NO. 1, MARCH 2011

Acid News

High economic benefits of new NEC directive

The annual benefits of achieving the interim targets of the EU thematic strategy on air pollution are valued at 15-49 billion euro in 2020.

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The role of forests in the Climate Convention

Negotiations for the second commitment period of the Kyoto Protocol continue to point towards a bias in accounting for sinks rather than sources.

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Negotiations for new emission ceilings

Europe-wide solutions for step-wise improvements of health and the environment at the least overall cost are being investigated within the LRTAP Convention.

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100 percent renewable energy globally by 2050

The world could be fuelled by renewable energy by 2050, while maintaining rates of economic growth and with small lifestyle changes, according to WWF.

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Strict sulphur standards no threat to shipping

The health benefits alone are worth 27 times more than the costs to the shipping industry, when tougher standards for sulphur emissions are introduced in 2015.

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NOx emission control in the Baltic Sea

Designating the Baltic Sea as a Nitrogen oxides Emission Control Area will more than halve ships' NOx emissions by 2040.

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The remaining carbon budget

Between 750 Gt and 1000 Gt of global CO_2 emissions is all that remains if the world is to have a 75 per cent chance of staying below the 2°C target, according to three reports.

In the Cancun agreements reached last December the United Nations adopted for the first time a target that global average temperature increase due to global warming should stay below 2°C compared with pre-industrial levels. It was also decided in Cancun that the UN should now analyse a 1.5°C target and the paths required to reach it. The next IPCC 5th Assessment Report, to be published in 2013/2014, will include a 1.5°C scenario.

Governments now have to decide how to stay below the 2°C ceiling, and over the next few months the European Union,

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Acid News

A newsletter from the Air Pollution & Climate Secretariat, 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 fulfil the purpose of Acid News, we need information from everywhere, so if you have read or heard about something that might be of general interest, please write or send a copy to:

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The Air Pollution and Climate Secretariat
The Secretariat has a board consisting of one representative from each of the following organisations: Friends of the Earth Sweden, Nature and Youth Sweden, the Swedish Society for Nature Conservation, and the World Wide Fund for Nature (WWF) Sweden.

The essential aim of the Secretariat is to promote awareness of the problems associated with air pollution and climate change, and thus, in part as a result of public pressure, to bring about the needed reductions in the emissions of air pollutants and greenhouse gases. The aim is to have those emissions eventually brought down to levels that man and 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 organisations, 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 organisations 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.

Editorial

AirClim

Necessary to go for 50 per cent by 2020

The EU should strengthen its climate targets during its European Council meeting in June this year. Large ecosystems around the world are threatened by global temperature increases above 1.5°C. This includes several small island states and low-lying coastal areas in Bangladesh and Egypt, for example, that are threatened by a sea level rise of more than 50 cm and large ecosystems like the arctic sea ice, coral reefs and mountain glaciers.

Temperature increases above this level would also have very serious effects on agricultural production and water availability in Africa and Asia, and could trigger large-scale ocean acidification. This year the EU should therefore stiffen its climate target set up in the 1990s from 2°C to a new target "below 1.5°C" in response to new scientific research about the tipping points of global ecosystems. The 1.5°C target is already supported by more than 100 countries in the UN Framework Convention on Climate Change.

"the window for reaching this temperature target is diminishing very fast"

Research in the last few years has shown that the window for reaching this temperature target is diminishing very fast if no decisions on very sharp emission cuts for greenhouse gases are taken now. All greenhouse gases must be reduced at the global level by nearly 100 per cent by 2050 at the latest. Carbon dioxide emissions play the key role in achieving the 1.5°C ceiling by 2100 and the remaining carbon budget that is left is very small (see articles on pages 1 and 5).

Swedish environmental organisations such as AirClim are strongly recommending the EU to divide the remaining carbon budget on a per-capita principle and to make sure that the EU takes responsibility for historical emissions and reduces emissions much faster than poor countries. These countries in the G77 must have the right to some space for development and cannot reduce emissions as fast as rich industrialised countries. However, the developing countries should also cut GHG emissions to zero by 2050. AirClim is demanding that the EU and other industrialised countries use domestic measures to reduce emissions by at least 50 per cent by 2020 and after that reduce emissions as soon as possible by 100 per cent long before 2050. The EU has to set up an emergency programme to reach these targets and assist substantially poor countries to develop sustainable energy systems. This would be the first step on a path towards fulfilling the limits of the remaining carbon budget and the 1.5°C target.

Reinhold Pape

The remaining carbon budget

Continued from front page

for example, will adopt a roadmap and emission reduction goals for 2020 to 2050. There is a clear risk that those decisions will not correspond with what science tells us is needed to reach the targets with high probability.

Several scientific institutions and environmental organisation have recently conducted research to calculate how much carbon dioxide, or greenhouse gases as a whole, can be emitted globally while still having a chance of staying below the 2-degree target. The German Advisory Council on Global Change (WBGU)[1] calculation for the global CO_2 budget is described in the following paragraphs.

"In order to limit global warming to 2°C, a cap must be set on the total amount of CO_2 emitted globally from fossil-fuel sources. Due to their sheer quantity and immense longevity in the atmosphere, CO_2 emissions must be the key focus of climate change mitigation. WBGU therefore proposes the introduction of a mandatory global cap in the form of a global CO_2 budget that may be emitted until the year 2050. The higher the desired probability of limiting warming to 2°C, the smaller the available budget is to be set.

WBGU proposes a global budget of 750 Gt CO_2 for the period 2010–2050. With this amount, there is a two-thirds probability that climate warming can be kept within the 2°C guard rail.

A world population of 6.9 billion in the year 2010 and a global budget of 750 Gt CO_2, would allow for average annual per-capita emissions of 2.7 t CO_2 until 2050. National emissions budgets are based on the size of the national population. With an estimated population of 82.2 million for 2010, Germany would have a national CO_2 budget of 9 Gt. How quickly a country exhausts its national budget will depend on its emissions and hence its mitigation efforts. If Germany's annual CO_2 emissions of around 0.9 Gt remain unchanged at the current level and no flexible mechanisms are deployed, the German budget would be exhausted within 10 years."[2]

Ecofys, the Dutch research institute, estimates the maximum level of greenhouse gas emissions necessary to achieve the 2°C target depending on the probability of meeting this target. It was estimated that in order to have a 50 per cent chance of meeting the 2°C target, CO_2 emissions should total no more than 2,000 Gt between the years 2000 and 2050. Increasing the probability of meeting such a target to 75 per cent would mean that a maximum of 1,500 Gt can be allowed within this period. Between 2000 and 2010, global emissions already account for roughly 500 Gt of CO_2. This implies that between 2010 and 2050, a maximum of 1,000–1,500 Gt can be emitted in order to meet the 2°C target with probabilities of 75 per cent and 50 per cent, respectively.[3]

In the United Kingdom, Friends of the Earth with advice from the Tyndall Centre for Climate Change Research has calculated the remaining global carbon budget as well. Their global carbon budget of 1,100 Gt CO_2 equivalents would require

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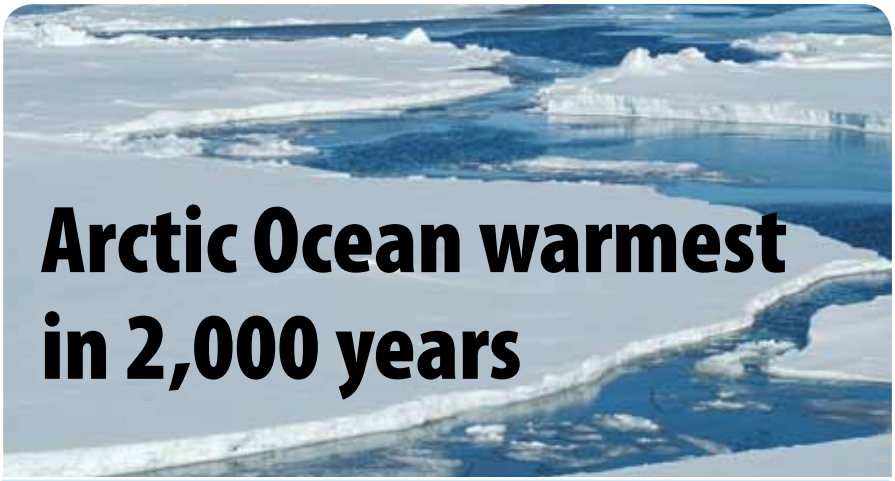


STAPHY/FOTOLIA

Arctic Ocean warmest in 2,000 years

Water flowing into the Arctic Ocean from the Atlantic Ocean is about 2 °C warmer today than it has been for at least 2,000 years, according to a study published in Science. The findings add to the picture of Earth's warming waters and melting sea ice, and the researchers suggest that the temperature rise is linked to amplification of climate change in the Arctic.

Researchers from the Leibniz Institute of Marine Sciences in Kiel, Germany, focused on the Fram Strait, which runs between Greenland and Norway's Svalbard archipelago, and which hosts the biggest channel of warm water flowing into the Arctic. The current of warm water lies 50 metres below the surface, and can reach a balmy 6°C in summer – warm in comparison to the frigid Arctic, where icy surface waters can be -2°C.

