduce the effect of the protocol in cutting down emissions from 5 to 3 per cent, and adding the deficit from US withdrawal brings the figure down by another one per cent, which would leave an ultimate reduction of no more than 2 per cent.

But what will really push the trend in the wrong direction, will, according to the IEA, be the climate policy launched by the Bush administration in February 2002. Intended as an alternative to Kyoto, it sets the goal in terms of carbon intensity. Specifically, the proposal would reduce US emissions from the present 183 tons per million dollars of GDP to 151 tons by 2012. The US government claims this would amount to a decrease of 18 per cent.

As the IEA demonstrates in its report, however, this would amount to no more than a maintenance of the trend to date. Over the last ten years the carbon intensity of the US economy has dropped by about 15 per cent. But according to the administration's own forecasts, in the next ten years the country's GDP is likely to grow by 3 per cent a year – which the IEA maintains would lead to an increase of 30 per cent in US emissions of greenhouse gases between 1990 and 2012. And that, says the IEA, is just what will tip the balance

from a slight decrease in emissions from developed countries worldwide, to a marked increase of 9 per cent.

Then there is the matter of the developing countries' emissions. They have no obligations under the Kyoto protocol, and there is little doubt that their emissions will increase.

The IEA hammers home that there is no sense in delaying action until

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*Developed countries  
will be increasing their  
emissions by 9 per cent*

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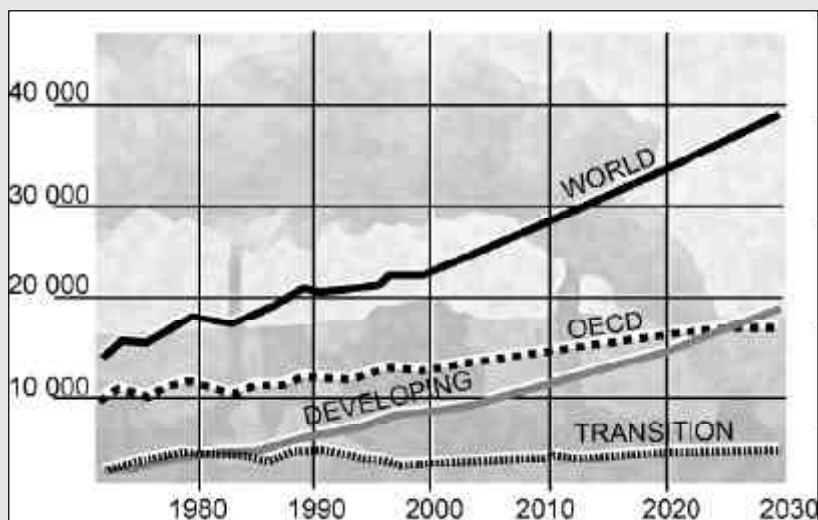
there is complete evidence of the environmental effects of greenhouse gases and what it will cost to stabilize concentrations in the air at a certain level. Decisions must be made despite lack of absolute certainty. The agency warns, for instance, that the chances of stabilizing the atmospheric concentrations of carbon dioxide at 450 ppm will have been lost within a few decades if no steps have been taken in the meantime. While

450 ppm is the level at which discussion starts in IPCC reasoning, it is also the limit at which many environmentalist organizations would stop.

While agreeing that there may have been cause for the dividing line between countries that have committed themselves to reducing emissions (Annex I) and others that had not when the protocol was conceived, it is now rapidly dissolving. The per-capita emissions of some 25 non-Annex I countries are now greater than those of countries at the bottom of the Annex I scale, and there are moreover now 40 non-Annex I countries with a higher per-capita GDP than the poorest of the Annex I countries. The number of relatively rich and/or polluting countries that have managed to avoid the obligation to cut emissions has thus grown.

