NO. 3, SEPTEMBER 2007

Acid News

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Flattening trend in pollutant emissions

Air pollutant emissions from land-based sources in Europe are continuing to fall, but considerably slower than in the 1990s. Some of the reductions on land are also countered by rising emissions from international shipping.

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Multiple benefits of low-CO_2 policies

A new study[1] shows that reductions in carbon dioxide emissions in the EU of more than 30 per cent are feasible by 2020, and that much larger reductions are possible in the longer term. Additional benefits of the low-carbon option include lowered emissions of common air pollutants, and a reduction in the import of fuels into the EU, with an accompanying improvement in the security of energy supplies.

Energy scenarios for the twenty-five EU countries were produced showing that total carbon dioxide (CO_2) emissions from fossil fuel combustion can be reduced by at least 30 per cent for the EU as a whole by 2020 as compared to 1990. The scenarios assume the introduction of addition abatement measures for CO_2 from 2008. Decisions on which measures to introduce were based on technical feasibility, cost-effectiveness and speed of introduction.

Energy use is the major cause of emissions of the main greenhouse gas, CO_2, as well as a range of air pollutants that

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Acid News

A newsletter from the Swedish NGO Secretariat on Acid Rain, the primary aim of which is to provide information on air pollution and its effects on health and the environment.

Anyone interested in these matters 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 available free of charge.

In order to fullfill the purpose of AcidNews, 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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Published by The Swedish Society for Nature Conservation.
Language consultant: Malcolm Berry, Seven G Translations, UK.
Printed by Trio Tryck AB, Örebro, Sweden.
ISSN 0281-5087.

The Swedish NGO Secretariat on Acid Rain

The Secretariat has a board consisting of 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:

- Keeps up observation of political trends and scientific developments.
- Acts as an information centre, primarily for European environmentalist organizations, but also for the media, authorities, and researchers.
- Produces information material.
- Supports environmentalist bodies in other countries in their work towards common ends.
- Participates in the lobbying and campaigning activities of European environmentalist organizations concerning European policy relating to air quality and climate change, as well as in meetings of the Convention on Long-range Transboundary Air Pollution and the UN Framework Convention on Climate Change.

Cost-effective to cut emissions from ships

Since 11 August ships in the North Sea and English Channel have been required to use fuel with a sulphur content of no more than 1.5 per cent. The same limit has applied for more than one year to ships plying the Baltic Sea.

This first step to lower marine fuel sulphur content stems from both EU legislation and from standards adopted under MARPOL Annex VI of the International Maritime Organisation (IMO). Outside of these two designated Sulphur Emission Control Areas (SECAs), the maximum allowed sulphur content of marine fuel is as high as 4.5 per cent.

By comparison, the EU standard for road vehicle fuels currently allows a maximum of 50 parts per million (ppm) of sulphur, to be lowered to 10 ppm as from 2009. In the US, the maximum sulphur content of road diesel fuel is 15 ppm. So compared to trucks, ships are allowed to burn fuel with up to 4,500 times more sulphur (up to 1,500 times more for ships in SECAs).

Not surprisingly, several studies have shown that enforcing emission controls for shipping is a very cost-effective way to cut air pollution. A recent Dutch study[1] has now confirmed that this is also the case for the Netherlands. Shipping traffic in the North Sea currently contributes twenty per cent of acid deposition, ten per cent of nitrogen oxide levels, and four per cent of PM_{10} levels, as average figures for the whole country.

The Dutch report concludes that air pollutants emitted from marine diesel engines reach far inland, contaminating the air over nearly the entire country. Moreover, shipping's relative contribution to air pollution is likely to grow steadily over the next 10–15 years as land-based emissions fall and shipping traffic continues to expand.

As shown in the article on p. 18, this situation is not in any way unique to the Netherlands – it is true for many European countries. In some countries, ship emissions already make up approximately one fifth or more of the total deposition of both sulphur and oxidized nitrogen compounds.

Surprisingly, neither the EU member countries nor the shipping industry seem to have realized yet that up-to-date environmental standards will be essential for the industry's future competitiveness and development. Ships can make no claim to environmental respectability as long as they go on polluting the air with such high emissions of sulphur and NO_x.

Emission abatement measures could significantly reduce pollution from ships. But developments under IMO so far can best be described as "too little, too late". In spite of twenty years of talks, very little has been delivered.

To lower emissions within a reasonable time, as well as bringing much-needed pressure to bear on the global negotiating machinery, moves will have to be made both at national and EU level. Initiatives must be taken to strengthen legally binding EU rules to set minimum emission standards. And to bring about sufficiently large reductions more quickly, economic instruments, such as emission charges, will be needed to supplement those rules.

If the environmental targets agreed within the EU are to be attained, the emissions of sulphur and NO_x from European shipping will have to be brought down by at least 80–90 per cent.

Several studies, including the Commission's analyses for the NEC directive, have clearly demonstrated that reducing ship emissions would be cost-effective in itself, as well as economically profitable for society.

Christer Ågren

[1] **Effectiveness of international emission control measures for North Sea shipping on Dutch air Quality**. MNP Report 5000920004/2007.

No agreement on ship emission controls

MEPC meeting in July decided to initiate a study to help evaluate options to reduce emissions.

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Finding global solutions to reduce emissions of air pollutants from shipping is yet again proving to be a very slow process under the leadership of the International Maritime Organization (IMO).

Two years ago, the IMO decided to review existing agreements and create tougher international standards for air pollution from international shipping. The revision was to be finalized and adopted before the end of 2007.

Instead, the IMO is now considering a new schedule that will not produce a final decision on any new limits until 2008 at the earliest – in fact, even further delay is possible.

At a meeting in London in July, the IMO's main environment policy decision-making body, the Marine Environment Protection Committee (MEPC), decided to initiate a study to help evaluate options to reduce emissions (AN 2/07).

The study will focus specifically on the effects of the proposed fuel options to reduce emissions of sulphur dioxide (SO_2) and particulate matter (PM). It should also address possible consequential effects, such as impacts on emissions of carbon dioxide (CO_2).

The study is to be finalized by December, and a report should provide input to the next MEPC meeting, which is scheduled for March 2008.

Other air pollution issues, such as strategies for reducing emissions of nitrogen oxides (NOx), will continue to be discussed by the Working Group on Air Pollution under the Bulk Liquids and Gases (BLG) Sub-Committee.

The working group is scheduled to meet once more this year – in Berlin from 29 October to 2 November – to finalize its recommendations in time for the next MEPC meeting.

Action by IMO to reduce emissions of greenhouse gases from shipping appears to be even slower than that aimed at air pollution. A group of experts was established this summer to discuss and compile possible measures to reduce greenhouse gas emissions from ships, and is due to present a report by early next year.

Moreover, the MEPC agreed to update an earlier IMO study on greenhouse gas emissions from ships. The updated study should ready by 2009, if possible, but at the latest in 2010.

Christer Ågren

MARPOL Convention

Originally signed in 1997, Annex VI to the International Convention on the Prevention of Pollution from Ships (MARPOL) came into force on 19 May 2005.

Annex VI sets limits on the sulphur content of marine heavy fuel oils (with a global cap of 4.5 per cent) and on the emissions of NOx from new ship engines. These standards are however so weak as to be hardly likely to have any appreciable effect.

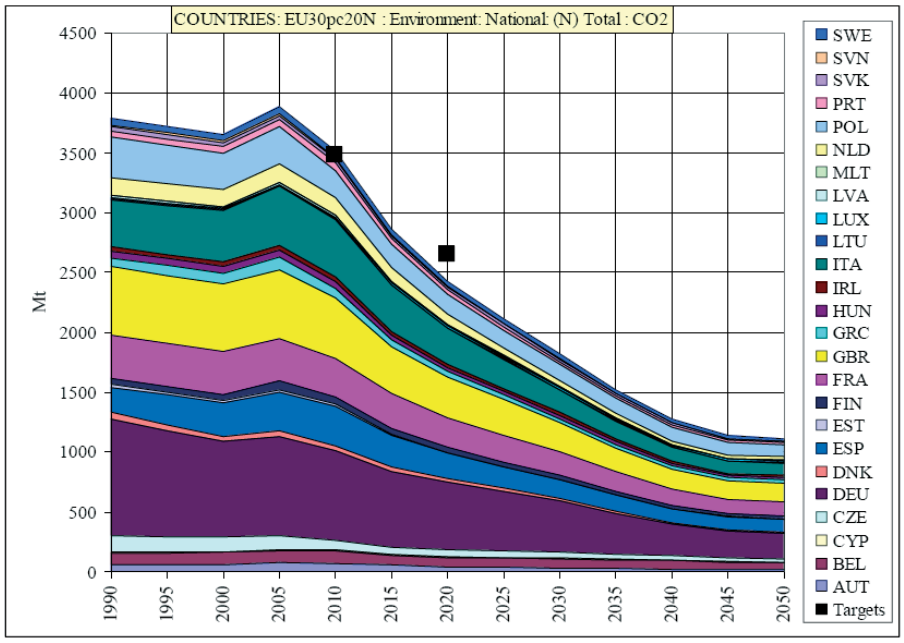
However, it also sets a limit of 1.5 per cent sulphur for fuel oil used by ships sailing in Sulphur Emission Control Areas (SECAs), which should lead to reductions in the two designated areas, the Baltic Sea and the North Sea.

At its first meeting after the entry into force of Annex VI, in July 2005, the IMO's Marine Environment Protection Committee (MEPC) agreed to review and strengthen the Annex.

The review should be completed by 2007, and in order to result in real reductions in ship emissions it needs to include, among other things, stricter emission limits for NOx and sulphur, for new as well as existing ship engines.

Multiple benefits of low-CO_2 policies

damage human health and ecosystems. Energy scenarios are therefore a key input for projections of pollutant emissions and for formulating policies and strategies to reduce pollution and achieve environmental objectives. At the outset of this study in the summer of 2006, a 30-per-cent reduction in CO_2 emissions from the EU by 2020 seemed very ambitious in comparison with political intent. In early 2007, however, EU leaders agreed targets to reduce greenhouse gas emissions by 20–30 per cent and to supply 20 per cent of demand from renewable energy sources by 2020.



Emissions of carbon dioxide for EU25 in the main low-carbon scenario investigated (million tonnes). The black squares show the Kyoto target for 2010 and the 30-per-cent target for 2020.

The main focus of this study is on the energy scenarios used to revise the 2001 EU directive on National Emission Ceilings (NECs). Here, energy scenarios contribute to integrated assessment modelling[2] and cost-effectiveness analysis. (The NEC directive was originally scheduled for review and revision by 2004, but the process has suffered significant delay and a proposal from the Commission is now expected by early 2008 – see article on p. 8).

Alternative energy strategies, including behavioural change, demand management, energy efficiency, and low-carbon fuels are explored in the report. In addition to abating greenhouse-gas emissions, these strategies can facilitate cheaper and greater abatement of other atmospheric pollutants as compared to higher carbon scenarios. This interaction between strategies to limit global warming and strategies for achieving other environmental objectives, such as reduced acidification and improved air quality, has high policy relevance.

As the marginal costs of applying end-of-pipe (EOP) emission control technologies have risen and concern about global warming has grown, there has been a greater emphasis on developing integrated policies that address the multiple environment problems of global warming and air pollution. This is particularly important because measures to control greenhouse gases generally also reduce air pollutants, so stringent targets for both can be achieved at a lower total cost than addressing each separately.

Non-end-of-pipe (NEOP) solutions, with the exception of switching between fossil fuels, reduce dependence on fossil fuels and improve security of supply. The depletion of European gas and oil fields raises concerns over energy supply security because of the need to import, and causes pressure to increase the use of indigenous fuels with environmental disadvantages, such as coal.