The summer water temperatures, reconstructed from the makeup of tiny organisms buried in sediments in the Fram Strait, have risen from an average 5.2°C from 1890-2007 and about 3.4°C in the previous 1,900 years.

The findings were a new sign that human activities were stoking modern warming since temperatures are above past warm periods linked to swings in the sun's output that enabled, for instance, the Vikings to farm in Greenland in Medieval times.

The authors wrote that the warming temperatures "are presumably linked to the Arctic amplification of global warming" and that the warming "is most likely another key element in the transition to a future ice-free Arctic Ocean."

Sourrce: Reuters, 28 January 2011

The remaining carbon budget

Continued from page 3

a very steep and unprecedented decline in global emissions.[4]

The report says that if the maximum amount of global emissions the world could allow were shared out equally on the basis of average populations between now and 2050, the US would need to reduce its emissions by as much as 95 per cent by 2030, the EU by 83 per cent, and the UK by 80 per cent. China would need to peak its emissions by 2013 and then reduce them by five per cent per year. The report shows emissions reductions for individual countries based upon an equal sharing of 1,100 Gt CO_2 equivalents 2010-2049 global budget (Table 1).

If historical, cumulative emissions are counted, the US and EU have already used more than their share of the global carbon budget. Emissions in these countries would need to cease immediately.

Reinhold Pape

Country	Carbon budget 2010-2049 (GtCO2e)	Peak year	Trajectory – annual percentage change in emmissions
Very high per capita emitting countries			
United States	49.2	2010	> -15 a year
Saudi Arabia	4.8	2010	> -15 a year
Russia	17.4	2010	> -15 a year
Australia	3.4	2010	> -15 a year
Canada	5.3	2010	-15 a year
Japan	15.7	2010	-10 a year
High per capita emitting countries			
South Korea	6.5	2010	-10 a year
Czech Republic	1.4	2010	-10 a year
Germany	10.4	2010	-9.5 a year
Poland	4.8	2010	-8 a year
EU	67.5	2010	-8 a year
UK	9.1	2010	-7.5 a year
Eire	0.7	2010	-7 a year
Medium per capita emitting countries			
Slovakia	0.7	2010	-6 a year
Hungary	1.3	2010	-5 a year
Italy	8.0	2010	-5 a year
Sweden	1.3	2010	-4.5 a year
Mexico	16.7	2013	+5 a year to 2013, then -5 a year afterwards
China	193.1	2013	+5 a year to 2013, then -5 a year afterwards
Chile	2.6	2014	+5 a year to 2014, then -5 a year afterwards
Thailand	9.7	2014	+5 a year to 2014, then -5 a year afterwards
South Africa	7.3	2015	+5 a year to 2015, then -5 a year afterwards
Syria	4.0	2016	+5 a year to 2016, then -5 a year afterwards
Low per capita emitting countries			
Tunisia	1.6	2020	+5 a year to 2020, then -5 a year afterwards
Brazil	28.7	2025	+5 a year to 2025, then -5 a year afterwards
Egypt	14.7	2025	+5 a year to 2025, then -5 a year afterwards
Indonesia	35.9	2028	+5 a year to 2028, then -5 a year afterwards
Peru	4.8	2032	+5 a year to 2032, then -5 a year afterwards
Very low per capita emitting countries			
India	195.8	2034	+5 a year to 2034, then -5 a year afterwards
Vietnam	13.9	2035	+5 a year to 2035, then -5 a year afterwards
El Salvador	1.0	2040	+5 a year to 2040, then -5 a year afterwards
Bolivia	1.7	After 2050	+5 a year
Pakistan	35.2	After 2050	+6 a year
Ghana	4.7	After 2050	+10 a year to 2035, then +5 a year afterwards
Sudan	8.1	After 2050	+10 a year to 2035, then +5 a year afterwards
Bangladesh	26.7	After 2050	+10 a year to 2041, then +5 a year afterwards
Uganda	8.2	After 2050	+15 a year to 2045, then +5 a year afterwards

Table 1 shows emissions reductions for individual countries based upon an equal sharing of 1,100 Gt CO_2 equivalents 2010-2049 global budget, assuming no negative emissions.

[1] The German Advisory Council on Global Change (WBGU) was established by the German Federal Government as an independent, scientific advisory body in 1992 in the run-up to the Rio Earth Summit. WBGU is an interdisciplinary body which provides in-depth scientific analyses and derives recommendations for policy action and research.

[2] German Advisory Council on Global Change (WBGU), 2009, "Solving the climate dilemma: The budget approach, Special Report"

http://www.wbgu.de/fileadmin/templates/dateien/veroeffentlichungen/sondergutachten/sn2009/wbgu_sn2009_en.pdf

http://www.wbgu.de/fileadmin/templates/dateien/veroeffentlichungen/factsheets/fs2009-fs3/wbgu_factsheet_3_en.pdf

[3] "Emission pathways towards 2ºC", Utrecht: EcoFys, 2009 , EcoFys, 2009, N. Hohne, C. Ellerman, R. de Vos

[4] "Reckless Gamblers – How Politicians' inaction is ramping up the risk of dangerous climate change" , Friends of the Earth England, Wales and Northern Ireland, 2010, http://www.foe.co.uk/resource/reports/reckless_gamblers.pdf

Carbon dioxide controls Earth's temperature

KARIN DALZIEL/ CREATIVE COMMONS

Not so important according to report.

Water vapour and clouds are the major contributors to Earth's greenhouse effect, but a new atmosphere-ocean climate modelling study shows that the planet's temperature ultimately depends on the atmospheric level of carbon dioxide.

The study published in Science, conducted by Andrew Lacis and colleagues at NASA's Goddard Institute for Space Studies (GISS) in New York, examined the nature of Earth's greenhouse effect and clarified the role that greenhouse gases and clouds play in absorbing outgoing infrared radiation. Notably, the team identified non-condensing greenhouse gases – such as carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbons – as providing the core support for the terrestrial greenhouse effect.

Without non-condensing greenhouse gases, water vapour and clouds would be unable to provide the feedback mechanisms that amplify the greenhouse effect.

A companion study led by GISS co-author Gavin Schmidt published in the Journal of Geophysical Research shows that carbon dioxide accounts for about 20 per cent of the greenhouse effect, water vapour and clouds together account for 75 per cent, and minor gases and aerosols make up the remaining five percent. However, it is the 25 per cent non-condensing greenhouse gas component, which includes carbon dioxide, that is the key factor in sustaining Earth's greenhouse effect. By this accounting, carbon dioxide is responsible for 80 per cent of the radiative forcing that sustains the Earth's greenhouse effect.

The climate forcing experiment described in Science was simple in design and concept – all of the non-condensing greenhouse gases and aerosols were zeroed out, and the global climate model was run forward in time to see what would happen to the greenhouse effect. Without the sustaining support of the non-condensing greenhouse gases, Earth's greenhouse effect collapsed as water vapour quickly precipitated from the atmosphere, plunging the model Earth into an ice-bound state – a clear demonstration that water vapour, although contributing 50 per cent of the total greenhouse warming, acts as a feedback process, and as such, cannot by itself uphold the Earth's greenhouse effect.

"Our climate modelling simulation should be viewed as an experiment in atmospheric physics, illustrating a cause and effect problem which allowed us to gain a better understanding of the working mechanics of Earth's greenhouse effect, and enabled us to demonstrate the direct relationship that exists between rising atmospheric carbon dioxide and rising global temperature," Lacis said.

The study ties in with the geological record in which carbon dioxide levels have oscillated between approximately 180 parts per million during ice ages, and about 280 parts per million during warmer interglacial periods. To provide perspective to the nearly 1°C increase in global temperature over the past century, it is estimated that the global mean temperature difference between the extremes of the ice age and interglacial periods is only about 5°C.

"When carbon dioxide increases, more water vapour returns to the atmosphere. This is what helped to melt the glaciers that once covered New York City," said co-author David Rind, of NASA's Goddard Institute for Space Studies. "Today we are in uncharted territory as carbon dioxide approaches 390 parts per million in what has been referred to as the 'superinterglacial.'"

"The bottom line is that atmospheric carbon dioxide acts as a thermostat in regulating the temperature of Earth," Lacis said. "The Intergovernmental Panel on Climate Change has fully documented the fact that industrial activity is responsible for the rapidly increasing levels of atmospheric carbon dioxide and other greenhouse gases. It is not surprising then that global warming can be linked directly to the observed increase in atmospheric carbon dioxide and to human industrial activity in general."

Reinhold Pape

Based on text provided by NASA and Science Daily
http://www.nasa.gov/topics/earth/features/co2-temperature_prt.htm

Germany is one of the countries that have gained most from the NEC directive, as proably will the runners at the Berlin Marathon.

High economic benefits of new NEC directive

The annual benefits of achieving the interim targets of the thematic strategy on air pollution are valued at 15-49 billion euro in 2020.

Additional air pollution abatement measures under a revised National Emissions Ceilings (NEC) are clearly cost-effective, according to an updated cost-benefit analysis (CBA) prepared for the European Commission. It is estimated that the monetised health benefits of achieving the interim targets of the EU's thematic strategy on air pollution exceed the costs by up to 37 times.

The costs of the additional emission reduction measures beyond the baseline (current legislation) that are required to meet the targets of the strategy have been estimated at 1.3-1.5 billion euro per year in 2020 (see AN 3/2010, pp.6-8). This equals an annual cost per EU citizen of approximately three euro, or a daily cost per person of less than one eurocent.