The IEA dismisses the idea that emission limits should be set for developing countries according to their supposed ability to bear the cost – referring to a study in which a country would join the Annex I group as soon as its per-capita income came up to 75 per cent of the Annex I countries' average in 1990. It was also

Trends in energy-related CO<sub>2</sub> emissions from OECD and transition economies (Annex I) and developing countries (million tons of CO<sub>2</sub>). (IEA)





## Air pollution and climate change

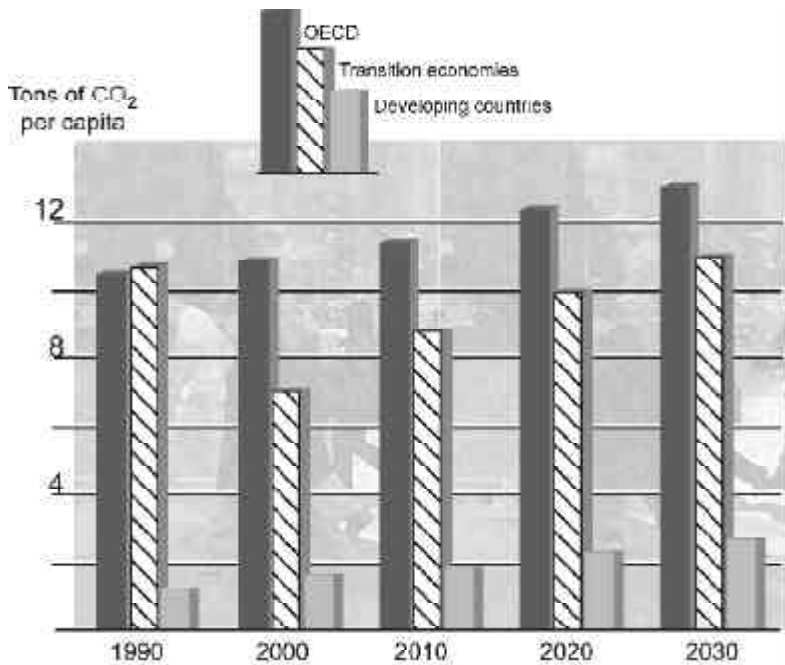
THERE IS A TENDENCY among researchers and policy makers to regard regional air pollution and climate change as separate areas for policy, whereas in fact they are closely tied in with each other, and so need to be dealt with in common. This turned out to be the evident conclusion of a workshop on “linkages and synergies of regional and global emission control” that was held in Vienna last January.

It not only noted, in a press release, links between atmospheric effects – such as that emissions of methane can contribute both to global warming and the formation of ground-level ozone – but also laid bare a strong link between the sources of emissions, pointing out energy production and transportation as being responsible for most of the emissions of carbon dioxide as well as much of the other air pollution. There would therefore be a twofold benefit from cutting down energy consumption and car use.

The cost of reaching the air pollution objectives for 2010 in the Gothenburg Protocol could, according to an estimate of the Centre for Integrated Assessment Modelling under the Convention on Long-range Transboundary Air Pollution (CLRTAP), be reduced by at least 5 billion euros if the European countries fulfilled their commitments by cutting emissions of carbon dioxide as agreed under the Kyoto protocol. Similar results have been found for China and Mexico.

It was also emphasized that a more systematic study was needed of the measures that were likely to yield a double gain, and that there should be closer cooperation between the LRTAP Convention and the researchers of IPCC, the Intergovernmental Panel on Climate Change.

For further information, turn to IIASA, the International Institute for Integrated Assessment Modelling. Internet: [www.iiasa.ac.at/rains/meetings](http://www.iiasa.ac.at/rains/meetings)



Per capita emissions of energy-related CO<sub>2</sub> in OECD and transition economies and developing countries (tons of CO<sub>2</sub>). (IEA)

assumed in that study that the Annex I countries would share out the reductions in accordance with each one's per-capita contribution to global warming – as in a Brazilian proposal, which also takes the historical emissions of greenhouse gases into account. See AN 2/02.

It appears from the IEA study that it would be impossible under that strategy to attain the desired stabilization of the carbon-dioxide concentration at 450 ppm as soon as 2020 or so even if the Annex I countries should achieve zero emissions. The reason is that with the proposed economic thresholds, the big developing countries such as India and China would have no obligation to take action before 2050.

The conclusion of the IEA study is that for any solution of the climate problem that will be sustainable in the long run, many more of the world's countries will have to undertake to cut their emissions of greenhouse gases already during the next period of the protocol, beginning 2012. “It is necessary,” says the IEA, “to find ways of bringing all countries back to the negotiating table.”