Non-end-of-pipe options include:

- Behavioural change (e.g. smaller cars, lower speeds).
- Demand management (e.g. building insulation, low energy appliances).
- Fuel switching (from coal and oil to gas and renewables).
- Improved energy conversion (e.g. condensing boilers, combined heat and power).

Percentage reductions in air pollutant emissions and emission control costs for the EU25 resulting from moving from a "business-as-usual" energy scenario to the main low-carbon energy scenario (-30% CO_2 1990-2020).

Pollutant	Emission reduction	Reduced control costs
NOx	20%	6%
SO_2	16%	23%
VOCs	4%	4%
PM	7%	17%
Total	-	11%

For this report a model called SEEScen (Society, Energy and Environment Scenario) was used to develop energy scenarios that have a greater and more detailed implementation of NEOP measures than other energy scenarios used by the European Commission. The new scenarios are then input into the GAINS model, and certain environmental and economic consequences assessed.

The Figure above shows the carbon emissions for the EU25 countries in the main scenario analyzed. The black squares show the Kyoto target for 2010 (but note that this does not just apply to CO_2) and the 30-per-cent target for 2020.

In this scenario, the EU fails to meet the Kyoto target in 2010, but then emissions fall steeply such that the 30-per-cent target in 2020 is met with good margin – the reduction achieved is actually 36 per cent. One notable feature is that EU25 carbon emissions are still falling steeply after 2020; this is because the measures take time to fully affect the stock of technologies. This means that the scenarios are quite robust.

Apart from the main scenario, a series of five variant scenarios in which NEOP

measures are implemented to differing degrees, were explored. These show that emissions are still declining after 2020, which underlines the importance of the early introduction of measures.

The variant scenarios also show that reductions significantly larger than 30 per cent are possible. It is possible to eliminate CO_2 emissions altogether, but this would not necessarily be desirable on social, economic or even environmental grounds. Investigation of various scenarios also illustrates that technological development may radically change our current view of the near future – for example the development of cheap solar cells and electricity storage could radically transform energy and environment policy.

Running the main new scenario through the GAINS model, and comparing the outcome with that of a traditional "business-as-usual" energy scenario, showed 30 per cent less CO_2 emissions in 2020.

Moreover, the new scenario results in 20 per cent lower SO_2 and NOx emissions, and about five per cent lower PM emissions, as well as accompanying reductions in EOP emission control costs (see Table).

The report demonstrates that in addition to abating greenhouse gas emissions, non-end-of-pipe options generally decrease the emissions of air pollutants such as sulphur dioxide, nitrogen oxides and fine particles, because fossil fuel combustion is reduced.

Consequently, implementing NEOP solutions facilitate greater emission abatement than is possible with end-of-pipe measures alone, and the total combined cost of meeting greenhouse gases and air pollutant targets is generally less than in scenarios which do not include the extensive use of non-end-of-pipe measures.

Christer Ågren

[1] **Low carbon energy scenarios for the European Union.** September 2007. 100 pp. By Mark Barrett, University College London (UCL). Published by the Swedish Environmental Protection Agency. Available (soon) at www.internat.naturvardsverket.se/

[2] So far, two main sets of energy scenarios have been used for the NEC analysis by the Commission. Firstly, EU-wide coordinated scenarios generated using the PRIMES model by the National Technical University of Athens (NTUA). Secondly, national energy scenarios produced by each EU member state. Output from the energy scenarios provides input to the GAINS model of the International Institute for Applied Systems Analysis (IIASA), which is used to calculate environmental impacts and find the optimal, least-cost selection of technical (so-called end-of-pipe) measures to meet agreed interim environmental targets.

Trading emission rights requires greater emission controls

The existing Swedish climate target is to be re-examined, in accordance with last year's budget proposal, in favour of an "allowance target", as this is regarded as the most effective socioeconomic method of achieving Sweden's climate target. The allowance target takes into account industry's allocated emission rights, but not traded emission rights.

A report from the National Institute of Economic Research shows, however, that although such an approach makes it easier to achieve the climate target, it will also lead to increases in emissions of sulphur dioxide and nitrogen oxides. These emissions would increase by 8 and 12 per cent, respectively, in comparison with the currently formulated climate policy target, based on projected economic growth. This would place greater pressure on environmental policy initiatives to improve air quality and to reduce acidification and eutrophication.

Source: **Nitrogen and Sulphur Outcomes of a Carbon Emissions Target Excluding Traded Allowances – An Input-Output Analysis of the Swedish Case**. Working Paper No. 101. Available at www.konj.se.

Parliament weak on air quality

Several amendments aimed at relaxing key elements of the EU directive on air quality were retabled by the European Parliament's rapporteur, Holger Krahmer, when the proposal was put before the environment committee for its second reading.

Surprisingly and uncharacteristically, the Parliament's first reading last year resulted in an environmentally weaker position than that taken by the Council (see AN 3/06).

For example, the Parliament wanted to allow member states to postpone compliance with air pollution limits for PM_{10} for up to nine years (i.e. until 2014, while the Commission proposed 2009 and the Council 2011). In an attempt at compromise, the rapporteur is now prepared to reduce the allowed time extensions by one year, to 2013.

The rapporteur also wants to reintroduce requests to weaken proposed new $PM_{2.5}$ exposure reduction targets, and to broaden the range of places where limit values do not apply.

On the other hand, he wants to tighten the limit value for $PM_{2.5}$ from 25 $\mu g/m^3$ (suggested by the Council and the Commission) to 20 $\mu g/m^3$. It should be noted, however, that the value of 20 $\mu g/m^3$ is still twice as high as that recommended by the WHO.

At a debate by the environment committee on 11 September, several MEPs made reference to the new greenhouse gas emission reduction targets for the EU. It is clear that climate policies will have a positive effect on air pollution – the air quality objectives can be met more easily and at much lower cost than previously expected.

The environment committee will vote on this report on 9 October, and a vote in plenary session is likely to take place in December.

Christer Ågren

Dispute over costs for cleaner shipping fuel

The investments required to produce an additional 50 million tonnes of low-sulphur distillate shipping fuel in Europe could be just one third of the estimates given by the oil industry.

Commissioned by the Netherlands Ministry of Transport, the Energy Research Centre (ECN) has studied the economic impact on the Netherlands that would result from a fuel switch in international shipping, from the current high-sulphur residual fuels to low-sulphur distillate fuel.

Such a fuel shift was proposed last October by the International Association of Independent Tanker Owners (Intertanko) to the International Maritime Organization (IMO). The proposal involves a switch by 2012 from the currently used residual fuel to distillate fuel with a sulphur content of one per cent, to be lowered to 0.5 per cent by 2015 (see AN 4/06, pp 5–7).

Worldwide, international shipping is estimated to use approximately 200 million tonnes of residual fuel per year, and the current global average sulphur content of this type of fuel is about 2.7 per cent.

Each year the Dutch refinery industry produces about eight million tonnes of refinery residues, the main component of the shipping fuel that is used now. Because domestic industry and power plants no longer burn heavy fuel oil, Dutch refineries have no domestic market in which to sell residual heavy fuel oil, which is why they mainly concentrate on the market for shipping fuel.

It is technically possible to convert all residues into lighter products, although this process will require additional energy use, which in turn will result in higher emissions of carbon dioxide (CO_2) from the refineries.

In the case of the Netherlands, replacing eight million tonnes of residual fuel with distillate fuel containing 0.5 per cent sulphur could – according to model calculations – mean additional energy use of about one million tonnes of crude oil and related CO_2 emissions of about 3.5 million tonnes.

Model calculations also indicate that desulphurization of the same amount of residual oil (a possible alternative to switching to distillate shipping fuel) would emit some 1.9 million tonnes of carbon dioxide.

Extrapolation of the calculations for the Netherlands to the European scale (i.e. conversion of 50 million tonnes of residual oil) indicates an extra 22 million tonnes of CO_2 emissions. This figure is significantly lower than the additional 35 million tonnes of CO_2 that would be emitted according to calculations by the European Petroleum Industry Association (Europia).

Last year, the European oil industry claimed that production of an additional 50 million tonnes of low-sulphur distillate in Europe would require an investment of 30 billion euro. Assuming that the estimates for the Netherlands

case – as calculated by the ECN – are applicable to the whole of Europe, the resulting investment requirement would be around nine billion euro, i.e. less than one third of the oil industry estimate.

According to the study, there will be substantial investment in additional refining capacity globally in the coming years, but it is highly unlikely that in the short term sufficient distillates can be produced to supply all sea-going vessels in addition to current sales.

It is also stated that the pace of implementing the Intertanko proposal could greatly affect pricing on the oil-market, the oil products market, and the market for sea transport, but that a gradual introduction over a period of about six years, preceded by a preparation phase for the refineries of approximately six years, could limit the negative effects.

Obviously there is great uncertainty regarding the costs and possible additional CO_2 emissions for switching from residual to distillate fuels and for fuel desulphurization. There are also strongly diverging views on the practicality and timing of the measures.

In an annex to the report, Intertanko argues that the total amount of additional distillate fuel production needed globally is less than 200 million tonnes. This is because the residual fuels are already blends between residuals and distillates – unfortunately there appears to be no consensus on the proportion of distillates that are currently being added.

Regardless of this mix, Intertanko estimates that – to satisfy the demand of the world shipping fleet for distillates – current global distillate production would only need to increase by 8–13 per cent. The lower figure is based on the assumption that the current share of distillates is 40 per cent, and the higher figure assumes a share of 10 per cent.

Regarding the increase in CO_2 emissions, Intertanko questions the figures produced by the oil industry and also points out that switching to distillates can reduce CO_2 emissions from shipping by at least four per cent.

Intertanko concludes that the three options available to cut ships' sulphur emissions (switching to distillates, desulphurization of residuals, and onboard flue-gas scrubbing) will all entail additional costs and will all need some transition time. But in their view the switch to low-sulphur distillates is the most practical, simplest and fastest solution.

As reported in the article on page 3, the IMO decided in July to designate an expert group to study the effects of the various options to reduce emissions of sulphur, including possible impacts on emissions of carbon dioxide.

Christer Ågren

Quick scan of the economic consequences of prohibiting residual fuels in shipping. July 2007. 76 pp. By the Energy Research Centre of the Netherlands. Report ECN-E--07-051. Can be downloaded from www.ecn.nl/docs/library/report/2007/e07051.pdf.

Technology for refining residual oil

Bunker or heavy fuel oil (HFO) consists largely of the residues that remain after distilling crude oil in refineries. Around eight million tonnes of residual oil is produced annually in the Netherlands, which could be reduced, primarily by subjecting all atmospheric residues to vacuum distillation. In the Netherlands, this would decrease residues to five million tonnes.

It is technically possible and economically feasible to convert the heavy and viscous residues that cannot be distilled further into lighter (distillate) products through deep conversion. This conversion can be achieved by either separating carbon in processes such as flexicoking, as done by Exxon Mobil, or by adding hydrogen, as done in Shell's HYCON process.

The remaining five million tonnes of residual fuel could be processed by building two or three flexicokers. (As an alternative to deep conversion, residual fuels can be gasified for power generation with gas turbines, and possibly combined with the production of hydrogen and/or heating.)

If no investments are made in processing capacity for residual oil, the industry's competitiveness will decline in the long term, particularly if there is a return to a situation with overcapacity and the margins for the refineries start diminishing again.