A comparison between the costs of additional emission reductions and the incremental monetised health benefits, shows that the benefits far outweigh the costs. Even when assuming the lowest figures for health damage valuation, the benefits are 15 billion euro – about 12 times higher than the costs. If a higher health damage valuation is assumed instead, benefits are estimated at 49 billion euro, i.e. 37 times higher than the costs.

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.

The study includes information on costs and benefits for each of the 27 EU member states. Net benefits from the assessment of health impacts – both for the low and high mortality valuation cases – are recorded in all countries except Cyprus.

As the benefit calculations include only health effects it is not surprising that

the greatest benefits accrue to countries with the largest populations (Germany, France, UK, Italy, Poland). A more even spread of benefits is seen when results are normalised per head of population. Benefits across the EU are estimated to average between approximately 30 and 100 euro/person and year.

Not surprisingly, benefits are more concentrated towards the centre of Europe, where countries pick up the benefits of emission controls in many neighbouring countries, than around the edges. Countries with higher than EU average benefits per person include Belgium, Czech Republic, France, Germany, Hungary, Luxembourg, Netherlands, Poland, Portugal, Romania, and the United Kingdom.

The report concludes that the analysis clearly demonstrates that monetised benefits outweigh costs for the EU even under the assumption of the lower valuation of mortality. It is pointed out that the surplus of benefit over cost could well be greater than shown here, because some benefits are not included in the analysis and because previous research has demonstrated that estimates of the costs of pollution control tend to be exaggerated.

Christer Ågren

Source: "Cost Benefit Analysis for the Revision of the National Emission Ceilings Directive." Interim Report to European Commission (20 December 2010). By M. Holland et al, AEA Technology plc, UK. Available at: http://ec.europa.eu/environment/air/pollutants/cba.htm

Table: Monetised annual health damage in 2000 and in 2020 under three scenarios, compared to incremental annual costs over the baseline scenario in 2020.

	2000	Baseline 2020	TSAP 2020	MTFR 2020
Premature deaths due to $PM_{2.5}$	566,000	250,000	230,000	181,000
Monetised health damage (bn euro/yr)	277-790	186-583	170-535	135-422
Monetised health benefits over baseline (bn euro/yr)			15-49	51-161
Costs over baseline (bn euro/yr)			1.3	51

Note: When evaluating chronic mortality from exposure to $PM_{2.5}$ two alternative values are used, the lower one is based on value of life years lost (VOLY) and the higher one on value of a statistical life (VOSL). Figures for the year 2000 are from "NEC CBA Report 1 – Baseline report" (AEA, May 2007).

Baseline = Baseline scenario assumes implementation of current legislation and policy.

TSAP = Optimized scenario achieving the environmental targets of the 2005 thematic strategy on air pollution at the least cost for EU27 as a whole.

MTFR = Maximum technically feasible reductions in the GAINS computer model, i.e. limited to include only so-called end-of-pipe technical measures.

Revision of NEC directive further postponed

Urgently needed measures to tackle air pollutants that are blamed for premature deaths and ecosystem damage will be further delayed. Following a debate on air quality at the European Commission on 18 January, environment commissioner Janez Potocnik released a statement, which makes clear that the Commission has no immediate plans to revise the National Emission Ceilings (NEC) directive, and indicating that there will be no action until 2013 when a whole string of related legislation is planned to be overhauled simultaneously.

The decision was immediately criticised by the European Environmental Bureau (EEB). Additional cuts in air pollutant emissions by revising the NEC directive could benefit the EU economy by up to 70 billion euro a year – up to 50 times the cost of doing so.

Sources: Press releases from European Commission and EEB, 19 January 2011.

Industrial Emissions Directive published

The new Industrial Emissions Directive (IED) has been published and entered into force. Directive 2010/75/EU updates and merges seven pieces of existing legislation directives on solvents, large combustion plants (LCPs), waste incineration, titanium dioxide production and integrated pollution prevention and control (IPPC), and will strengthen the application of Best Available Techniques (BAT) in the permitting process. Member states have two years to transpose the directive into their legislation.

Source: Official Journal, 17 December 2010.

CARO'S LINES/CREATIVE COMMONS

Seven pieces of legislation have been merged.

Non-compliance with EU air quality laws

Both Poland and Belgium have failed to transpose into national law the 2008 EU air quality directive. Consequently, the European Commission has sent a reasoned opinion to Poland, while Belgium is receiving a second reasoned opinion. In case Poland and Belgium do not comply, the Commission may refer them to the Court of Justice and may already ask the Court to impose financial sanctions.

According to the Commission, Latvia has failed to effectively tackle PM_{10} pollution, and the daily concentration limit values have not been respected in all zones in Latvia since the legislation was adopted in 1999 and became binding in 2005. While Latvia has applied for time extension for one zone, the Commission considers that the conditions for granting it have not been met. Therefore a reasoned opinion was sent, and Latvia has two months to take appropriate action.

Source: European Commission, 16 February 2011.

Policy action improves air quality in Europe

A new study by the European Environment Agency (EEA) evaluates three key EU policy instruments for air pollution control and finds that they have significantly improved Europe's air quality and reduced pollution-induced health damage. There is however scope for further improvement, if countries achieve all their binding commitments to reduce emissions.

Industrial combustion and road transport are major sources of air pollutants, accounting for around 50–66 per cent of total emissions of fine particles, acidifying pollutants and ozone-forming gases.

To reduce air pollutant emissions from these sources, the EU has among other things introduced emission standards for road vehicles and directives on Integrated Pollution Prevention and Control (IPPC) and Large Combustion Plants (LCP). But how effective have they been?

The study estimates how much these policies have reduced air pollutant emissions and improved Europe's air quality compared to a "no-policy scenario". It also explores how much better air quality could be if the policies were fully applied.

Despite a 26 per cent increase in road transport fuel use over the period 1990–2005, the introduction of the road vehicle standards has cut road transport emissions of carbon monoxide (CO) by 80 per cent, non-methane volatile organic compounds (NMVOC) by 68 per cent, nitrogen oxides (NOx) by 40 per cent, and fine particles ($PM_{2.5}$) by 60 per cent, compared to a no-policy scenario.

Regarding industrial combustion, current emissions of NOx and sulphur dioxide (SO_2) are significantly below the no-policy scenario, and the reduction in PM emissions from industrial combustion is more marked than from the road transport sector. Concentrations of acidifying pollutants (NOx, SO_2) and fine particles would be around twice as high if no measures had been implemented.

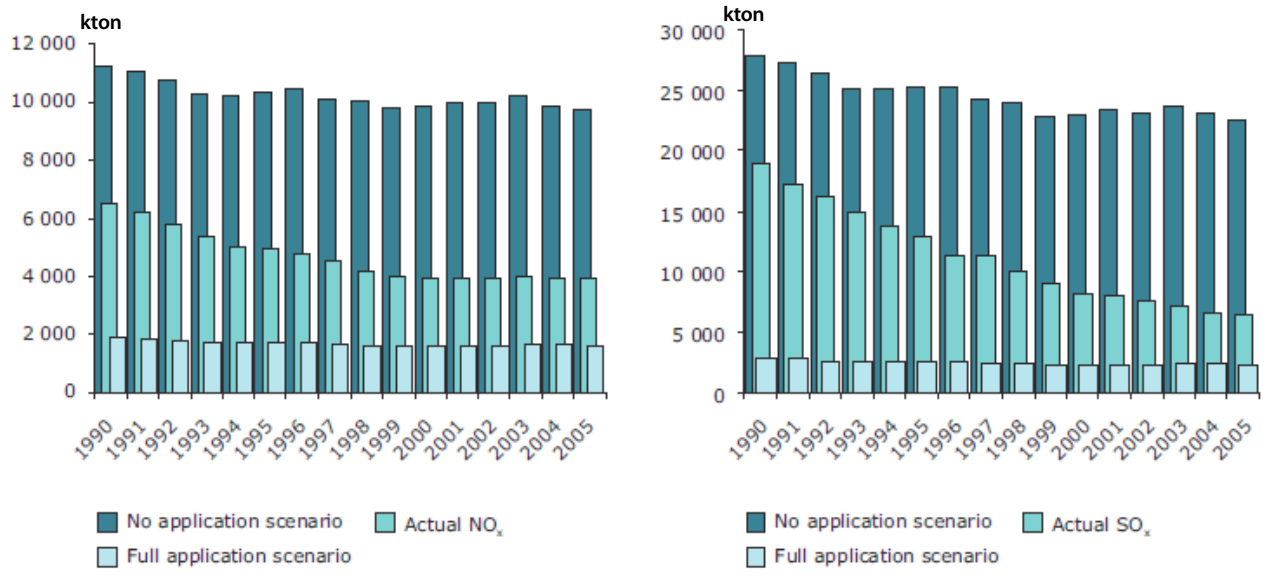
If the latest road vehicle standards were fully applied in all European countries, however, emissions could be reduced much further. This would mostly affect NOx emissions and direct $PM_{2.5}$ emissions from diesel-fuelled vehicles.