A main obstacle will be how get around many governments' fear of binding their countries to outlays that cannot be calculated in advance, especially as they cannot know, either, what they will get for their money (since it is uncertain how cost-effective the measures will be). A main aim of the IEA report is to describe

and analyze various models for such commitments. In the opinion of the agency, “the Kyoto Protocol's combination of a cap on emissions and tradable permits allows an acceptable allocation of effort without losing economic efficiency.”

Such a framework could however be even more acceptable, it says, to a wider assembly of countries if the nature of the targets were changed. One model that the IEA seems to cautiously favour in its report is a combination of dynamic aims with a price ceiling. As an example of a dynamic aim it gives an emissions limit set in relation to economic growth on the lines of the new US climate policy. A price ceiling would ensure it from becoming too costly to attain the emission target. If the marginal cost per ton of reduced pollutant should rise above a predetermined level, the country would be freed from any obligation to proceed with further steps.

Apart from all else, the IEA report is primarily a call for action, stating in conclusion that “... no option can be a substitute for political will. While concerns about uncertain costs are legitimate – and can be dealt with – all countries must engage if the world is to stop climate change from rising beyond acceptable levels.”

ROGER OLSSON

<sup>1</sup> *Beyond Kyoto. Energy Dynamics and Climate Stabilisation.* OECD/IEA 2002. Available from IEA Books, 9, Rue de la Fédération, 75739 Paris Cedex 15, France. Internet: [www.iea.org/books](http://www.iea.org/books)

## Savings from better appliances

IF STANDARDS for minimum efficiency for residential electrical appliances were introduced at the latest by 2005, there would, according to the International Energy Agency,<sup>1</sup> be a falloff of 642 TWh a year in the demand for electricity in the twenty-six IEA member countries, compared with the likely result of policies that are now in effect there. This is equal to a reduction of 322 million tons a year in the emissions of carbon dioxide – or as much as from 100 million cars. And there would be an overall saving to society as well.

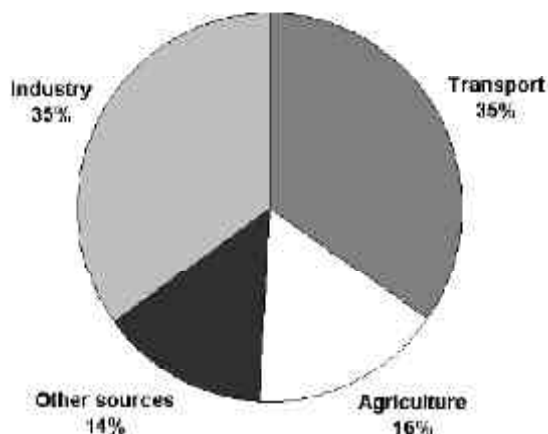
The extra costs of more efficient appliances would be offset by the savings in running costs over their lifetime. Each ton of carbon dioxide so avoided would save consumers in the United States \$65 in 2020. In Europe the saving would be even more – 169 euros, in consequence of the higher electricity costs there, as well as the present lower efficiency standards.

Appliances left continuously on stand-by were found to offer the greatest potential for savings, followed by lighting. But there are also great possibilities in respect of dryers, TVs, space and water heating.

The various member countries' policies concerning appliance efficiency are also compared in the IEA report. Its conclusion is that the most effective approach would be a combination of standards for minimum energy performance together with proper labelling, as well as an "active and effective institutional framework" and voluntary measures. Also urged is greater international cooperation in the development of standards, test procedures, and labelling.

<sup>1</sup> The International Energy Agency is an autonomous body within the framework of the OECD. Of the thirty OECD member countries, twenty-six are members of the IEA. The results presented above comes from the report **Cool Appliances – Policy Strategies for Energy-Efficient Homes**. 231 pp. 75 euros. Can be ordered from IEA Books, 9, rue de la Fédération 75739 Paris Cedex 15, France. Internet: [www.iea.org/books](http://www.iea.org/books).

Estimated emissions of PM<sub>10</sub> from different sectors in the Netherlands in 1995. Total emissions were 60.9 ktons.



PARTICLES

## Difficulties in meeting coming EU standards

THE MOST COST-EFFECTIVE way of reducing the emissions of primary particles in the Netherlands would, according to RIVM, the National Institute for Public Health and the Environment, be to attack emissions from inland and seagoing shipping.<sup>1</sup>

The institute refers to an estimate based on epidemiological studies from which it appears that 1700 to 3000 people die prematurely every year in the Netherlands as a result of short periods of exposure to particles (the acute effect). If the long-term effects were also taken into account, the death figure might rise to as much as 10,000-15,000 a year.