Shipping is Denmark's largest GHG emitter

Danish government research institute Danmarks Statistik has released a report which shows that the shipping sector has become the country's largest greenhouse gas producer. According to the report, global emissions from Danish-registered merchant and container ships account for 25 per cent of Danish companies' combined carbon dioxide emissions. The institute said in a statement that Denmark would not reach its 2012 Kyoto goals if shipping companies were included in overall emission figures. "CO_2 emissions from the Danish economy grew by 33 per cent in the period 1990 to 2005," the statement said. "The main reason for this development is shipping, which has become more and more significant to the economy. Ships' energy usage has more than trebled since 1990."

Source: **Car Lines** 2007-3.

US EPA sued over ship smokestack pollution

On 5 September Friends of the Earth, represented by lawyers from Earthjustice, sued the US Environmental Protection Agency (EPA) for failing to meet a deadline to regulate air pollution from large ships. EPA recently postponed indefinitely its commitment to set emissions standards for ship engines.

"The EPA promised to act months ago to rein in ship smokestack pollution, but instead they have delayed regulations. Port communities are fed up and suffering, that's why we went to court today," said Teri Shore of Friends of the Earth in San Francisco.

"In Los Angeles alone, the ships in port spew more pollution than the metro area's six million cars combined. Residents of nearby neighbourhoods have high rates of respiratory illness and the region's highest cancer risk," said Sarah Burt of Earthjustice.

The Clean Air Act requires EPA to establish regulations to reduce air pollution from non-automobile engines that significantly contribute to pollution in areas with poor air quality, and in response to a previous lawsuit by Friends of the Earth and Earthjustice, challenging the lack of agency action on pollution from large ocean-going vessels, EPA committed to regulate ocean-going vessel emissions by April 2007.

Further information: www.earthjustice.org/news/press/007/epa-sued-over-ship-smokestack-pollution.html

New scenarios for future emissions

New projections show that air quality in 2020 is still inadequate to protect health and the environment, but also that the potential for further cutting air pollutant emissions is significant, especially if agreed climate policies are implemented.

Two years ago, on 21 September 2005, the European Commission presented its proposal for improving air quality in the EU – the thematic strategy on air pollution. This strategy established interim environmental objectives for 2020, and thus also set the level of ambition regarding air quality in the EU until that year.

Complaints from industrial interests meant that the strategy had been delayed for several months, but even worse was that the Commission eventually decided to opt for an ambition level between the "low" and "medium" of the policy scenarios analyzed under the Clean Air For Europe (CAFE) programme (see AN 4/05, pp. 1–4). Earlier drafts aimed at a higher level of ambition, but were watered down under pressure from EU commissioners for industry, agriculture and domestic markets.

Regarding the emission abatement measures required to attain the interim objectives of the strategy, no specific proposals for new or revised EU legislation were presented with the strategy. The Commission did however announce its intention to review the national emission ceilings (NEC) directive (see Box), and in 2006 propose revised emission ceilings that would be based on the level of ambition set out in the strategy.

In order to provide technical assistance and expert advice to the Commission, a working group was formed to revise national emission ceilings and policy instruments (NECPI), made up of experts from member states, industry and environmental organisations, as well as other experts. The first NECPI meeting took place in November 2005, and this was followed by another six meetings, the latest one in June 2007.

The analysis underpinning the NEC directive is fairly complex and uses

computer models to identify the least-cost solution for the EU as a whole to meet environmental targets. In essence, the methodology is intended to attain agreed targets for the protection of health and the environment, and achieve the same minimum relative environmental improvements everywhere in the EU, while at the same time ensuring extraordinary improvements in the worst affected areas.

The aim of the general relative improvement is expressed in the form of a gap closure towards the long-term objective: zero exceedance. Gap closure means a stepwise gradual closing of the gap between the current environmental situation and the "ideal" situation, i.e. no exceeding of critical loads. The extraordinary improvements are achieved by adding absolute limits for exposure to pollutants to the gap-closure procedure.

A computer model for integrated assessment was used to carry out a joint optimization process to find the most cost-effective way for the EU as a whole to achieve its environmental aims. This enabled the Commission to propose differentiated national emission ceilings, which largely reflect the polluter-pays principle and should maximize the environmental benefits of emission reductions.

Policies and strategies for greenhouse gas reductions have a big impact on energy use and on air pollutant emissions. At present there is still a great deal of uncertainty as to how the member states will fulfil their commitments to reduce emissions of greenhouse gases. Their actions will greatly affect the extent to which fossil fuels will be used in the EU, and thus emissions of air pollutants. Consequently, various energy scenarios have been analyzed, illustrating the impacts of different assumptions regarding future use of fossil fuels within the EU.

For its latest analyses earlier this year, the Commission's consultant, IIASA, used two different sets of energy projections:

- The national energy projections scenario (NAT), which reflects the member states' current national expectations for future energy use and agricultural activities. These projections are not however compliant with the Kyoto protocol and certainly go against EU targets for 20 to 30-per-cent reductions in greenhouse gas emissions by 2020. For the EU27 as a whole they even imply an increase in CO_2 emissions as compared to the protocol base year (mostly 1990).
- The coherent energy scenario (COH), which was developed for the Commission using the PRIMES computer model, and is largely in line with the agreement reached by the European Union's Heads of State in March 2007 to reduce greenhouse gas emissions by at least 20 per cent by 2020 (from 1990) and increase the share of renewables to 20 per cent by 2020.

The baseline projections for air pollutant emissions under the NEC directive should in principle include the effects of full implementation of all existing national and EU-wide legislation and measures. For various reasons, however, the analysis by IIASA so far has ignored further measures that might be needed to meet the national emission ceilings in 2010. It also failed to consider measures that may be required to comply with EU air quality limit values for NO_2 and PM_{10}.

Based on these baseline projections, only about half of the member states will achieve their NOx emission ceilings by 2010, and some countries will also have problems achieving their ceilings for volatile organic compounds (VOCs) and ammonia (NH_3). Even by 2020 some member states are projected not to attain their 2010 NECs for NOx and NH_3, unless additional measures are taken. (See AN 2/07, pp. 6–7.)

The combination of lower energy use and fuel switching in the coherent energy scenario results in lowered emissions of air pollutants in the energy and transport sectors, especially for SO_2 and NOx, and thus to more member states achieving their ceilings.

Much has happened over the last couple of years, i.e. since the Commission adopted its thematic strategy on air pollution, including:

- Methodological changes in computer modelling;
- Improvements in emission data and forecasting;
- Two more countries are now members of the EU;
- Adoption of Euro 6 standards for passenger cars;
- Agreement on a new, tougher EU greenhouse gas policy.

In order to account for these, and other, developments, IIASA has updated its analysis of what measures will be needed to attain the interim 2020 environmental targets of the thematic strategy. For this purpose, a new benchmark baseline scenario was developed, which also includes some additional assumptions, namely that new Euro VI standards for heavy duty vehicles will be introduced as from 2013, and that the 2010 NECs will not be exceeded by any member state in 2020.

Starting from the benchmark scenario, the GAINS computer model optimization mode was used to identify the least-cost set of emission reduction measures to achieve the environmental targets of

The NEC directive

Directive 2001/81/EC on national emission ceilings (NECs) for certain atmospheric pollutants aims to gradually improve, through the stepwise reduction of air pollutant emissions, the protection of both human health and the environment throughout the EU. Interim environmental quality targets, to be attained by 2010, constitute the first step towards the achievement of the long-term objectives of not exceeding the so-called critical loads, and the effective protection of human health against health risks from air pollution, as laid down in the EU's environmental action programme.

By setting binding national emission ceilings for the four air pollutants that cause acidification, eutrophication, and the formation of ground-level ozone, namely sulphur dioxide (SO_2), nitrogen oxides (NOx), volatile organic compounds (VOCs), and ammonia (NH_3), the NEC directive is the key legislation for the achievement of these environmental objectives, as well as for attaining air quality standards for a number of pollutants, including SO_2, NO_2, fine particles (PM_{10} and $PM_{2.5}$), and ozone.

LIPPENDORF, GERMANY

the thematic strategy (see Table 1).

Using these assumptions, the resulting optimized emission reductions for SO_2 in the EU27 range from 79 per cent for the energy scenario without ambitious climate policies (NAT) to 93 per cent for the COH energy scenario, i.e. the one reflecting a 20-per-cent reduction in CO_2 emissions. Most, but not all, of this divergence is linked to the different baseline emission levels of the two energy scenarios. For the NAT, current legislation is estimated to lead to a 62-per-cent cut in SO_2 emissions by 2020. The cost-effectiveness analysis results in a further fall of up to 79 per cent. For the COH scenario, however, the baseline already suggests 92-per-cent lower emissions, mainly due to lower coal consumption, so essentially no further measures would be necessary to meet the environmental targets.

Regarding NOx, optimized emissions should be reduced by 60 per cent and 62 per cent respectively, under NAT and COH scenarios. In contrast, the significantly larger reductions in SO_2 emissions for the COH scenario relieve the pressure on NH_3 and – to a lesser extent – on $PM_{2.5}$ and VOC, compared to what would be required for the NAT scenario. For NH_3, the 31-per-cent reduction for the NAT scenario could be relaxed to a 24-per-cent cut in case of the COH scenario. The differences are smaller for $PM_{2.5}$ (from 53 to 56 per cent) and VOCs (49 instead of 52 per cent).

The scenario analysis also includes estimates of some health and environmental impacts expected to result from the projected levels of future emissions (see Table 2). For $PM_{2.5}$ the GAINS model estimates changes in the loss of statistical life expectancy that can be attributed to changes in anthropogenic emissions. It should be noted that these calculations only refer to impact on the population over 30 years of age, thus underestimating the total impact.

Using the pollution levels for the year 2000, it is estimated that $PM_{2.5}$ results in an average shortening of life expectancy in the EU of approximately eight months. In the benchmark baseline scenarios, this figure comes down to 4.3–5.1 months by 2020, and in the optimized scenarios to 3.8 months.

When it comes to the impact on health from ground-level ozone, the GAINS model estimates the number of premature deaths associated with ozone levels above a cut-off level of 35 parts per billion (ppb). The number of premature deaths estimated as above will gradually decrease up to 2020 as a result of decreased emissions of the ozone precursors NOx and VOCs.

The analysis of environmental impact includes ozone damage to vegetation, and acidification and eutrophication of various types of sensitive ecosystems.

For the year 2000, more than 20 per cent of the forest area in the EU, or approximately one quarter of a million square kilometres, received acid deposition above the critical loads. By 2020 this is calculated to drop to 5–9 per cent in the benchmark baseline scenarios, and to four per cent in the optimized scenarios.

Not surprisingly, there are great variations in the costs for the additional emission reduction measures beyond the current legislation that are required to meet the targets of the strategy. For the optimized coherent scenario, costs are estimated at 1.85 billion euro per year in 2020, while the national energy scenarios would result in additional costs of 10.5 billion euro per year (excluding costs for Euro VI in both cases).

For comparison, costs given in the thematic strategy on air pollution for an energy baseline with an eight-per-cent CO_2 reduction have been recalculated for the EU25 at 5.2 billion euro per year.

However, climate policies do not only influence the costs of additional meas-

Table 1: Emissions of air pollutants from land-based sources in EU27 under various scenarios (ktonnes).