In many countries, NOx and SO_2 emissions from combustion plants could be approximately halved if they were brought down to the requirements set out in the LCP legislation, i.e. if emissions were in line with the associated emission levels (AELs) described in the Large Combustion Plant Best Available Techniques (BAT) Reference Document (LCP BREF). High reduction potentials for this sector are mainly found in southern and eastern Europe.

A combination of the "full application" scenarios for the road transport and industrial combustion sectors results in a theoretical potential for further reductions in $PM_{2.5}$ concentrations in all countries, ranging between 0 and 5 micrograms per cubic metre ($\mu g/m^3$), as well as lowered ozone concentrations in a large part of Europe, especially in the Mediterranean area (but slightly increased concentrations some other areas).

Sources: EEA press release from 5 January 2011, and the report "Impact of selected policy measures on Europe's air quality" (EEA Report No 8/2010). Available at: www.eea.europa.eu/highlights/has-policy-improved-europe2019s-air-quality

Note: The "EEA-32" area is made up of the 27 EU member states plus Iceland, Liechtenstein, Norway, Switzerland, and Turkey.



Comparison of the 'no application', 'actual' and 'full application' scenarios for industrial combustion plants (EEA-32 countries) for NOx (left) and SO_2 (right).

CHERYL CASEY/FOTOLIA

Major emitters.

Further cuts in emissions of air pollutants needed

The European Environment Agency (EEA) recently released its fourth state of the environment report (SOER 2010), providing a comprehensive assessment of how and why Europe's environment is changing.

As part of the SOER 2010, thirteen Europe-wide thematic assessments of key environmental issues have been done, one of which deals with air pollution. In this, it is noted that the most problematic pollutants in terms of health damage are fine particles (PM), ground-level ozone (O_3) and nitrogen dioxide (NO_2), and that many EU member states do not comply with legally binding air quality limits. Effects of these pollutants can range from minor respiratory irritation to cardiovascular diseases and premature death. An estimated 5 million years of lost life per year are due to fine particles ($PM_{2.5}$) alone in the 32 countries covered by the EEA.

The EU has not achieved its interim environmental objective that was set to protect sensitive ecosystems from acidification. However, in the EEA-32, the ecosystem area affected by excess acidification due to air pollutant depositions was significantly reduced between 1990 and 2010. This was mainly a result of past sulphur dioxide (SO_2) abatement measures.

Nitrogen compounds, emitted as nitrogen oxides (NOx) and ammonia (NH_3), are now the principal acidifying components of air pollution. In addition to its acidifying effects, nitrogen deposition also contributes to nutrient oversupply (eutrophication) in terrestrial and marine ecosystems, leading to changes in biodiversity. The area of sensitive ecosystems affected by excessive atmospheric nitrogen diminished only slightly between 1990 and 2010.

Exposure of crops and other vegetation to elevated levels of ground-level ozone will continue to exceed long-term EU objectives.

In terms of controlling emissions, only 14 countries expect to comply with all four pollutant-specific emission ceilings set under EU and international legislation for 2010. Emission ceilings for NOx are the most challenging – 12 countries expect to exceed their ceilings, some by as much as 50 per cent.

Despite significant reductions since 1990, the energy sector is still responsible for nearly three-quarters of the SO_2 emissions and one-fifth of the NOx output. Another important source of pollution is road transport – heavy-duty vehicles are an important emitter of NOx, while passenger cars are among the top sources of carbon monoxide (CO), NOx, $PM_{2.5}$ and non-methane volatile organic compounds (NMVOCs). Energy use by households – the burning of fuels such as wood and coal for heating – is an important source of $PM_{2.5}$. Agriculture is responsible for 94 per cent of the ammonia emissions.

Under a current policy scenario, the EEA-32 and western Balkan emissions of the main air pollutants are projected to decline by 2020. The largest proportional decreases are projected for emissions of NOx and SO_2. Emissions of $PM_{2.5}$ and NH_3 are however projected to be similar or even slightly higher than in 2008, although substantial reductions are technically possible.

EEA concludes that successfully addressing air pollution requires further international cooperation. There is growing recognition of the importance of the long-range movement of pollution between continents and of the links between air pollution and climate change. Factoring air quality into decisions about reaching climate change targets, and vice versa, can ensure that climate and air pollution policies deliver greater benefits to society.

Christer Ågren

Source: "Air pollution – SOER 2010 thematic assessment", 30 November 2010. Web link: www.eea.europa.eu/soer/europe/air-pollution

EU consultation on Sixth Environmental Action Programme

The European Commission has launched a public consultation to assess the effectiveness of the EU's Sixth Environmental Action Programme (6EAP), which expires in 2012. A final assessment will be presented in mid-2011, based among other things on a report from the European Environment Agency. A stakeholder meeting on the 6EAP will be held on 29 March in Brussels. The internet consultation is open until 8 April 2011.

Source: European Commission, 28 January 2011.

A recent decrease in carbon storage.

VIEW CAMPER/CREATIVE COMMONS

Negotiating forests in the Climate Convention

Among the plethora of acronyms flooding global climate negotiations, LULUCF is one of the most frequently used. Interpreted Land-Use, Land-Use Change and Forestry it has been a controversial issue in the negotiations for the Kyoto Protocol and its implementation since the beginning. The battle is still raging in an almost impenetrable fog of calculation methods, reference levels, caps and exceptions and with devils in virtually every detail.

The underlying logic is simple: the larger the amount of biological carbon sequestration countries may account for, the smaller the reductions required from burning of fossil fuel. This has led to negotiating dynamics in which many countries have an interest in rules that maximise LULUCF credits. They pursue accounting rules that are biased towards crediting sinks versus debiting emissions. The rules for LULUCF are a series of attempts to reduce the level of gaming in the system and to steer them in the least damaging direction, while still satisfying the interests of the LULUCF lovers of the world. So far, the outcome of the process is a set of complex and somewhat fragmented rules.

Negotiations for the second commitment period of the Kyoto Protocol continue to point towards a bias in accounting for sinks rather than sources. It appears that parties not only want to account more for sinks, but they don't want to account for some emissions. Parties have continued to develop fixes for their particular issues and some have even staked their 2020 target on these fixes. New Zealand have stated that their 20 per cent reduction target by 2020 is conditional on LULUCF and Russia's range of emission reductions is based on the condition that LULUCF will contribute to the target.

At the 7th convention of the parties to the UN Climate Convention (COP 7) in Marrakesh in 2001, eight principles for governing LULUCF activities were adopted in order to ensure that their use should not undermine the environmental integrity of the Kyoto protocol (see box). Parties have continued to accept these principles for the second commitment period (beyond 2012). To what extent they will be implemented remains to be seen. Negotiations on LULUCF rules have been going on since 2008 and become increasingly complicated as attempts are made to

include additional land-use activities and to close loop-holes – or to open new ones. No agreement was reached at COP16 in Cancun last December.

Changes and additions to the LULUCF rules in a number of areas are on the negotiating table right now, including:

- inclusion of additional land-use activities, such as forest degradation and conversion of wetlands.
- forest management accounting approaches
- natural disturbances
- accounting for carbon storage in harvested wood products.

Presently, conversion of forested to non-forested land is included in LULUCF accounting, while degradation of forest is not. However, degradation (i.e. loss of biomass) from selective logging, fuel wood collection or fire can result in substantial reduction of forest carbon stocks. If degradation was included in the accounting, such as proposed by Tuvalu, it would remove an imbalance particularly for those countries that have chosen to include forest management in their LULUCF accounting.

Wetland management has been proposed as a new LULUCF activity. The conversion of wetlands is a significant source of greenhouse gas emissions. There is, however, doubt whether emissions from peat land management can be correctly quantified and transparently reported.

At present, Kyoto Protocol Parties may voluntarily include forest management in their LULUCF accounting up to a cap agreed in the Marrakesh accords. A number of parties have proposed new options for the next commitment period, aiming at increasing incentives to include forest management. Some of these proposals would increase the possible forest management credits dramatically – and thus decrease the need to reduce fossil fuel emissions correspondingly.

Due to the potentially large emissions from natural disturbances, such as forest fires and pest outbreaks, parties are trying to address ways to exclude these emissions from their accounting. In the negotiations the term "force majeure" is used for these events, which are in fact part of natural dynamics in a large part of the world's forests.

A number of countries have proposed that carbon storage in harvested wood products (HWP) should be included in the second commitment period LULUCF accounting rules, while others oppose this. The issue is that part of the carbon in harvested wood is not released into the atmosphere immediately, but stored in long-lived wood products (such as wooden houses) and landfills. Critics claim that no workable, consistent and comprehensive approach for calculating this pool has been adopted. Furthermore, accounting for additions to the pool of wood products without accounting for emissions from the entire pool could incentivise increased harvesting and thus unsustainable logging.

Roger Olsson

Based on "LULUCF-Briefing" by Climate Analytics 2010. The report can be downloaded from: http://www.airclim.org/factsheets/lulucfguide.pdf

The Marrakesh principles on LULUCF

- That the treatment of these activities be based on sound science;
- That consistent methodologies be used over time for the estimation and reporting of these activities;
- That the aim stated in Article 3, paragraph 1 of the Kyoto Protocol not be changed by accounting for land use, land-use change and forestry activities;
- That the mere presence of carbon stocks be excluded from accounting;
- That the implementation of land use, land-use change and forestry activities contributes to the conservation of biodiversity and sustainable use of natural resources;
- That accounting for land use, land-use change and forestry does not imply a transfer of commitments to a future commitment period;
- That reversal of any removal due to land use, land-use change and forestry activities be accounted for at the appropriate point in time;
- That accounting excludes removals resulting from: (i) elevated carbon dioxide concentrations above their pre-industrial level; (ii) indirect nitrogen deposition; and (iii) the dynamic effects of age structure resulting from activities and practices before the reference year.