Although the emissions of PM<sub>10</sub> have come down markedly in the Netherlands since 1980, and a further reduction of 20 per cent is expected for 2010, the effects on health are expected to rise, since especially liable groups – the aged and asthmatics – constitute an increasing proportion of the population.

The RIVM thinks it probable that the Netherlands will be able to meet the EU air-quality standards for PM<sub>10</sub>, 40 µg/m<sup>3</sup> yearly average on the whole by 2005, although the figure may be exceeded locally. But it is hardly likely to get down to the 24-hour average of 50 µg/m<sup>3</sup>, exceeded no more than 35 times a year, by that date. Nor does it think it will manage, even by taking the strongest measures, to attain the indicative levels for 2010.

In its report, the RIVM therefore includes a number of recommendations concerning the coming review of the EU standards for 2010.

One reason for the Dutch difficulties in meeting the standards is that a great proportion of the local concentrations stems from other countries' emissions as well as from natural sources, of which salt from the sea is one. A series of measures that would cut down the Dutch emissions of primary particles by 60 per cent more than has already been decided for 2010 would only reduce the concentrations of PM<sub>10</sub> by 1.1 µg/m<sup>3</sup>.

But there is another – and much less expensive – scenario for reducing emissions by a quarter more than already decided by 2010. That would entail concentrating all measures for the transport sector to shipping (inland as well as maritime in Dutch ports) because the abatement cost here is very low. Unless something is done, ships' part of the transport sector's emissions of PM<sub>10</sub> will have risen from 20 per cent in 1998 to 40 per cent in 2010, since most of the other mobile sources are already, or will be, subject to stricter requirements.

PER ELVINGSON

<sup>1</sup> **On health risks of ambient PM in the Netherlands. Executive summary.** Available from RIVM, P.O. Box 1, 3720 BA Bilthoven, The Netherlands. Internet: [www.rivm.nl](http://www.rivm.nl).

# Recent publications

## **Air quality in Europe: State and Trends 1990–99 (2002)**

An overview and evaluation of the air quality in Europe in 1999 and its development in the preceding decade. Covers the whole European area, including the 18 EEA member countries as well as thirteen countries in central and eastern Europe. Takes account of the effects of air pollutants on human health, ecosystems and materials.

82 pp. Topic report No. 4. Published by European Environment Agency, Kongens Nytorv 6, 1050 Copenhagen K, Denmark. E-mail: eea@eea.eu.int. Available in pdf format at [http://reports.eea.eu.int/topic\\_report\\_2002\\_4](http://reports.eea.eu.int/topic_report_2002_4)

## **Renewable energy (2002)**

The International Energy Agency (IEA) has assembled a data base with extensive statistics on renewables and waste sources in the 30 OECD member countries.

The information is available both in printed and electronic form. The publication *Renewables Information 2002* can be had free of charge from the IEA Public Information Office, e-mail [info@iea.org](mailto:info@iea.org). The database can be accessed at <http://library.iea.org/renew/eng/ReportFolders/Rfview/explorerp.asp>.

There is also a fact sheet, *Renewables in Global Energy Supply*. Can be downloaded at [www.iea.org/leaflet.pdf](http://www.iea.org/leaflet.pdf).

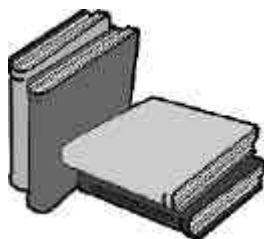
## **Manual for Environmental Calculation of International Freight Transport**

The Danish EPA has caused a computer model to be developed, called OMIT, which makes it possible to calculate the use of energy and air pollutant emissions for transportation in various forms to and from Denmark. Is described at and can be downloaded from [www.mst.dk/udgiv/publications/2002/87-7972-368-3/html/default\\_eng.htm](http://www.mst.dk/udgiv/publications/2002/87-7972-368-3/html/default_eng.htm)

## **Road Travel Demand: Meeting the Challenge (2002)**

Surface transportation congestion remains a vexing challenge for OECD metropolitan cities. Report on strategies, programs and services that have lately been implemented to reduce travel demand and improve traffic conditions, as well as on case studies and examples that demonstrate successful approaches to grappling with gridlock around the globe.