		National energy scenario		Coherent energy scenario	
		2020	Change	2020	Change
Sulphur dioxide	2000	10,322		10,322	
	Baseline	4,074	-61%	2,424	-77%
	Benchmark	3,955	-62%	2,423	-77%
	Optimized	2,194	-79%	2,065	-80%
	MRR	2,023	-80%	1,252	-88%
Nitrogen oxides	2000	12,322		12,322	
	Baseline	7,011	-43%	5,891	-52%
	Benchmark	6,578	-47%	5,445	-56%
	Optimized	4,909	-60%	4,666	-62%
	MRR	4,579	-63%	3,889	-68%
Ammonia	2000	3,975		3,975	
	Baseline	3,594	-10%	3,624	-9%
	Benchmark	3,562	-10%	3,585	-10%
	Optimized	2,746	-31%	3,020	-24%
	MRR	2,488	-37%	2,494	-37%
Volatile Organic Compounds	2000	11,007		11,007	
	Baseline	6,321	-43%	6,261	-43%
	Benchmark	6,060	-45%	6,061	-45%
	Optimized	5,250	-52%	5,667	-49%
	MRR	4,172	-62%	3,778	-66%
PM2.5	2000	1,782		1,782	
	Baseline	1,171	-36%	1,027	-42%
	Benchmark	1,149	-36%	1,010	-43%
	Optimized	780	-56%	844	-53%
	MRR	593	-67%	520	-71%

Baseline = Baseline scenario assuming full implementation of existing air quality legislation.
Benchmark = Baseline scenario including implementation of Euro VI for heavy-duty vehicles.
Optimized = New optimized scenario achieving the environmental targets of the thematic strategy.
MRR = Maximum reductions in the RAINS model, i.e. only so-called end-of-pipe technical measures.

Table 2: Summary of air pollution effects in EU27 under various scenarios.

	Human health		Natural environment	
	Premature deaths due to $PM_{2.5}$	Monetized health damage (billion euro/yr)	Acidification: Unprotected forest area (km^2)	Eutrophication: Unprotected ecosystem area (km^2)
Year 2000	350,000	280-790	259,000	1,020,000
Benchmark NAT 2020	272,000	191-609	119,000	896,000
Benchmark COH 2020	230,000	162-516	70,000	858,000
Optimized strategy NAT 2020	204,000	144-457	50,000	682,000
Optimized strategy COH 2020	204,000	144-457	48,000	714,000

Note: When evaluating chronic mortality from exposure to $PM_{2.5}$ two alternative values are shown here, the lower one is based on value of life years lost (VOLY) and the higher one on value of a statistical life (VOSL).

ures beyond current legislation to meet given air quality objectives, they also affect the cost of implementing current legislation. It is estimated that the costs of implementing current legislation on air pollution in 2020 would fall from 77.4 to 66.1 billion euro per year by switching from the NAT scenario to the COH scenario, i.e. by 11.3 billion euro per year.

The total difference in air pollution control costs between the non-climate policy (NAT) and the climate policy (COH) situation thus amounts to almost 20 billion euro per year, which constitutes a significant fraction of the costs for adjusting the energy system towards the needed CO_2 reductions.

Moreover, when comparing the costs of additional emission reductions associated with moving from the baseline scenario (which reflects current legislation in 2020) with the monetized health benefits, it is clear that the benefits far outweigh the costs. Assuming the lowest figures for health damage valuation, the benefits are nearly five times higher than the costs, and assuming a higher health damage valuation, benefits are estimated to exceed costs 15 times.

It should be noted that this comparison of costs and benefits does not include all the benefits that would result from improved air quality – notably it excludes benefits to ecosystems and cultural heritage as well as some health benefits.

As reported in AN 2/07, the European Commission decided in May to again postpone its planned proposal for a revised NEC directive, the main reason being that the adoption in March of new climate and energy policies for the EU should be fully accounted for when developing the proposal.

Since the new scenario analysis can only be done once the Commission has adopted its proposal for burden sharing between member states on the 20-percent reduction target for greenhouse gas emissions and the target for a 20-percent share of renewable energy, the NEC proposal is not expected until February 2008 at the earliest.

Christer Ågren

Sources: **NEC Scenario Analysis Reports No. 4: Updated baseline projections for the revision of the emission ceilings directive of the European Union**, and **NEC Scenario Analysis Reports No. 5: Cost-effective emission reductions to meet the environmental targets of the thematic strategy on air pollution under different greenhouse gas constraints**. June 2007. By M. Amann et al., International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria. Available from the website of IIASA: www.iiasa.ac.at/rains. **Analysis of the costs and benefits of proposed revisions to the national emission ceilings directive: NEC CBA report 2**. June 2007. By S. Pye et al., AEA Energy & Environment, Didcot, UK.

More information on the NEC directive and its revision can be found on the website of the Commission's environment directorate: http://ec.europa.eu/environment/air/ceilings.htm

Spain to exceed caps

Spain will exceed two of four national air pollutant emissions ceilings set for 2010 in the NEC directive, according to a revised national implementation programme. The cap on NOx is predicted to be exceeded by 37.5 per cent and on VOCs by 33.9 per cent. On the other hand it will "very probably" comply with ceilings on sulphur dioxide and ammonia. The government blames unpredicted economic and population growth for persistently high NOx and VOC emissions.

Source: **ENDS Europe DAILY**, 10 September 2007.

Emissions decreased slightly

EU greenhouse gas emissions fell in 2005, but need to fall significantly faster to achieve Kyoto targets.

Emissions of greenhouse gases (GHG) from the EU countries decreased between 2004 and 2005, according to the annual report prepared by the European Environment Agency (EEA). But compared with the baseline year for the Kyoto Protocol, emissions from the EU15 had fallen by just two per cent by 2005, compared with the collective undertaking of the 15 countries: to cut emissions by eight per cent by 2010.

The key points of the EEA report are:

EU15: Emissions of GHGs fell by 0.8 per cent (35.2 million tonnes CO_2 eq.) between 2004 and 2005. Emissions of GHGs decreased by 1.5 per cent between 1990 and 2005.

EU27: Emissions of GHGs fell by 0.7 per cent (37.9 million tonnes CO_2 eq.) between 2004 and 2005. Emissions of GHGs decreased by 7.9 per cent compared to 1990 levels.

Germany, Finland and the Netherlands contributed most to the EU15 reduction in absolute terms. Other EU15 countries that saw emissions decrease between 2004 and 2005 were Belgium, Denmark, France, Luxembourg, Sweden and UK.

In absolute terms, among the EU15, Spain increased greenhouse gas emissions the most between 2004 and 2005. The increase by 3.6 per cent or 15.4 million tonnes CO_2 equivalents came mainly from public electricity and heat production. Other EU15 countries that saw emissions increase between 2004 and 2005 were Austria, Greece, Ireland, Italy and Portugal.

Source: **Annual European Community greenhouse gas inventory 1990–2005 and inventory report 2007**. EEA Technical report No 7/2007, available at www.eea.europa.eu

Tougher heavy vehicle emission limits proposed

Strict emission standards could be met at reasonable cost and need not require a trade-off with fuel economy and CO_2 emissions, according to an ICCT response to EU consultation.

In July the EU Commission presented a proposal for new emission requirements for heavy vehicles, known as the Euro VI standard. However, the Commission chose not to make a recommendation itself, but to put forward four different suggestions for stakeholder consultation until 5 September.

The pollutants from heavy vehicles that the Commission primarily aims to regulate more tightly are nitrogen oxides (NOx), hydrocarbons (HC) and particles (PM), since they contribute to significant air quality problems throughout the EU.

The proposal sets different standards for vehicles fuelled with diesel (and ethanol) and those fuelled with gas. Only the proposed diesel engine standards are given in the figure opposite, as gas-fuelled heavy vehicles currently represent less than one per cent of the heavy vehicles on the EU market.

Scenario A is the one closest to the forthcoming US standards. According to the Commission, it will however entail a slight increase in fuel consumption, and hence an increase in carbon dioxide emissions.

In response to the consultation exercise the International Council on Clean Transportation (ICCT), reports that it strongly favours Scenario A:

"That scenario would provide the maximum level of protection for human health and environment, while also bringing Europe more closely in line with Japanese and US requirements for heavy-duty vehicles."

Scenario A can, according to ICCT, be met at a reasonable cost and need not require a trade-off with fuel economy:

"We note that the Commission is concerned that stringent NOx and PM standards could entail a slight carbon dioxide penalty. While this may be true for some of today's emission control technologies, the ICCT believes that continuing technical refinement will eliminate fuel economy impacts by 2012."

The ICCT also recommends incorporating a number-based standard for particulate matter as a complement to mass-based standards into Euro VI. A number-based standard is impor-

tant to ensure control of ultrafine and nano-particles, which have come under increasing scrutiny for what is believed to be their disproportionate impact on human health.

Research for the Commission says the scenarios would add between 1,000 and 6,000 euro to the cost of a vehicle. ICCT comments that research shows that the health and environmental benefits of the US 2010 requirements for heavy-duty diesel vehicles far outweigh the costs. Technical advances since then have further reduced costs, and it is now possible to limit emissions of PM (including ultrafine particles) and NOx by 90 per cent or more at a very low cost; generally less than one per cent of the total cost of a conventional heavy-duty vehicle.

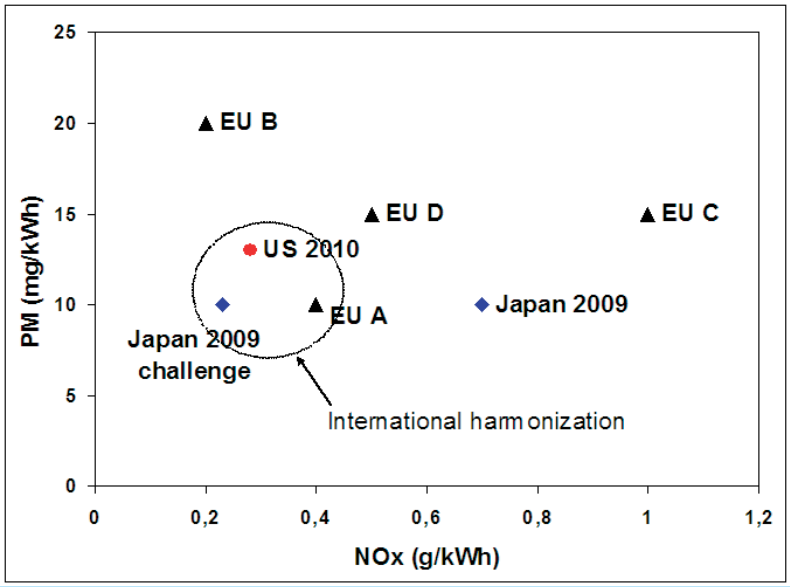
No date has been proposed for the new standards to come into force. Draft legislation is expected around the end of the year.

Per Elvingson

Note. The first EU directive to regulate emissions from heavy vehicles, i.e. road vehicles heavier than 3.5 tonnes, came in 1988. The current regulations, Euro IV, came into effect in 2006, and the next stage, Euro V, which imposes stricter requirements on nitrogen oxide emissions, comes into force in September 2008. (The Euro standards for HDV are distinguished from Euro standards for passenger cars by the use of roman numerals.)

Further information: EU Commission, ec.europa.eu/enterprise/automotive

Current standards and proposed scenarios



Scenario A represents the closest to global harmonization with forthcoming US and Japanese standards, according to ICCT. Compliance with standards is however measured under different test procedures in different countries, complicating direct comparison of numerical targets.

Limit values in **scenario A** are considered to be equivalent to the future US standards. Compliance with the emission limits of this scenario would require a higher rate of cooled exhaust gas recirculation, EGR (in addition to the use of a more efficient selective catalytic reduction (SCR) system). The higher rate of cooled EGR would, according to the Commission, lead to higher fuel consumption and hence to higher CO_2 emissions in the range of 2–3 per cent.