Climate policy links to air quality

A Dutch study has found that climate policy is likely to bring benefits to the country's air quality by 2020. Measures that stimulate energy saving, energy efficiency, and the use of wind, solar and geothermal energy always benefit national air quality. The purchase of foreign CO_2 credits, however, "exports" air quality benefits to other countries.

Some climate measures, such as carbon capture and storage and increasing small-scale production and use of bioenergy, may on the other hand increase the amount of certain air pollutants. But these increases can be prevented by additional air pollution abatement. The use of biofuels in road transport is expected to have negligible effects on air pollution exhaust emissions.

Source: "Co-impacts of climate policies on air polluting emissions in the Netherlands", by the Dutch Policy Research Programme on Air and Climate (December 2010). Web link: www.pbl.nl

Spanish cities hiding air pollution problem

Spain's environmental prosecutor, Antonio Vercher, has launched an investigation into suspected manipulation of air pollution data in the country's largest cities. In 2009 the Madrid municipality had quietly moved nearly half its pollution sensors from traffic-clogged streets in the city centre to parks and gardens.

Environmental group Ecologistas en Acción claimed that authorities in 13 Spanish cities "have been surreptitiously moving measuring stations since 2001." Despite the suspected data manipulation, levels of pollutants remain above legal limits in Madrid and elsewhere in Spain.

Source: ENDS Europe Daily, 7 February 2011.

MARK PATTISON

Where is the traffic?

Air pollution in the UK linked to 200,000 deaths

Reducing concentrations of particulate air pollution would lead to significant gains for public health, according to new review from an independent expert group.

Long-term exposure to fine particles may take almost two years off the lives of some 200,000 people, says a panel of experts to the UK government.

A study published on 21 December 2010 by the Committee on the Medical Effects of Air Pollutants (COMEAP), an independent advisory group of experts reporting to the UK Department of Health, found that man-made pollution by fine particles ($PM_{2.5}$) led to a loss of 340,000 years of life in 2008.

This loss of life is an effect equivalent to 29,000 premature deaths per year, but the expert group stressed that along with other factors, air pollution was likely to have taken an average of just under two years off the lives of 200,000 people.

As an average for the whole population, exposure to $PM_{2.5}$ pollution levels in 2008 is calculated to cut life expectancy at birth by six to seven months in England and Wales. In Scotland and Northern Ireland the pollution levels are lower and the impacts smaller – here life expectancy is cut by three or four months on average. Because of higher local pollution levels, the effects in cities would be greater than the average figures.

Emission abatement measures that would reduce annual average concentrations of $PM_{2.5}$ by just one microgram per cubic metre (equal to about ten per cent of the average man-made contribution), would raise life expectancy at birth by about twenty days. This may seem like a small number, but for the population as a whole, the benefits would add up to about four million extra years of life over the next hundred years.

If it were possible to remove all human-made fine particulate matter from the UK's air, one would see a six-month increase in life expectancy from birth and gain an estimated 35.5 million years of life over the same time period.

Professor Jon Ayres, Chairman of COMEAP, said: "The report clearly shows that particulate air pollution continues to have a significant effect on health in the UK and, importantly, that reducing concentrations of this pollutant would lead to significant gains for public health. Expressing the effects of air pollution numerically is difficult and this report is, I think, the most detailed examination of the problem yet published."

The expert group concluded that the mortality effects of long-term exposure to particulate pollution can be reported in terms of effects on life expectancy, and on loss or gain in life years across the population. It has also reported the effects as equivalent to a number of deaths occurring in a specified year, although it does not advise the use of deaths when evaluating the impacts of pollution reduction as the number will vary year on year.

Dirty air worse for heart than cocaine

Air pollution triggers more heart attacks than using cocaine and poses as high a risk of sparking a heart attack as alcohol, coffee and physical exertion, according to new findings published in The Lancet journal. Sex, anger, marijuana use and chest or respiratory infections can also trigger heart attacks to different extents, the researchers said, but air pollution, particularly in heavy traffic, is the major culprit.

Source: Reuters, 24 February 2011.

In the report, it is stated that: "As a central estimate, we conclude that anthropogenic $PM_{2.5}$ at 2008 levels had an effect on mortality equivalent to nearly 29,000 deaths in 2008 in the UK and an associated loss of total population survival of 340,000 years. These results are consistent with an average loss of life ranging from 11½ years, if air pollution was solely responsible for 29,000 deaths, to six months if the timing of all deaths was influenced by air pollution.

We believe both of these possibilities to be extremely unlikely. Given that much of the impact of air pollution on mortality is linked with cardiovascular deaths, it is more reasonable to think that air pollution may have made some contribution to the earlier death of up to 200,000 people in 2008, with an average loss of life of about two years per death affected, though that actual amount would vary between individuals. However, this assumption remains speculative."

National air quality campaigners have been fighting hard and long for the UK government to publish updated statistics on the health impacts of air pollution and accused officials of underestimating the health impacts.

James Grugeon of charity Environmental Protection UK, said: "This shocking new report is unequivocal about the massive impact that air pollution has on the health of the UK public. It is high time the issue was taken seriously – action to mitigate pollution must be prioritised immediately."

Christer Ågren

The report "The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom – A report by the Committee on the Medical Effects of Air Pollutants" can be found on the COMEAP website: www.comeap.org.uk

Air pollution control saved 160,000 lives

The benefits of reducing fine particle and ground-level ozone pollution under the 1990 Clean Air Act amendments will reach approximately US$2 trillion in 2020 while saving 230,000 people from early death in that year alone, according to the United States Environmental Protection Agency (EPA). About 85 per cent of the economic benefits are attributable to reductions in premature mortality associated with reductions in ambient particulate matter.

The new EPA report, "*The Benefits and Costs of the Clean Air Act from 1990 to 2020*," shows that the benefits of avoiding early death, preventing heart attacks and asthma attacks, and reducing the number of sick days for employees far exceed the costs of implementing clean air protection measures. These benefits lead to a more productive workforce, and enable consumers and businesses to spend less on health care – all of which help strengthen the economy, the agency concludes.

In the year 2010, the reductions in fine particle and ozone pollution from the 1990 Clean Air Act amendments prevented more than:

- 160,000 cases of premature mortality
- 130,000 heart attacks
- 13 million lost work days
- 1.7 million asthma attacks

In 2020, the study projects benefits are projected to prevent more than:

- 230,000 cases of premature mortality
- 200,000 heart attacks
- 17 million lost work days
- 2.4 million asthma attacks

LISA F. YOUNG/FOTOLIA

A less common scene in the US, because of the Clean Air Act.

It should be noted that this report estimates only the benefits from the 1990 Clean Air Act amendments. The 1990 Clean Air Act amendments built on the progress made in improving the nation's air quality through the Clean Air Act of 1970 and its 1977 amendments. The overall benefits of the Clean Air Act exceed the benefits estimated in this report, with millions of lives saved since 1970.

The report is the third in a series of EPA studies required under the 1990 Clean Air Act amendments that estimate the benefits and costs of the act. These reports are intended to provide Congress and the public with comprehensive, up-to-date, peer-reviewed information on the Clean Air Act's social benefits and costs, including improvements in human health, welfare, and ecological resources, as well as the impact of the act's provisions on the US economy.

Source: US EPA press release, 1 March 2011.

For more information and a copy of the summary report: http://www.epa.gov/air/sect812/prospective2.html

Coal-fired power could be considerably cleaner

A new report by the American Lung Association, entitled "*Toxic Air: The Case for Cleaning Up Coal-fired Power Plants*", documents a range of hazardous air pollutants emitted from power plants and the urgent need to clean them up to protect public health. The report also discusses the technologies that are available for dramatically cutting these emissions – technologies that are commercially available and proven to work.

"It's time that we end the 'toxic loophole' that has allowed coal-burning power plants to operate without any federal limits on emissions of mercury, arsenic, dioxin, acid gases such as hydrogen chloride and other dangerous pollutants," said Charles D. Connor, president and CEO of the American Lung Association.