196 pp. Published by the OECD, 2, Rue André Pascal, 75775 Paris Cedex 16, France ([www.oecd.org/bookshop](http://www.oecd.org/bookshop))



## **Trends in the Transport Sector 1970–2001**

Presents up-to-date statistics on transport markets in Europe, together with charts highlighting the major trends. It analyses the transport situation both in western and eastern European countries.

68 pp. 21 euros. Published by the European Conference of Ministers of Transport (ECMT). Can be obtained from OECD TURPIN, PO. Box 22, Blackhorse Road, Letchworth SG6 1YT, UK. E-mail: [books@turpinltd.com](mailto:books@turpinltd.com)

## **Managing the Fundament Drivers of Transport Demand (2003)**

Proceedings of the International Seminar organized by ECMT in December 2002. Gives a review of the key determinants of transport demand, and the available measures for influencing these key factors.

140 pp. 35.00 euros. Available from OECD, address as above.

## **Newsletter: Bankwatch Mail**

The CEE Bankwatch Network is an international network of NGOs with members in twelve countries of central and eastern Europe which monitors the activities of international financial institutions. Here it examines the effects of loans and other form of aid to the region.

Requests for subscriptions to the newsletter should be addressed CEE Bankwatch Network, Kratka 26, Prague 10, 10000, Czech Republic. Also available at [www.bankwatch.org](http://www.bankwatch.org)

## **Burden sharing in the context of global climate change. A North-South perspective (2002)**

Report from the National Environmental Research Institute in Denmark examining the ways in which responsibility for reducing the emissions of greenhouse gases could be shared among the world's nations. Among the matters also considered are the costs of damage from climate change and adaptation to it.

NERI Technical Report No. 424, 2002. Available at [www.dmu.dk/1\\_viden/2\\_publicationer/3\\_fagrappporter/rappporter/FR424.pdf](http://www.dmu.dk/1_viden/2_publicationer/3_fagrappporter/rappporter/FR424.pdf)

## **A warmer world (2003)**

A popular presentation of the climate change problem, based to a large extent on an assessment of current understanding in this field, undertaken by IPCC, the Intergovernmental Panel on Climate Change. Presents, in addition, new projections of what could happen to the climate of Sweden and Europe over the next hundred years.

168 pp. 255 kronor. Can be ordered from the Environmental Protection Agency, 106 48 Stockholm, Sweden. E-mail: [natur@cm.se](mailto:natur@cm.se)

## **Database on Economic Instruments**

The OECD and the European Environment Agency have developed a database, covering 43 countries, with the intention of helping governments to choose a mix of economic instruments and voluntary approaches for protection of the environment. Available at [www.eea.eu.int/products](http://www.eea.eu.int/products).

## **Buying into the Environment: Experiences, Opportunities and Potential for Eco-Procurement (2003)**

Eighteen per cent of EU commitment under the Kyoto Protocol could be achieved if major cities in the union purchased green electricity, according to calculations in this book, in which the obstacles to environment-oriented public procurement as well as its possibilities are examined.

285pp. £35.00. ISBN 1 874719 67 5. Can be ordered from Greenleaf Publishing, Aizlewood Business Centre, Aizlewood's Mill, Sheffield S3 8GG, UK. Internet: [www.greenleaf-publishing.com](http://www.greenleaf-publishing.com)

## **Trans-European Transport Networks: Options for a sustainable future (2003)**

Survey of the work being done by the EU with the trans-European transport networks (TEN-T). Includes proposals for changes in the guidelines which are now under revision. Considers the coming extension to eastern Europe and what that will imply for TEN-T in developing a sustainable transportation system.

Published by European Federation for Transport and Environment (T&E), WWF-EPO, BirdLife International, and CEE Bankwatch. Can be ordered from T&E, Bd. de Waterloo 34, B-1000, Brussels, Belgium. Also available in pdf format at [www.t-e.nu](http://www.t-e.nu)

# “Reduce the emissions of CO<sub>2</sub> by 60 per cent”

Joint move by the two countries’ prime ministers to vitalize EU climate policy.