Scenario D could also be considered, to a certain extent, as equivalent to the US standards. Higher fuel consumption with higher CO_2 emissions is not foreseen in this case.

Scenario B is stricter than scenario A in terms of NOx for diesel engines but less stringent in terms of PM. This scenario requires a rate of cooled EGR that is considerably higher than that of scenario A. In order to achieve such a high ratio of EGR, scenario B requires an improved cooling system. As a result, higher fuel consumption and thus higher CO_2 emissions of 5–6 per cent are anticipated.

Finally, **scenario C** is the least stringent in terms of NOx emissions; no negative impact is anticipated in terms of fuel consumption/CO_2.

Germany aims for 40-per-cent emission cut

The German government has adopted a national strategy aimed at cutting greenhouse gas emissions by 40 per cent against 1990 levels by 2020 and improving energy efficiency by three per cent per year.

The 30-point strategy was formally approved by Chancellor Merkel's cabinet in August. It envisages renewable energy accounting for 25–30 per cent of electricity production by 2020 against 13 per cent today.

Support for combined heat and power (CHP) will be increased to 750 million euro annually. Support for green renovation of old buildings will also be continued at the current level of 700 million euro per year until 2011. For new buildings, 15 per cent of their heating will have to come from renewable sources.

Other measures include a requirement that by 2020, the share of biofuels in the transport sector must equal 20 per cent. Motorway tolls on heavy lorries are to be linked more closely to their emissions.

Source: **ENDS Europe DAILY** 28 August 2007.

EU pleasure boat pollution law reviewed

A recent review by the EU Commission shows that further cuts in pollution emissions from recreational craft beyond the limits introduced in directive 2003/44/EC are possible. The directive was adopted four years ago to regulate pollution and noise from motorboats between four and 24 metres in length.

Four scenarios for further reducing emissions of hydrocarbons, nitrogen oxides and particulate matter were evaluated, showing emission reduction potentials of up to 33 per cent for all three pollutants, as compared to estimated baseline emissions.

The review does not provide any benefits-to-cost ratios for the options investigated, but it is stated that the "figures indicate that the compliance costs for emission reduction ... do not outweigh the monetary environmental benefits..."

The Commission says it aims to further explore the possibilities for maximizing the emission reduction potential of recreational craft, and that an impact assessment would be carried out before any proposals for further regulation are made.

Source: **European Commission**, COM(2007) 313 final.

Profitable to reduce particle emissions

In socioeconomic terms it is also profitable to fit filters to small wood-burning units.

A recent report by the Danish Environmental Protection Agency estimates that particle (PM) emissions from wood burning in Denmark can be reduced by 96 per cent between 2005 and 2020 if effective filters are installed on all wood-burning units.

Old wood-burning stoves and boilers generally have higher emission factors than new installations, and it is estimated that almost 90 per cent of the emissions come from installation types with high emission factors. Consequently, there is a great potential for reducing emissions by switching to installations with more efficient combustion, for example new boilers with storage tanks, automatically fired stoves and boilers, modern wood-burning stoves, and masonry stoves.

The report only looks at technological reduction possibilities. However, there is also good potential to reduce emissions by running awareness campaigns to inform people about the appropriate use of wood-burning stoves and boilers.

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Domestic wood-burning heating appliances can easily produce particle emission levels similar to those of a modern diesel car. Recent studies have shown that Denmark's 700,000 wood-burning stoves are responsible for up to 50 per cent of fine particulate emissions ($PM_{2.5}$).

The projected emissions were analyzed for four different scenarios:

- A baseline scenario, where the replacement of stoves and boilers is assumed to be the same as assessed for 2005, however with some technological development for stoves;
- A Statutory Order scenario, where maximum emission standards for stoves and boilers are imposed to direct the development;
- A filter scenario, where over a ten-year period electrostatic filters are installed on all wood-burning units; and,
- A sub-scenario where filters are only installed on wood-burning units located in cities of a certain size.

In the baseline scenario emissions are estimated to come down by 16 per cent by 2020, in spite of an expected increase in wood consumption by 22 per cent over the same time period. Scenarios 2 and 4 both resulted in emission reductions of 35–40 per cent, while scenario 3 – the filter scenario – reduced emissions by 96 per cent.

The economic analysis shows that the filter scenario clearly offers the largest socioeconomic gain overall, which results from a reduction in costs of damage from emissions of $PM_{2.5}$ valued at DKK 16.4 billion, minus the consumer-borne additional costs of DKK 4.5 billion, as compared to the baseline scenario. So even if the filter scenario is more than twice as expensive as the baseline scenario, the net socioeconomic gain is estimated at DKK 11.9 billion spread over fifteen years.

Christer Ågren

Source: **Brændeovne og små kedler – partikelemissioner og reduktionstiltag** (2007). In Danish, with summary in English. Miljøprojekt nr. 1164. Published by the Danish Environmental Protection Agency. Can be downloaded from www2.mst.dk/common/Udgivramme/Frame.asp?pg=http://www2.mst.dk/Udgiv/publikationer/2007/978-87-7052-451-3/html/default.htm

Downward trend for Danish emissions

Between 1985 and 2004, emissions of ammonia from Danish agriculture decreased by nearly 30 per cent, primarily as a result of improved utilization of nitrogen in animal feedstuffs, a fall in the number of cattle, and changed manure storage and application techniques.

In line with the 1999 Gothenburg Protocol under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and the 2001 EU directive on national emission ceilings, Denmark is committed to maximum ammonia emissions of 69,000 tonnes (equivalent to 56,800 tonnes of NH_3-N) in 2010.

In a new study, the National Environmental Research Institute has made projections on future emissions showing that by 2010 Danish emissions are expected to come down to 53,600 tonnes NH_3-N, i.e. well below the emission ceiling, representing a 40-per-cent reduction as compared to 1990.

By 2020, emissions are expected to have fallen further to about 45,000 tonnes NH_3-N, a reduction of 50 per cent since 1990.

The projection includes all implemented and planned measures, such as the third Danish action plan for the aquatic environment, the reform of the EU Common Agricultural Policy, and newly launched legislation on animal husbandry in Denmark. Expected technological developments are also taken into account. Moreover, stricter environmental requirements, especially in relation to expansion of livestock farming, are expected to result in the implementation of various technical measures to reduce ammonia emissions, such as air treatment or floor drainage systems.

Source: **Projection for ammonia emissions from Denmark from 2005 until 2025** (2007). By S. Gyldenkærne & M.H. Mikkelsen. NERI Technical Report No. 239. Full report in pdf format available from www2.dmu.dk/Pub/AR239.pdf

Historic and projected ammonia emissions in Denmark 1990 to 2025 (tonnes NH_3-N/year).

	1990	2000	2005	2010	2015	2020	2025
Animal manure	80,400	60,700	53,800	46,700	40,400	38,300	36,400
Artificial fertilizers	8,700	5,600	4,500	4,300	4,000	3,900	3,700
Sludge	100	100	100	100	100	0	0
Industry	400	500	500	500	500	500	500
Transport	100	1,800	2,000	2,000	2,000	2,000	2,000
Total	**89,700**	**68,600**	**60,800**	**53,600**	**47,000**	**44,800**	**42,700**
Relative change	100	76	68	60	52	50	48
Emission ceiling	-	-	-	56,800	-	-	-

Cutting emissions cheaper than expected

The cost of reducing emissions of greenhouse gases in the Nordic Region will be lower than expected, according to a new report commissioned by the Nordic Council of Ministers. A 60-per-cent reduction from the 1990 level by 2050 will cost just over 11 billion euro, or approximately one per cent of total Nordic GDP.

The report by the COWI Research Institute calculated the potential for reductions in emissions in the energy and transport sectors. The calculations assume cuts of approximately 80 per cent by 2050 in energy-sector emissions by reducing reliance on fossil fuels and increasing the use of renewables. The report envisages a far smaller cut in the transport sector, approximately 40 per cent.

Source: **Climate 2050**. TemaNord 2007:535. ISBN 978-92-893-1497-8. Available at www.norden.org.

Ten times cheaper than fossil-fuelled future

Investing in a renewable electricity future will save ten times the fuel costs of a "business as usual" fossil-fuelled scenario, saving US$180 billion annually and cutting carbon dioxide emissions in half by 2030, according to a joint report by Greenpeace and the European Renewable Energy Council (EREC).

Future Investment – A Sustainable Investment Plan for the Power Sector to Save the Climate. Available from www.energyblueprint.info.

Huge potential for increased efficiency

Industrial energy efficiency could be improved by up to 26 per cent, even without introducing new technologies, according to a study published by the International Energy Agency (IEA). Areas where further improvements can be achieved immediately are "conventional factory systems" such as motor and steam systems, combined heat and power generation, and materials efficiency and resource use, it says.

Manufacturing industries use nearly a third of world energy production while releasing 36 per cent of the global emissions of greenhouse gas carbon dioxide. Chemicals, petrochemicals, iron and steel, cement, paper and pulp, along with other minerals and metals, account for more than two thirds of this amount.

Tracking Industrial Energy Efficiency and CO_2 Emissions. ISBN 978-92-64-03016-9. Available from IEA bookshop, www.iea.org.

Heavy traffic in Cairo. Congestion charging could offer benefits in most of the world's big cities.

Successful trial brings permanent charging

One in five cars disappeared when Stockholm re-introduced a congestion tax on 1 August.

A congestion charging trial took place in Stockholm in the first half of 2006. The number of vehicles passing the charging points fell by over 20 per cent, queuing was significantly reduced and the number of people using public transport increased.

The trial ended on 31 July 2006 and was followed by a local referendum during the local and national elections in September. A small majority of residents of the city of Stockholm voted yes to continued congestion charging, while the residents of surrounding municipalities mostly voted no.

Public referenda in Sweden are only advisory, and political debate at government level took place in autumn. The decision was taken to continue with congestion charging. Those parties that were originally opposed to the scheme accepted it on condition that the revenues generated would go towards the construction of a future bypass to the west of the city.

"Public transport users and the environment were the main losers when the government refused to use the congestion charge as a locally governed incentive to reduce traffic congestion and improve the environment. Instead, the government has imposed an additional tax on motorists in Stockholm in order to build more roads and so increase the environmental burden," commented Magnus Nilsson, traffic expert for the Swedish Society for Nature Conservation.

The system was re-introduced on 1 August and is now permanent. The scheme works in much the same way it did during the trial period from January to June 2006, and the effects are similar – roughly one in five cars has disappeared.

The charges apply on weekdays from 6.30am to 6.30pm, and the charge ranges from SEK 10 to 20 (1–2 euro) depending on the time of day. The maximum cost per vehicle per day is SEK 60 (just under 6 euro). In contrast to the trial period, the charges are now tax deductible for companies and individuals.

Magnus Nilsson from the Swedish Society for Nature Conservation points to a number of weaknesses in the current system, which must be rectified if it is to be effective in the long term:

"The charging zone has to be bigger. Otherwise the charge-exempt road that runs through the western side of the zone is likely to become a bottleneck; we can already see such a trend.

"The region itself must have control over the revenues. Under the Swedish constitution, Parliament has to decide over the money, since technically the charge is a tax, but a more reasonable approach would be to give the county council decision-making responsibility. If decisions were made at regional level it would be easier to adjust the level of charging as required to eliminate congestion.

"There should also be more freedom to decide how surplus revenue can be used. At the moment some politicians are worried that congestion could disappear, as this would make it difficult to gain acceptance for the planned bypass.