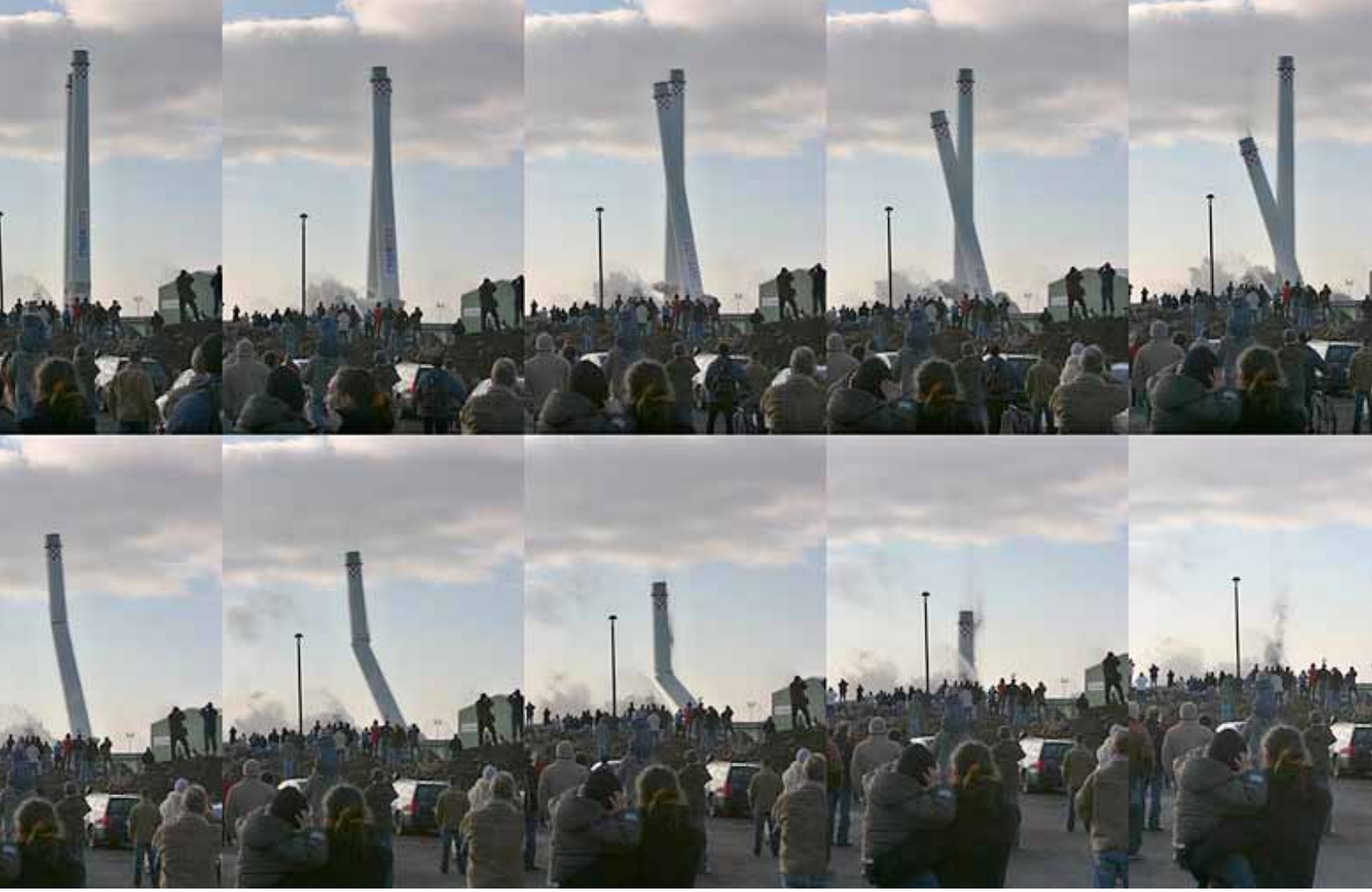
Source: American Lung Association press release, 8 March 2011.

Database on impacts of electricity generation

The United States Environmental Protection Agency (EPA) has updated its databases that help Americans understand the health and environmental impacts of electricity generation.

eGRID is a database on emissions of NOx, SO_2, CO_2, CH_4 and N_2O from almost all electric power generated in the US. The data are used to show the impacts of electricity generation as well as the benefits from reduced electricity demand. Power Profiler is a user friendly online application that uses eGRID data to show air emissions information in various regions of the country. By simply entering a zip code and selecting a utility, users can learn more about where their electricity comes from and what impact it has on air quality and the environment.

Source: US EPA press release, 8 March 2011.



Process to be continued?

RENE SCHWIETZKE/CREATIVE COMMONS

Ongoing negotiations for new emission ceilings

Europe-wide solutions for step-wise improvements of health and the environment at the least overall cost are being investigated.

A revised Gothenburg Protocol to the Convention on Long-range Transboundary Air Pollution Convention (LRTAP) should be ready before the end of 2011, according to a decision by the convention's Executive Body (EB), which met in Geneva in December 2010.

The Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone was signed in 1999 and entered into force in 2005. It sets binding national emission ceilings for 2010 for four pollutants (sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia), contains emission limit values for a number of specific emission source categories such as large combustion plants and road vehicles, and requires the use of best available techniques.

Ongoing negotiations are taking place under the convention's Working Group on Strategies and Review (WGSR) and focus on establishing new emission ceilings for 2020, updating the technical annexes that specify emission limit values etc., and including new pollutants, primarily fine particles ($PM_{2.5}$).

Black carbon is to be included in the revision of the Gothenburg Protocol as a component of $PM_{2.5}$, the EB agreed. Other air pollutants that contribute to near-term global climate change, such as

The CLRTAP Convention

The Convention on Long-Range Transboundary Air Pollution (CLRTAP) dates back to 1979 and covers 51 parties in Europe and North America. The convention is extended by eight protocols that specify emission reduction commitments and identify specific abatement measures to be taken. Cooperation under the convention includes development of policies and strategies to combat the discharge of air pollutants through exchanges of information, consultation, research and monitoring.

More information: www.unece.org/env/lrtap/

ground-level ozone with its precursors, are to be investigated more closely.

To provide negotiators with up-to-date information on cost-effective emission abatement options up to 2020, a computer model for integrated assessment is being used.

In February 2011, a first set of cost-optimised scenarios was produced by the International Institute for Applied Systems Analysis (IIASA), and discussed by the convention's Task Force on Integrated Assessment Modelling.

The scenarios are constructed for what is known as a gap closure approach, aiming at step-wise health and environmental improvements. This first set of scenarios investigated gap-closures of varying levels of ambition, from 25 to 75 per cent gap closure (see AN 3/10, pp. 14-15).

Recommendations from the Task Force are fed into the formal negotiation process, with the next negotiation meeting taking place in Geneva on 11-15 April. A final negotiating meeting is scheduled for mid-September.

Implementation of the existing protocol is a matter of high priority for the convention, and the EB was informed by its implementation committee that some countries are still failing to comply with the emission reduction demands of the protocols, and several countries are failing to comply with the obligation to report.

Despite repeated sharp reprimands over several years, Greece and Spain have now been in non-compliance with the 1988 NOx Protocol for 16 years, i.e. every year since 1994. Spain has also failed to comply with the 1991 VOC Protocol, and is still a long way from achieving the required 30-per-cent reduction.

Consequently, the EB expressed increasing disappointment at the continuing failure of Spain and Greece to fulfil their obligations to take effective measures to attain compliance, and strongly urged both countries to implement the measures necessary to achieve compliance as soon as possible. Cyprus was also criticised for non-compliance with the NOx Protocol.

A long-term strategy for the implementation of the Convention was adopted, providing strategic directions for the next ten years and beyond. The challenges to be addressed include: Health damage, especially from fine particles; Acidification and eutrophication of ecosystems with ensuing effects on biodiversity; Impacts to health and vegetation from ground-level ozone; and, Damage to materials and cultural monuments.

Christer Ågren

The report and other documents from the Executive Body meeting are available at: www.unece.org/env/lrtap/ExecutiveBody/welcome.28.html

Cutting PM pollution saves lives and money

Further reductions in pollutant emissions to levels that achieve the World Health Organisation's (WHO) annual air quality guideline for fine particles ($PM_{2.5}$) of 10 micrograms/cubic metre in 25 large European cities could add up to 22 months of life expectancy for persons 30 years of age and older, according to the Aphekom research programme. Moreover, the monetary health benefits from complying with the WHO guideline would amount to some 31.5 billion euro annually, including savings on health expenditures, absenteeism and intangible costs such as well-being, life expectancy and quality of life.

Current EU legislation sets a limit value for $PM_{2.5}$ of 25 μg/m^3 to be met by January 2015, and an indicative limit value of 20 μg/m^3 from January 2020, subject to a review in 2013. The Aphekom findings will strengthen the case for the 2020 limit to be tightened.

Source: Aphekom press release, 2 March 2011. Web link: www.aphekom.org

Coal's hidden costs top $345 billion in US

The United States' reliance on coal costs the economy about US$345 billion a year in hidden expenses not borne by miners or utilities, including health problems in mining communities and pollution around power plants, according to a new study, entitled "*Full cost accounting for the life cycle of coal*".

The US$345 billion annual cost figure is a best estimate of the costs associated with burning coal – the costs could be as low as US$175 billion or as high as US$523 billion.

Accounting for all the ancillary costs associated with coal burning would add about 18 cents per kilowatt hour to the cost of electricity from coal-fired plants. Those costs would effectively triple the price, shifting electricity produced by coal-fired plants from one of the cheapest sources of electricity to one of the most expensive, the study led by a Harvard University researcher found.

Coal-fired plants currently supply about 45 percent of the nation's electricity, according to US Energy Department data.

Source: Reuters, 16 February 2011.

New boiler emissions standards save lives

In response to federal court orders, the US Environmental Protection Agency is issuing final Clean Air Act standards that reduce toxic air emissions, including mercury and soot, from boilers and two types of waste incinerators. The new standards are estimated to cut the overall cost of implementation by about 50 per cent, or US$1.8 billion, as compared to an earlier draft proposal issued last year.