IN A MANIFESTO published in the Swedish daily *Dagens Nyheter* on February 25, the British and Swedish prime ministers urge action by the EU to ensure that by 2050 emissions of carbon dioxide will have come down by 60 per cent. This comes in the form of letters to the Greek presidency and the EU Commission in which the writers commit their countries to taking the necessary steps to attain the target and call for clear decisions on the part of the EU to promote clean and cost-efficient technologies, more environmentally friendly transportation, and alternative energy sources. They see such measures as important moves towards a modern, competitive Europe.

“We consider the time to be ripe for more pointedly making use of the climate-friendly techniques that already exist or are under development, with a focus especially on increased energy efficiency and a technology not based on coal,” was part of the content of their manifesto.

More specifically, they propose that the proportion of renewables in the energy mix should be 12 per cent by 2010, that energy efficiency must be improved, environmentally compatible technologies promoted, and that an EU system for classifying environment-friendly cars and trucks be developed before 2005.

They also want to see subsidies with adverse effects on the environment phased out, and especially those for fossil fuels, as well as an effective EU system for the taxation of energy.

In a speech, Blair has pointed to the great potential for technical development lying in conversion to a “truly low-carbon economy.” It’s a myth, he said, that reducing emissions will make us poorer – noting that the UK economy had grown by 17 per cent since 1997, when Labour came into power, at the same time as emissions had gone down by 5 per cent.

His attitude, that there can be a gain to the economy in reducing emissions, is in strong contrast to that of the US administration, which has given fear of recession as a reason for backing out of the Kyoto protocol.

Seeing climate change as a serious threat that will have to be dealt with by agreement within an international community, Blair gave assurance that his government would continue to press the matter with the United States. It is, he said, as great a threat in the long term as weapons of mass destruction are in the short.

The speech is on [www.number-10.gov.uk/output/Page3073.asp](http://www.number-10.gov.uk/output/Page3073.asp)

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## Coming events

For the latest news and direct links, please visit [www.acidrain.org](http://www.acidrain.org) (choose “Coming events” in the lefthand column).

**EU Environment Council.** June 13.

**Transport and Air Pollution. 12th International Scientific Symposium.** Avignon, France. June 16-18, 2003. *Information:* Sylvie Méreaud, [mereaud@inrets.fr](mailto:mereaud@inrets.fr)

**ISES Solar World Congress 2003 – Solar Energy for a Sustainable Future.** Göteborg, Sweden. June 14-19, 2003. *Information:* [www.congrex.com/ises2003](http://www.congrex.com/ises2003).

**Meeting Kyoto Targets in the EU – Challenges for the Power Sector.** Brussels, Belgium. June 25-26, 2003. Organized by the WWF European Policy Office. *Information:* [climate@wwfepo.org](mailto:climate@wwfepo.org)

**7th International Conference on Energy for a Clean Environment.** Lisbon, Portugal. July 7-10, 2003. *Information:* Maria Fernanda Afonso, Instituto Superior Técnico, Mechanical Engineering Department, Av. Rovisco Pais, 1049-001 Lisbon, Portugal. E-mail: [cleanair@esoterica.pt](mailto:cleanair@esoterica.pt)

**CLRTAP Working Group on Strategies and Review.** Geneva, Switzerland. September 15-19. Internet: [www.unece.org/env/lrtap/](http://www.unece.org/env/lrtap/)

**Air Pollution 2003 – 11th International Conference on Modelling, Monitoring and Management of Air Pollution.** Catania, Italy. September 17-19. *Information:* [www.wessex.ac.uk/conferences/2003](http://www.wessex.ac.uk/conferences/2003)

**Clean Air For Europe (CAFE) Steering Group Meeting.** Brussels, Belgium. September 29-30. Internet: [www.europa.eu.int/comm/environment/air/cafe\\_steering\\_group.htm](http://www.europa.eu.int/comm/environment/air/cafe_steering_group.htm)

**Air quality – assessment and policy at local, regional and global scales.** IUAPPA 14th International Conference. Dubrovnik, Croatia. October 6-10, 2003. *Information:* [www.imi.hr/cappa2003.html](http://www.imi.hr/cappa2003.html)

**UN Framework Convention on Climate Change, 9th Conference of the Parties (COP9).** Italy, December 1-12, 2003.

**Executive Body for the LRTAP Convention.** Geneva, Switzerland. December 9-12. Internet: [www.unece.org/env/lrtap/](http://www.unece.org/env/lrtap/)