"Exemption for 'green cars' has to be removed. At present, cars that can run on renewable fuels are exempt from the congestion charge until 2012. There are proposals to extend this exemption to include cars with low fossil carbon emissions. The problem is that under current tax rules, the number of 'green cars' is growing, so a large part of the effect on congestion is lost. But green cars clearly contribute just as much to congestion as other vehicles."

Per Elvingson

Further information: **The Swedish Road Administration**, www.vv.se (select English, and then "Congestion tax Stockholm" in the left-hand column).

Sharp increase in charges for the worst offenders

Since congestion charging was introduced in 2003, traffic in central London has decreased by around 15 per cent. In February this year the area covered by charging was doubled. In 2006 the latest report from Transport for London (TfL) stated that congestion was down around 26 per cent in comparison with the pre-charge period and traffic delays had also been reduced.

The criticism that was initially levelled at congestion charging soon abated, as air quality improved and the number of traffic snarl-ups fell. For the first 10 years of congestion charging in London, all revenues will go towards improving the traffic situation, such as extending public transport.

At the start of August, Ken Livingstone, Mayor of the city, announced a proposal that would make it considerably more expensive to drive vehicles with high carbon dioxide emissions into the heart of the city, as part of measures to reduce the climate impact of the city.

The current daily charge is £8 (12 euro), which is what most people would also pay under the new proposal. Owners of cars producing more than 225g CO_2/km will however be charged £25 (37 euro) to drive into the city centre, as will drivers of vehicles registered before March 2001 with engines bigger than 3000 cc.

Vehicles that emit less than 120g/km *and* meet Euro 4 emissions criteria will on the other hand be congestion charge exempt. The Mayor is also proposing to drop the 90-per-cent residents discount for those who live inside the zone, if the car in question falls into the top 225g/km-plus tax bracket.

The proposal will undergo public consultation from 10 August to 19 October. It is intended that the new charges should be introduced in 2008.

Nationwide road pricing schemes are also being discussed in the UK to fight congestion and reduce emissions of greenhouse gases from road transport. A report issued in December last year under the lead of Rod Eddington, a former head of British Airways, stated that road pricing could halve congestion by 2025 and bring environmental and economic benefits worth 41 billion euro a year. Eddington said there was "no attractive alternative" to road pricing. He also recommended investment in rail, buses and cycle paths.

Further reading: **Transport for London**, www.cclondon.com. **The Eddington study**: UK Department for Transport, www.dft.gov.uk/about/strategy/eddingtonstudy/

Federal support to congestion pricing in NY

On Earth Day in April, New York Mayor Michael Bloomberg introduced a pilot congestion pricing programme as part of a larger plan for greening New York City, called PlaNYC 2030.

On 15 August New York was awarded $354 million in federal funds to implement a congestion pricing programme.

The pilot would establish congestion pricing to manage traffic in the Central Business District. On weekdays from 6.00am to 6.00pm, trucks would be charged $21 a day and cars would be charged $8 to enter this area, in addition to premium parking fees charged by city and private lots.

If the State Legislature approves a pilot congestion pricing plan or an alternative pricing mechanism, the New York Metropolitan Transportation Authority will receive $184 million for new bus facilities and the city will receive $112.7 million to establish Bus Rapid Transit in all five boroughs.

The city will also receive $29.3 million for pedestrian and traffic signal improvements, $10.4 million in grant money to implement congestion pricing, $15.8 to improve ferry services, and $2 million to conduct research.

US Transportation Secretary Mary Peters selected five metropolitan areas as the first communities to participate in a new $848.1 million federal initiative to fight traffic gridlock. As the nation's largest city, New York is receiving the lion's share of the funds. Miami, Minneapolis, San Francisco and Seattle were also chosen to receive smaller amounts for their traffic programmes.

Further information: **US Department of Transportation, National Strategy to Reduce Congestion**, www.fightgridlocknow.gov. **PlaNYC 2030**, www.nyc.gov/html/planyc2030

Flattening trend in pollutant emissions

Air pollutant emissions from land-based sources in Europe are continuing to fall slightly, but considerably slower than in the 1990s. Some of the reductions on land are also countered by rising emissions from international shipping.

Since the early 1980s, total European emissions of sulphur dioxide (SO_2) – the most significant acidifying pollutant – from land-based emissions sources have fallen by three-quarters, from around 53 million tonnes in 1980 to 12.5 million tonnes in 2005.

Emissions of nitrogen oxides (NOx), volatile organic compounds (VOCs) and ammonia in Europe have also fallen since the early 1990s, although not by as much as emissions of SO_2. While the first two dropped by about 30–40 per cent since 1990, emissions of ammonia fell by less than a quarter.

Since the late 1990s, emissions of fine particles ($PM_{2.5}$) have been gaining increasing attention. However, these emissions are not as well documented as those of other air pollutants, and many countries lack emission data for the 1990s. Between 2000 and 2005 it is estimated that emissions of $PM_{2.5}$ have fallen slightly, from 3.3 to 3.2 million tonnes.

Although SO_2 emissions continue to fall, the downward trend for the other three pollutants appears to have more or less flattened out over the last few years. In the case of NOx, small reductions in most countries were negated by an increase in Russian emissions of 600,000 tonnes over the same period.

Emissions from international shipping in European waters show a steady increase. Since 1990, ship emissions of SO_2 have gone up from 1.8 to 2.7 million tonnes, and those of NOx from 2.6 to 3.8 million tonnes – in both cases an increase of more than 40 per cent.

The data in the table on the opposite page is taken from figures reported by the countries themselves to the Convention on Long-range Transboundary Air Pollution, and was compiled by EMEP[1].

The Convention's EMEP programme is not confined to keeping track of emissions. Its main task is to model the ways in which emissions from one country affect the environment in others. The EMEP report also provides an overview of calculations for source-receptor relationships, covering acidifying, eutrophying, photo-oxidant, and particle pollution.

The source-receptor relationships calculated by EMEP show the transboundary movements of air pollutants across Europe. They also quantify the "export" and "import" between countries of these pollutants.

Table 2. Examples of European countries where the proportion of air pollutant depositions of sulphur and oxidized nitrogen coming from ships is most marked. Source: EMEP, 2007.

Sulphur		NOx-nitrogen	
Denmark	46%	Denmark	27%
Sweden	23%	Sweden	22%
Netherlands	21%	Greece	22%
UK	19%	Norway	21%
Ireland	18%	Ireland	20%
France	12%	UK	19%
Finland	12%	Portugal	19%
Belgium	12%	Netherlands	18%
Italy	11%	Italy	17%
Germany	10%	Spain	16%
Spain	9%	Belgium	13%
Norway	8%	Germany	10%

It is true for most European countries that the biggest share of depositions of sulphur and oxides of nitrogen emanates from outside their own territory. Another similarity is that an increasing share of depositions originates from international shipping.

For 2005 it was estimated that ship emissions were responsible for ten per cent or more of the total deposition of both sulphur and oxidised nitrogen compounds in at least twelve European countries (see Table 2). In a few countries, such as Denmark, Sweden, the Netherlands, Ireland, and the United Kingdom, ship emissions already make up approximately one fifth or more of total pollutant depositions.

Christer Ågren

[1] The data reported by individual countries to the Convention on Long-range Transboundary Air Pollution is compiled by EMEP (the cooperative programme for monitoring and evaluating the long-range transmissions of air pollutants in Europe), and published both in printed form and on the EMEP website.

The title of this year's report is **Transboundary acidification, eutrophication and ground-level ozone in Europe in 2005**. EMEP Status Report 1/2007. By L. Tarrason et al. Available at the EMEP website: www.emep.int/index_facts.html

Table 1. European emissions of sulphur dioxide, nitrogen oxides (as NO_2), VOCs, and ammonia (thousand tonnes).

	Sulphur dioxide				Nitrogen oxides (NO_2)				Volatile Organic Compounds (VOCs)				Ammonia		
	1980[1]	1990	2000	2005	1980[1]	1990	2000	2005	1980[1]	1990	2000	2005	1980[1]	1990	2005
Austria	346	74	32	26	246	212	204	225	432	284	179	154	52	69	64
Belgium	828	361	171	147	442	382	330	293	399	305	201	155	89	112	74
Bulgaria	2 050	2 007	918	900	416	363	184	233	309	214	123	147	144	144	57
Cyprus	28	46	50	42	13	19	25	17	14	16	16	9	8	5	5
Czech Republic	2 257	1 876	264	219	937	742	398	278	275	374	266	218	156	157	68
Denmark	451	176	27	22	307	266	188	186	261	166	127	118	138	134	93
Estonia	287	274	96	77	70	74	37	32	81	71	38	36	24	26	9
Finland	584	259	74	69	295	299	235	177	210	221	154	131	39	38	36
France	3 213	1 333	613	465	1 989	1 829	1 390	1 207	2 660	2 414	1 658	1 439	810	787	735
Germany	7 514	5 289	630	560	3 334	2 878	1 855	1 443	3 224	3 584	1 569	1 253	835	758	619
Greece	400	487	493	537	306	299	328	317	255	281	295	262	79	79	72
Hungary	1 633	1 011	486	129	273	276	194	203	215	252	187	177	157	124	80
Ireland	222	186	131	70	73	119	129	116	111	111	90	62	112	114	113
Italy	3 441	1 795	752	496	1 585	1 945	1 377	1 173	2 034	2 023	1 538	1 261	441	405	426
Latvia	96	97	10	4	70	69	34	41	121	73	58	63	52	47	14
Lithuania	311	263	43	44	152	158	49	58	100	136	78	84	85	82	39
Luxembourg	24	26	4	4	23	20	33	29	15	16	13	10	7	7	7
Malta	26	29	26	18	9	14	12	12	2	8	8	5	5	1	1
Netherlands	490	189	72	62	583	549	389	344	579	491	267	176	234	249	135
Poland	4 100	3 278	1 507	1 222	1 229	1 581	838	811	1 036	832	606	885	550	511	326
Portugal	253	317	306	215	158	243	285	275	189	273	282	302	96	55	73
Romania	1 055	1 310	727	727	523	527	331	346	829	517	378	404	340	289	266
Slovakia	780	542	127	89	197	215	109	97	252	122	86	84	63	66	29
Slovenia	234	198	99	42	51	63	60	58	39	53	51	43	24	25	19
Spain	2 913	2 166	1 489	1 215	1 068	1 247	1 477	1 405	1 392	1 135	1 162	1 055	285	329	398
Sweden	491	117	52	40	404	306	217	205	528	443	282	199	54	55	52
United Kingdom	4 841	3 699	1 173	706	2 652	2 932	1 857	1 627	2 099	2 396	1 348	977	370	382	318
Sum EU27	**38 868**	**27 405**	**10 372**	**8 147**	**17 405**	**17 627**	**12 565**	**11 208**	**17 661**	**16 811**	**11 060**	**9 709**	**5 249**	**5 050**	**4 128**
Albania	72	74	32	32	24	23	22	25	31	30	29	32	32	23	23
Belarus	740	888	162	103	234	379	208	184	549	497	340	326	142	215	135
Bosnia & Herzegovina	482	484	420	427	79	73	53	52	51	48	40	42	31	21	17
Croatia	150	178	60	60	60	88	77	69	105	105	80	92	52	53	44
Iceland	18	9	9	8	21	9	9	11	8	12	9	11	3	4	4
Norway	136	53	27	24	191	224	224	197	173	295	379	222	23	20	23
Macedonia	107	110	90	108	39	46	39	30	19	21	25	28	17	15	14
Moldova	308	175	13	13	115	131	27	31	105	123	42	38	53	61	27
Montenegro	-	-	-	48	-	-	-	21	-	-	-	21	-	-	9
Russia	7 323	6 113	2 263	1 858	3 634	3 600	2 457	3 093	3 410	3 659	2 445	2 675	1 189	1 204	621
Serbia[2]	406	593	396	293	192	165	137	149	142	158	141	126	90	74	57
Switzerland	116	42	19	17	170	156	101	86	323	262	130	101	77	68	55
Ukraine	3 849	3 921	1 599	1 294	1 145	1 753	861	960	1 626	1 053	641	725	729	682	550
Sum Non-EU	**13 707**	**12 640**	**5 090**	**4 285**	**5 904**	**6 647**	**4 215**	**4 908**	**6 542**	**6 263**	**4 301**	**4 439**	**2 438**	**2 440**	**1 579**
Sum Europe	**52 575**	**40 045**	**15 462**	**12 432**	**23 309**	**24 274**	**18 780**	**16 116**	**24 203**	**23 074**	**15 361**	**14 148**	**7 687**	**7 490**	**5 707**
Int. ship: Baltic Sea	139	168	216	245	215	236	303	343	5	8	10	12	-	-	-
Int. ship: Black Sea	35	45	58	65	52	62	80	90	1	2	3	3	-	-	-
Int. ship: Mediterran.	725	858	1 108	1 259	1 000	1 234	1 593	1 810	21	41	54	61	-	-	-
Int. ship: North Sea	277	361	464	526	395	508	652	739	9	18	23	26	-	-	-
Int. ship: N.E. Atlantic	550	384	492	557	772	565	724	819	15	19	24	27	-	-	-
Sum internat. ship.	**1 726**	**1 816**	**2 338**	**2 652**	**2 434**	**2 605**	**3 352**	**3 801**	**51**	**88**	**114**	**129**	**-**	**-**	**-**
Sum Europe + ships	**54 301**	**41 861**	**17 800**	**15 084**	**25 743**	**26 879**	**20 132**	**19 917**	**24 254**	**23 162**	**15 475**	**14 277**	**7 687**	**7 490**	**5 707**
Turkey	1 030	1 519	2 122	1 792	364	691	942	932	359	636	563	554	321	373	407