EPA estimates that the new standards will avoid between 2,600 and 6,600 premature deaths, prevent 4,100 heart attacks and avert 42,000 asthma attacks per year in 2014, and that for every dollar spent to cut these pollutants, the public will see between US$10 and US$24 in health benefits, including fewer premature deaths. Moreover, the rule is expected to generate over 2,000 new jobs.

Information: www.epa.gov/airquality/combustion

100 per cent renewable energy globally by 2050

The world could be fuelled by 95 per cent renewable energy by 2050, according to a report by WWF, while maintaining rates of economic growth and with small lifestyle changes.

"The Energy Report 100% Renewable Energy By 2050" was produced by WWF in collaboration with the energy consultant EcoFys and the Switzerland-based OMA, Office for Metropolitan Architecture.

It comes in two parts, the first more qualitative and inviting discussion, the second a full energy balance from EcoFys.

The scenario projects a 2050 world with no fossil use for electricity, transport and buildings, and for more than an 80-per-cent cut in fossil energy use in industry, where some coke use in the steel industry remains.

Nuclear is ruled out for several reasons. Carbon Capture and Storage is not dismissed, but is not credited "primarily because it is expected to mature too late, by 2025–2030. By the time CCS could then be deployed on a large scale, the use of fossil fuels will have declined so heavily that investments would not be likely to yield the required returns."

This may seem a pretty devastating critique, but the report hastens to say a few favourable words about CCS, such as bio-CCS and its use for industrial processes. (Maybe it would have been simpler to state that the report authors have different views.)

The quote also shows that the scenario is not only a 2050 scenario. It is not a case of a perfect, but distant world. There is a dotted line through 2020, 2030 and 2040, and the scenario does not make any heavy bets on unproven technology.

But to see the broad picture, with a manageable amount of figures, Table 1 summarises the use in 2010 and 2050.

As seen, efficiency plays a large part. Energy use is projected to shrink some 15 per cent despite two billion more people and world GDP that is more than doubled.

An important part of this increased efficiency comes from retrofitting 2-3 per cent of the floor area of existing buildings every year. Such a level of renovation has already taken place in Germany, according to the report.

	2010	2050
Total electricity (EJ/a)	60.0	127.4
Wind power: Onshore	1.4	25.3
Wind power: Offshore	0.0	6.7
Wave & Tidal	0.0	0.9
Photovoltaic solar	0.1	37.0
Concentrated solar: Power	0.1	21.6
Hydropower	11.3	14.9
Geothermal	0.3	4.9
Biomass	0.0	16.2
Coal	21.5	0.0
Gas	14.0	0.0
Oil	3.1	0.0
Nuclear	8.2	0.0
Industry fuels & heat (EJ/a)	79.1	59.0
Concentrated solar: Heat	0.0	8.8
Geothermal	0.1	2.9
Biomass	6.1	34.8
Fossil fuels	72.9	12.5
Building fuels & heat (EJ/a)	86.0	24.1
Solar thermal	0.7	12.6
Geothermal	0.5	8.4
Biomass	33.2	3.1
Fossil fuels	51.6	0.0
Transport fuels (EJ/a)	102.6	50.8
Biomass	4.8	50.8
Fossil fuels	97.8	0.0
Grand total (EJ/a)	327.6	261.4
of which biomass	44.1	104.9
wind	1.4	32
solar	0.9	80
geothermal	0.9	16.2

Table 1. Global energy provided by source and year (EJ/a).

The biggest contribution to renewables comes from biomass. This suggests a need for "250 million hectares for bioenergy crops, equal to about one sixth of total global cropland". To achieve this without deforestation or food and water shortages is admittedly "no easy challenge".

However an honest effort to reconcile different land use stakeholders is presented in the report. It does not use inflated figures for available land, and subtracts more protected land and all land now used for food from the potential area available.

The problem is not that very large amounts of sustainable biomass production is impossible in principle; it is that that we live in an imperfect world where things often go wrong, as already happens. It is commendable to state that "land-grabbing" – when rich countries buy or lease large tracts of land, especially in Africa, to grow biofuels or food – should be outlawed.

But how can you create enough strong incentives for bioenergy crops without also creating incentives for abuse?

Some of the biomass potential is not so controversial however.

Traditional biomass for cooking etc. in poor countries, often unsustainable, is projected to decrease substantially, taking stress off some land.

Residues and waste from food and agriculture should be used more widely and more efficiently, as should felling waste

Solar thermal, part of a non fossil energy mix.

INTERNATIONAL RIVERS/CREATIVE COMMONS

and other by-products from sustainable forestry.

Algae is an additional resource, though not yet a proven technology.

Other routes to sustainability include very large lifestyle changes. This report assumes fairly mild and slow changes of this type.

World GDP is (by convention) expected to grow by more than 100 per cent from 2010 to 2050.

Though no austerity is assumed, some lifestyle changes are seen as necessary. "If people in the developed world ate half as much meat as they do today, we would need less land for growing animal feed and grazing."

Personal mobility is also predicted to rise by 2050. Projections show the overall distance people travel will increase by half in OECD countries, and treble in the rest of the world. Ecofys "suggests we can manage these increases if we move towards more efficient forms of transport – walking or cycling short distances, taking buses, and taking the train instead of flying."

1.4 billion people are not connected to the electric grid today. This is one reason why global electricity use more than doubles. The other reason is of course that much of the near-term energy technology produces electricity: wind, hydro, photovoltaics and concentrating solar thermal power produces nothing else. Geothermal energy is used both for direct heat (11.3 EJ) and for power (4.9) by 2050.

	Efficiency gain 2050 vs 2000 %	Electrification %
2,3-wheelers	50	40-90
Car, city	75	90
Car, non-city	75	70
Bus, coach	50-65	50-70
Ship	50	none
Rail, freight & passenger	30	95
Truck	65	30
Plane, freight & passenger	50	none

Table 2. Efficiency and fuel shift assumptions for all transport modes.

Biomass is projected mainly for transport and industry use, but a minor part of it is used for power production.

Concentrating solar thermal, considered for deserts, can store some energy as heat, so electricity production can continue through the night, but not for cloudy days. Photovoltaics and wind and wave power, on the other hand, have a big problem with variability. Hydro and biomass can mitigate, as can demand side management.

The report assumes that for 60 per cent wind and photovoltaics, "full use of all of the following four levers are needed":

- Grid capacity increase
- Demand side management, first for

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How to cut global energy use by three quarters

It will probably be difficult to replace all fossil fuels with sustainable energy. But if we first cut energy demand it will be much easier – and the potential for energy efficiency is huge!

The world could cut energy use by 73 per cent according to a Cambridge team. They claim this is achievable with proven technology, such as better insulation, lightweight cars and using a lid when cooking.

It's the physics, stupid.

At least you have to start with the physics, because if physics and economics collide, physics will prevail.

While most people agree in principle that energy conservation makes more sense than building new power stations, the influence of neoclassical economists has usually stopped serious conservation effort. The basic economic notions are that a) the present system is in economic balance, i.e. optimised b) that people always makes rational choices and c) that all the choices can be squeezed into one, monetary, dimension.

All empirical evidence shows this to be wrong, but it still represents the conventional wisdom.

If you accept it, the only way to cut energy use is to increase prices, which is political suicide.

The actual success stories of energy conservation, such as the EU ban on incandescent lamps or previous US legislation on car fuel consumption have been achieved by non-economic thinking, though in effect saving a lot of money.

The physical view is taken by a new report *"Reducing energy demand: what are the practical limits?"*.[1]

A physical model calculates theoretical efficiency limits based on engineering principles.

The Cambridge team notes the inefficiency of energy conversion devices. If you use coal to produce power and use the power in an oversized motor for an oversized fan, the total efficiency can be ridiculously low.

But their focus is on passive systems. The final energy, as heat, cooling, light or motion, tends to dissipate, but there is great potential to keep it a while longer, so less energy input is needed. Don't build a new heating system; concentrate on stopping the heat from escaping.

Designing all buildings to Passivhaus standard (see Wikipedia) can save 83 per cent of present energy use for heating, or 179 exajoules (EJ) or 50,000 TWh.

Illuminated space can, they claim, save 95 per cent of energy input. How? Much of it through directing light to where it is needed and wanted, for example to the office desk rather than the office floor. Inferior luminaires steal much of the light instead of sending it to where it is wanted. More losses result from dirty lamps and luminaires. Lighting levels are also often unnecessarily high, to cover future degradation. And cleaner or whiter roofs and walls can cut losses even more. Such detailed information can be found in supporting information, to be retrieved for free at *http://pubs.acs.org/doi/suppl/10.1021/es102641n/suppl_file/es102641n_si_001.pdf*

TRAIN BIRD/ CREATIVE COMMONS

Passive houses: an active way to save energy.

Industrial furnaces can, by using better insulation and heat recovery, save 62 per cent of present energy use or 42 EJ.

Industrial drive systems (pumps, fans, refrigeration etc.) can save 59 per cent of energy by using larger diameter tubing and other simple measures.