[1] Emissions in 1980 from EMEP MCS-W Technical Report 1/2005. [2] Figures for 1980,1990 and 2000 including Montenegro emissions.

The US lags behind

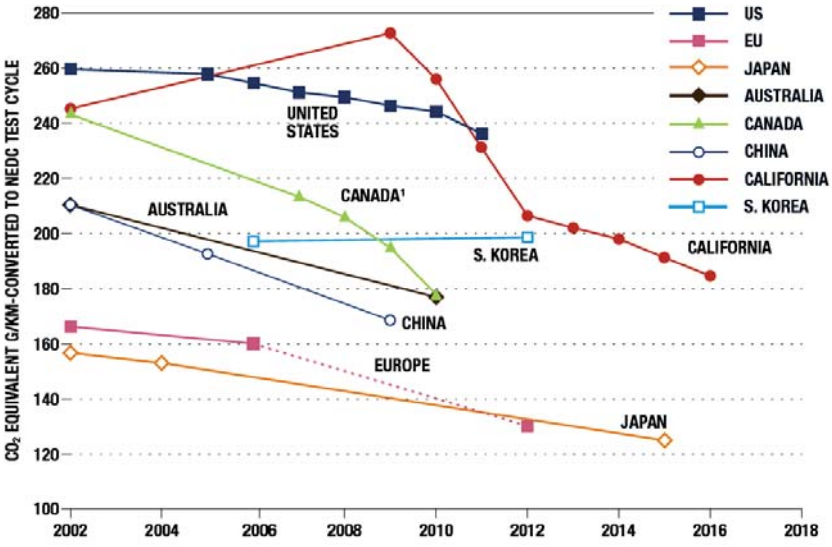
Europe and Japan lead the world in reducing greenhouse gas emissions from their vehicle fleets. But California and Canada make the biggest advances in recent years.

Comparison between the vehicle emission requirements of different countries has been difficult until now because they each use different test cycles to determine fuel consumption and emissions.

Thanks to the International Council on Clean Transportation (ICCT), comparisons are now available for a string of countries, based on the emission standard that is used in the EU, which is measured in grams of carbon dioxide equivalent per kilometre, and on the fuel-economy based standard that is used in USA, which is measured in terms of CAFE-adjusted miles per gallon.

In each case it is assumed that the sale of new cars on average exactly meets adopted or anticipated future standards for the given year.

The chart compares national standards in terms of grams of CO_2-equivalent per kilometre adjusted to the EU test cycle.



Actual and projected GHG emissions for new passenger vehicles by country, 2002-2018.

Europe and Japan lead the world in reducing greenhouse gas (GHG) emissions from their vehicle fleets. For most years up to 2015, Japan's fuel efficiency targets translate as the most stringent passenger vehicle emission standards in the world, with Europe in close second place. At the end of their regulatory periods, Japan's new passenger fleet CO_2 emissions are estimated to be equivalent to 125 g/km in 2015. Europe is projected to achieve 130 g/km three years earlier, in 2012.

The US new vehicle fleet is expected to remain the world's most carbon intensive for the foreseeable future, although significant improvements could be achieved should the US government enact the US Senate's CAFE legislation or the President's "Twenty in Ten" Executive Order.

California is notable for its sharp improvement in GHG emission standards, particularly in the early years of the programme, from 2009 to 2012.

China, Canada, and Australia have adopted substantively equivalent regulations, with the carbon intensities of new vehicles sold in each country in the 2009–2010 time frame projected to be 168, 178, and 176 grams of CO_2-equivalent per kilometre, respectively.

When comparison is based on the US calculation method the results are somewhat different, since the unit of measurement is miles per gallon. Petrol and diesel contain different amounts of carbon per unit of volume, and the proportion of diesel vehicles therefore affects the rankings. From the climate viewpoint the EU calculation method (g CO_2/km) is therefore most relevant.

Per Elvingson

Source: **Passenger Vehicle Greenhouse Gas and Fuel Economy Standards: A Global Update**. ICCT July 2007. Available at www.theicct.org.

Around the world

In 2006, **Japan** increased the stringency of its fuel economy standards. As a result, Japan's standards are expected to lead to the lowest fleet average emissions for new passenger vehicles in the world: 125 g CO_2/km in 2015.

The new standards in **California** are expected to achieve the greatest absolute emission reductions from any policy in the world. The standards cover all GHG emissions related to vehicle operation and use, not only tailpipe emissions. The target for 2016 means emissions that are equivalent to the average in the EU15 in the mid-1990s. The California standards have been adopted by eleven other states in the US.

Passenger vehicle standards in the **United States** continue to lag behind. According to a bill that was approved by the Senate in June, the average consumption for each manufacturer should be reduced to 6.7 litres/100 km by 2020, which corresponds to a reduction of 40 per cent from the current CAFE standards. However, the bill must first be considered by the House of Representatives and then put before the president.

The standards in **China** set up maximum fuel consumption limits by weight category. Phase 1 took effect in 2005 for new models and a year later for continued models. Phase 2 is due to take effect in 2008/09. China has recently revised its taxation to strengthen incentives to buy vehicles with smaller engines.

EU Commission drafts new bill for cars and CO_2

The EU Commission is currently drafting a new bill, under heavy lobbying from the automotive industry, which will use binding standards to forcibly reduce carbon dioxide emissions from new cars. The level proposed by the Commission in a communication issued in February is 130 g CO_2 per km by the year 2012 (see AN 1/07, p.3). A public consultation was held in spring. The bill is expected to be ready next year.

Environment ministers meeting in June confirmed their support for the Commission's 130 g/km limit by 2012. When Parliament's environment committee considered the matter in September they called for a limit of 120 g/km by the same year. Parliament as a whole will debate the issue in October.

One important question right now, aside from the specific limit and deadline, is whether the standard will apply across the board, or if cars in different size classes will be allowed different emission limits. The European Automobile Manufacturers' Association (ACEA) is in favour of a weight-based standard that allow heavier vehicles higher emissions.

However, the European Federation for Transport and Environment (T&E) believes that making cars lighter is one of the most important and most straightforward ways of cutting CO_2 emissions. But linking CO_2 standards to weight removes the main incentive to make a car lighter, because doing so would result in that model receiving a tougher CO_2 standard.

T&E says there should be a single standard for CO_2 emissions that applies to the average of the fleet of all cars sold in a given year. If a range of standards for different classes is used as a temporary measure, T&E says the vehicle's "footprint", the area between the four wheels, should be used to define them, instead of weight. Parliament's environment committee also supported this line during a vote in September.

T&E has also published a report[1] showing that boosting the existing trend towards heavier cars by introducing weight-based CO_2 targets would lead to more road fatalities than if a single CO_2 standard for all cars was used.

[1] **Danger ahead: why weight-based CO_2 standards will make cars dirtier and less safe**. Can be downloaded from the T&E website: www.transportenvironment.org/Downloads-req-getit-lid-468.html. See also T&E position paper on cars and CO_2: www.transportenvironment.org/Article454.html

Reducing carbon footprint in the fuel chain

Reducing carbon dioxide emissions during the fuel life cycle is more important than increasing the use of biofuels.

This view forms the basis for the proposed amendment to the fuel quality directive presented by the EU Commission in January, which recommends giving fuel suppliers responsibility for reducing the carbon footprint of their road fuels by 10 per cent by 2020. Specifically, they must cut the life-cycle greenhouse gas emissions of their fuels by one per cent per year from 2011 onwards. The market will then decide for itself if the fossil fuel chain or biofuels offer more cost-effective emission reductions.

The Commission's proposal has won favour, not least from the environmental movement, which has long been critical of biofuel initiatives that take no account of the real benefit they deliver – sustainable biofuels can be part of the solution, but unsustainable biofuels are even worse for the environment than not producing them. The use of "well-to-wheel" calculations and sustainability criteria ensure that the most appropriate fuels are given priority.

The revised proposal is now being considered by the Council of Ministers and by Parliament.

In September, Portugal, which currently holds presidency of the EU, presented a proposal for political agreement by the Council of Ministers, hopefully by December. The wording generally backs the Commission's proposal, although the ten-per-cent target remains in square brackets, reflecting reluctance by some governments to agree to a reduction target before finalizing emission calculation methods and biofuel sustainability criteria.

Portugal's draft text also states that only biofuels conforming to sustainability criteria should count towards the reduction target. It does not, however, suggest any criteria or guidelines for them.

The European Parliament's environment committee will consider the proposed directive at a first reading in November, and Parliament as a whole will consider it in January 2008.

The EU also has individual targets for the proportion of biofuels used by the transport sector. In March, EU leaders agreed to a legally binding ten-per-cent biofuel target by 2020. The binding nature of the target is subject to sustainable, second-generation biofuels being available. It is not yet clear how this volume target will work with the target to "decarbonize" fuels, but if decarbonization is to be achieved solely through an increased share of biofuels, it will require a higher proportion than 10 per cent by 2020.

Further reading: **Presidency note on EU fuel quality revision**, http://register.consilium.europa.eu/pdf/ en/07/st12/st12451.en07.pdf. Dorette Corbey, rapporteur for the EU Parliament, has presented a draft report available among the environment committee's meeting documents for 11 September, see www.europarl.europa.eu.

Clear benefits from combined abatement

More consideration must be given to the links between climate change and traditional air pollution, according to a experts gathered at a workshop in Gothenburg, Sweden.

Nearly 200 policymakers, scientists, experts and stakeholders from 35 countries participated at the Gothenburg workshop[1], the aim of which was to elaborate scientific and policy needs in order to solve air pollution problems in both the short and long term. In particular the workshop considered:

- Links between air pollution and greenhouse gas policies.
- Interactions between climate change and air pollution effects.
- Intercontinental transport of air pollution.
- Emissions from international shipping.
- The nitrogen problem.
- Further development of international air pollution control regimes, with the main focus on the Convention on Long-Range Transboundary Air Pollution.

After a few initial plenary presentations, the participants were split into eight parallel working groups, and each working group was given the task of coming up with conclusions and recommendations on ways forward. The following are some selected excerpts from these conclusions and recommendations on the theme: "Air pollution and greenhouse gas policies".

At present there is a small but growing number of initiatives in the world aimed at combining air pollution and climate change. The benefits of combined emission abatement policies are obvious in terms of achieving improvements at less cost. It is important to look at policies beyond 2020, since decisions taken today will influence emissions of air pollution and greenhouse gases for several decades.

Recommendations:

- Focus on early identification of synergies and trade-offs between air quality and climate change policies and measures.
- Use combined air pollution/climate change policies at local, national and EU levels. Combined strategies should be considered with some caution at regional and global levels.
- Promote the development of integrated assessment tools for combined strategies.
- Investigate possibilities to use innovative solutions (e.g. urban planning and agricultural practices), in particular in the developing countries.
- Promote further investigations and exchange of experience from the use of economic instruments in combined strategies.
- Consider other aspects, such as energy security, competitiveness, public health, etc., in relation to the environmental drivers.

A summary report was prepared covering the main conclusions and recommendations from the workshop. This report, as well as the reports from each of the working groups and other material from the workshop, can be found at http://asta.ivl.se.

Christer Ågren

[1] The conference **Air pollution and its relationship to climate change and sustainable development – Linking immediate needs with long-term challenges** "Saltsjöbaden 3", was held in Gothenburg, Sweden, on 12–14 March 2007. It was the third in a series – the previous ones were held in 2000 and 2004, and it was organized by the Swedish research programme ASTA in collaboration with the Convention on Long-Range Transboundary Air Pollution (CLRTAP), the European Commission and the EU ACCENT Network of Excellence.

Check the ozone level where you live

The European Environment Agency (EEA) provides a map that makes it possible to check current concentrations of ground-level ozone throughout Europe:
www.eea.europa.eu/maps/ozone/map

... and the polluters

The Commission for Environmental Co-operation (CEC) has created a map layer for Google Earth that lets users explore pollution data from over 30,000 industrial facilities in North America. CEC is a North American organization that deals with transboundary regional issues.
www.cec.org/naatlas/prtr/

How green is your car?

The British Ministry of Transport has ranked all new cars by carbon dioxide emissions on a new website. Cars can be selected by size class, fuel type and gearbox type. By choosing a car with the most fuel-efficient engine in its class, buyers can reduce fuel costs and carbon dioxide emissions by a quarter. The best vehicle in all categories is the Volkswagen Polo Blue Motion (109g/km).
www.dft.gov.uk/ActOnCO2/

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Criticism of one-sided biofuel initiatives

Stop subsidizing biofuels and concentrate on eliminating fossil carbon use instead. This is the main message of an OECD report that was published in September.

The OECD considers that biofuels have limited potential to reduce fossil carbon emissions, and that the benefits that arise are achieved at a very high cost. The study estimates that the US alone spends $7bn (5bn euro) a year helping to make ethanol, with each tonne of carbon dioxide avoided costing more than $500. In the EU, the cost can be almost ten times that.

It also says biofuels could lead to damage to the environment. "As long as environmental values are not adequately priced in the market, there will be powerful incentives to replace natural ecosystems such as forests, wetlands and pasture with dedicated bio-energy crops."

The report recommends that governments phase out biofuel subsidies, using "technology-neutral" carbon taxes instead to allow the market to find the most efficient ways of reducing greenhouse gases. "Such policies will more effectively stimulate regulatory and market incentives for efficient technologies," it said.

A book published by the Worldwatch Institute in August also points to the risks associated with a massive increase in the production and use of biofuels, including increased deforestation and biodiversity loss.

A report issued in summer by the German Advisory Council on the Environment (SRU) also warned that biomass is "not an inexhaustible resource", and says that if broad environmental and nature protection goals are taken into account, the role of biomass will only cover a small percentage of primary energy needs.

In its paper the SRU says using biomass for transport fuels risks wasting a valuable resource on the wrong priorities. "Biomass can be used up to three times more efficiently in heating and combined heat and power than in producing the currently used biodiesel and bioethanol."

Further reading: **Biofuels: Is the Cure Worse Than the Disease?** OECD, 2007. SG/SD/RT(2007)3. Available from Friends of the Earth, www.foe-europe.org/publications/2007/OECD_Biofuels_Cure_Worse_Than_Disease_Sept07.pdf. **Biofuels for Transport: Global Potential and Implications for Sustainable Agriculture and Energy in the 21st Century**. Worldwatch Institute, www.worldwatch.org/node/5302. **Climate Change Mitigation by Biomass**. SRU, www.umweltrat.de.

Recent publications

Transboundary Air Pollution, Scientific Understanding and Environmental Policy in Europe

Ed. H. Pleijel. Describes current scientific understanding of European transboundary air pollution. The way science has become a driving force for policy action is dealt with in some detail. The book closes by looking at expected future trends, including the accumulating evidence of intercontinental transport of air pollutants and the globalization of air pollution management related to its strong links with climate change.

260 pp. £ 33.00. ISBN 9789144004716. Can be ordered from www.amazon.co.uk.

Ammonia emissions in agriculture

Gives an overview of current knowledge about ammonia emissions and how this knowledge can implemented in current agricultural systems.

404 pp. 59 euro. ISBN: 978-90-8686-029-6. Published by Wageningen Academic Publishers, www.wageningenacademic.com.

Reactive Nitrogen in the Environment – Too Much or Too Little of a Good Thing

Examines the impacts of reactive nitrogen on the environment, human health and economies from local to global scale.

56 pp. US$20.00 ISBN 978-92-807-2783-8. Published by UNEP, www.gpa.unep.org.

Developments in deriving critical limits and modeling critical loads of nitrogen for terrestrial ecosystems in Europe

By W. de Vries et al. Presents an overview of adverse effects of nitrogen deposition in terrestrial ecosystems, a review of currently used critical limits of nitrogen concentrations in soil solution, and the current state of knowledge in the modelling of critical loads.

206 pp. Alterra-report 1382. Available at www.alterra.wur.nl

Critical loads of acidity for alpine lakes

By M. Posch et al. 69 pp. Published by the Federal Office for Environment, Switzerland. Report UW-0709-E. Available from www.bafu.admin.ch/?lang=en

Impacts of air pollution on alpine lakes and rivers

By S. Steingruber and L. Colombo. 74 pp. Published by the Federal Office for Environment, Switzerland. Report UW-0619-E. Available at www.bafu.admin.ch/?lang=en

Urban Planning for Reduced Car Use

Manual published by the Municipality of Lund. Can be downloaded from www.lund.se (type Urban Planning in the search window).

Slow progress in negotiations

The Vienna Climate Change Talks failed to produce agreement on important conclusions – contrary to media reports.

At the end of August representatives of most nations gathered in Vienna to discuss climate change in two parallel sessions within the climate convention:

The dialogue group, which includes all nations, held general discussions on topics that included a new UN report on the financial aspects of climate change.

The ad hoc working group, which is only open to those countries that have ratified the Kyoto Protocol, began preparing for the negotiations that are to be held in Bali in December, when the nations are expected to stake out a timetable for the successor to the Kyoto Protocol. The new protocol needs to be ready to sign by 2009 in order to come into effect before the Kyoto Protocol expires in 2012. The ad hoc group does not include the USA or Australia.

On the final day of the meeting the ad hoc group managed to agree on a formulation that refers to the IPCC's fourth assessment report and implies that emissions from industrialized countries need to be reduced by 25–40 per cent by 2020, compared with 1990 levels.

Most media sources reported this as meaning that the nations have now agreed on a reduction of 25 to 40 per cent as a target for future negotiations, although there is nothing in the records of the meeting to support this conclusion. Several nations were also reluctant to mention any figures for emission reductions, including Canada, Japan, Switzerland, New Zealand and Russia.

On 24 September, the UN is scheduled to host a high-level ministerial meeting on climate change. US President Bush has separately called a meeting of major emitters in Washington on 27–28 September.

Per Elvingson

Further information: **UN Framework Convention on Climate Change**, www.unfccc.int (select "Meetings" in left-hand column).

Two degrees is too much!

The Alliance of Small Island States (AOSIS) said in a submission to the dialogue group that under international law, states have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states.

As a consequence they believe that all nations have a duty to ensure that climate change is slowed down, and that the frequently mentioned target to limit temperature rise to 2°C is set too high to protect the most vulnerable countries:

"Even a 2°C increase compared to pre-industrial levels would have devastating consequences due to resulting sea level rise, coral bleaching, coastal erosion, changing precipitation patterns and the impacts of increasingly frequent and severe weather events."

"A temperature rise of just 1°C above 1980–99 levels implies significant coral bleaching, increased losses from flooding, and substantial species extinction," write the AOSIS members in reference to the latest IPCC report, and therefore argue that such scenarios must be developed and highlighted.

The AOSIS group clearly identify where responsibility lies for reducing emissions: "Consistent with the polluter pays principle and the principle of common but differentiated responsibilities and respective capabilities, the largest historical emitters must now take aggressive action under the Convention to facilitate the reduction

Coming events

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Sixth Environment for Europe Ministerial Conference. Belgrad, Serbia, 10-12 October. *Information*: www.environmentforeurope.org.

CDM 2.0: what post-2012 mechanisms do we need? Brussels, Belgium,15 October. *Information*: Climate Action Network Europe, www.climnet.org.

How to Make the Sea Green: Seminar on Air Pollution and Greenhouse Gas Emissions from Maritime Transport. Brussels, Belgium, 17 October 2007. *Information*: T&E, www.transportenvironment.org/Article460.html

The 8th Annual Global Conference on Environmental Taxation. Munich, Germany, 18-20 October. *Information*: www.worldecotax.org

Ultrafine Particles in Urban Air. Dresden, Germany, 23-24 October 2007. *Information*: www.ufipolnet.eu.

EU Environment Council. 30 October 2007.

IMO BLG 12 – Revision of MARPOL Annex VI. Berlin, Germany, 29 October - 2 November. *Information*: www.imo.org

Clean Vehicles and Fuels – European Symposium and Exhibition. Stockholm, Sweden, 8-9 November 2007. *Information*: www1.stocon.se/cleanvehicles/9/10620.asp

Scaling up Renewables: Finance, Policy and Market Growth. London, UK, 19-20 November. *Information*: Chatham House, www.chathamhouse.org.uk/events.

3rd Annual European Energy Policy Conference. Brussels, Belgium, 21-22 November 2007. *Information*: www.euenergypolicy.com.

Workshop on integrated assessment modelling of nitrogen. Laxenburg, Austria, 28-30 November 2007. *Information*: LRTAP Convention, www.unece.org/env/lrtap

EU Transport, Telecommunications and Energy Council. 29-30 November and 3 December.

UN Climate Convention COP13 and COP/MOP3. Bali, Indonesia, 3-14 December 2007. *Information*: www.unfccc.int.

Executive Body for the LRTAP Convention. Geneva, Switzerland, 10-14 December. *Information*: LRTAP Convention, www.unece.org/env/lrtap

EU Environment Council. 17 December 2007.

World Sustainable Energy Days 2008. Wels, Austria, 5-7 March 2008. *Information*: www.wsed.at.