Cars could save 91 per cent of the 40 EJ they now consume. The passive system here is the motion, which is attacked by air drag, rolling resistance, and braking. As the greatest saving potential is in urban driving – 96 per cent – compared to the more modest 87 per cent in highway driving, one of the most important measures is to cut weight. Based on calculations for Rocky Mountain Institute's '2000 Revolution Hypercar' they conclude that a 200 kg car would be practical and meet safety requirements. Other contributions come from tyres now on the market and from using an aerodynamic shape, not quite the ideal teardrop shape but halfway there.

Heat losses from cooking are reduced 80 per cent by putting a lid on the boiling pan. Insulation of cookers and fridges can save a total of 67 per cent from appliances.

The 73-per-cent overall saving would obviously take time to achieve, but on the other hand improvements in conversion efficiency would add to the potential, such as improved light sources compared to business as usual. The total saving, without substantial life style changes, is 85 per cent.

Can we substitute all fossils for renewables? If it looks difficult, subtract 73-85 per cent first!

Unfortunately that is not the politicians' view. The EU Commission is pouring money into fusion, CCS and gas pipelines, with just a trickle for wind and solar, but the mandatory efficiency target for 2020 is getting nowhere.

Fredrik Lundberg

[1] By Cullen, Allwood, and Borgstein of the Department of Engineering, University of Cambridge in Env Sc&Tech 12 Jan 2011.

100 per cent renewable energy ...

Continued from page 17

wholesale customers but then also for individuals

- Storage as pumped hydro, centralised hydrogen storage and heat storage
- Excess electricity is used for hydrogen production for use as a fuel in specific applications.

Hydrogen is given a limited role in the scenario, due to huge research, development and infrastructural demand. It is mainly projected for use near production, as an industrial fuel or high temperature source, not for example for cars, but plays a minor part as fuel for ships.

In this electricity-dependent world, cars have to be overwhelmingly electric, either alone or as plug-in vehicles. Electrification degrees are given as follows from

It can be done, but it won't be easy. One of the non-climate objects is equity, i.e. to end energy poverty and to give access to electricity to everybody. Anything else would be unfair, and this probably calls for some economic growth. Historical data at least tells us that in poor countries, there is a strong correlation between economic growth and life quality.

But is a doubling in global GDP really necessary or, for that part, likely? It could be argued that slower growth would make it simpler to make ends meet.

Fredrik Lundberg

The report can be downloaded from wwf.panda.org/what_we_do/footprint/climate_carbon_energy/energy_solutions/renewable_energy/sustainable_energy_report/

Polar ice sheets melting faster than predicted

Ice loss from the massive ice sheets covering Greenland and Antarctica is accelerating, according to a new study.

If the trend continues, ice sheets could become the dominant contributor to sea level rise sooner than scientists had predicted, concludes the research, published in the journal Geophysical Research Letters.

"The traditional view of the loss of land ice on Earth has been that mountain glaciers and ice caps are the dominant contributors, and ice sheets are following behind," said study co-author Eric Rignot, a glaciologist at NASA's Jet Propulsion Laboratory and the University of California, Irvine. "In this study, we are showing that ice sheets, mountain glaciers and ice caps are neck-and-neck."

But that could soon change, Rignot said, because the rate at which ice sheets are losing mass is increasing three times faster than the rate of ice loss from mountain glaciers and ice caps.

"I don't think we expected ice sheets to run neck-and-neck with mountain glaciers, which basically sit in a warmer climate, this soon," he said.

Source: Greenwire, 9 March 2011

IVONNE WIERINK/FOTOLIA

Will be needed sooner.

Strict sulphur standards no threat to shipping

The health benefits alone are worth 27 times more than the costs to the shipping industry, when tougher standards for sulphur emissions are introduced in 2015.

The health and environmental benefits to society from implementation of stricter shipping fuel sulphur standards from 2015 are considerably higher than the costs, according to a recent study by the European Maritime Safety Agency[1] (EMSA). Moreover, if the price of low-sulphur fuel stays around US$500-800 per tonne, as predicted in most studies, short sea shipping will remain competitive.

MARCUS WOELFLE

Shipping can afford cleaner fuels.

In October 2008 the International Maritime Organisation (IMO) unanimously adopted strengthened requirements on the maximum allowed sulphur content in marine fuel oil (see AN 4/08). As a result, from 1 July 2010, the maximum sulphur limit for marine fuels used by ships in designated Sulphur Emission Control Areas (SECAs) was reduced from 1.50 per cent to 1.00 per cent. This limit is then to be further reduced to 0.10 per cent, starting 1 January 2015.

The EMSA study summarises the findings of eight different studies (published in 2009 and 2010) on the impacts of implementing the 2015 SECA standard, and assesses the various technical options available to achieve the standard.

Not surprisingly, one main issue of concern is the cost of cleaner low-sulphur fuel, and in particular the expected price difference in 2015 between heavy fuel oil (HFO) with 1.00 per cent sulphur and marine gas oil (MGO) with 0.10 per cent sulphur.

Assumptions on the expected future price vary widely between the different studies, mostly ranging from around US$500-900. A study for the European Commission by consultancy Purvis & Gertz assumes a price for 0.10 per cent sulphur MGO of US$883 in 2015, and this would imply a price difference (compared to 1.00 per cent sulphur HFO) of about 60 per cent.

It is worthwhile noting that current EU legislation already requires ships to use fuel with maximum 0.1 per cent sulphur while at berth in ports, and that a significant number of ships plying the SECA areas (i.e. the Baltic Sea and the North Sea) already use fuel with a lower sulphur content than the maximum of 1.00 per cent.

Several studies have tried to assess the effect of the increased fuel costs for shipping on the total transport costs, and the potential for modal shift from shipping to rail and road. EMSA concludes that there are certain risks for such a modal shift, but "only within certain limited routes and under certain (high-end) fuel price scenarios."

It is further concluded that if the price for low sulphur fuel stays around US$500-800 per tonne, as predicted in most studies, "short sea shipping will remain competitive towards other modes even if volumes will be lost", and that if the fuel price reaches levels around US$1,000 per tonne, "the effects will be more severe but still many short sea shipping routes will remain competitive."

There are however some apparently cheaper alternatives available, such as flue gas cleaning (scrubber) or switching to liquefied natural gas (LNG). EMSA describes four different types of scrubbing technologies: sea water scrubber; freshwater scrubber; hybrid scrubber; and, the CNOx system.

All four technologies are said to achieve at least 97 per cent sulphur dioxide (SO_2) removal efficiency (some claiming a removal efficiency of over 99 per cent), which means they will achieve SO_2 emissions equivalent with 0.1 per cent sulphur fuel while using fuel with 3.5 per cent sulphur content. All scrubber systems also reduce emissions of fine particles (PM), some of them significantly.

Using LNG instead of fuel oil eliminates emissions of SO_2 and PM, cuts emissions of nitrogen oxides (NOx) by around 90 per cent, and also reduces emissions of carbon dioxide (CO_2) by some 20-25 per cent.

According to EMSA, both scrubbers and

LNG have "proven their workability and availability as alternatives in the past few years," and "the estimated payback time for both options seems to be relatively short."

But EMSA also points out that for scrubbers, "certain legal clarification at EU level (regarding wash-water standards) would seem helpful", and for LNG that "further work is needed to develop the necessary infrastructure and administrative framework for the bunkering of ships in ports."

While much of the focus of the ongoing debate about the new marine fuel standards is on costs and possible impacts to the shipping industry, EMSA stresses that the underlying objective of the standards is to reduce and minimise damage to health and the environment.

European ship emissions of air pollutants such as SO_2, NOx and PM are rising, and now contribute significantly to the concentrations and fallout of harmful air pollutants in European countries.

In a recent cost-benefit analysis prepared for the European Commission, the annual health benefits alone of the stricter SECA standard are valued at 8-16 billion euro in 2015. This figure is up to 27 times higher than the estimated annual costs of 0.6-3.7 billion euro. By 2020, the annual health benefits will increase to 10-23 billion euro (see AN 3/10, pp4-5).

EMSA notes that the air quality improvements resulting from the new SECA standard will benefit large parts of Europe, but more so those countries bordering the SECAs, and especially the densely populated countries around the North Sea.

Christer Ågren

Source: "The 0.1% sulphur in fuel requirement as from 1 January 2015 in SECAs – An assessment of available impact studies and alternative means of compliance." EMSA Technical Report, 22 October 2010. Published by European Maritime Safety Agency. Available at: http://ec.europa.eu.environment/air/transport/ships_directive.htm

[1] According to its website, EMSA's main objective is to provide technical and scientific advice and assistance to the European Commission and EU member states on issues relating to maritime safety and prevention of pollution by ships in the continuous process of updating and developing new legislation, monitoring its implementation and evaluating the effectiveness of the measures in place. See: www.emsa.europa.eu

Several options for cutting ships' emissions

A mix of regulatory measures, such as emission control areas and fuel efficiency standards, combined with market-based instruments, is the best way of reducing air emissions from shipping, according to a report published by the European Commission's Joint Research Centre (JRC) in December.

The report describes a wide variety of options for reducing emissions of both "traditional" air pollutants and of greenhouse gases (GHG), and provides an assessment of the emission abatement potential of each of these measures.

Application of the technological measures outlined in the report could reduce shipping emissions of sulphur dioxide (SO_2) and fine particles (PM) by 90 per cent, nitrogen oxides (NOx) by 80 per cent, and carbon dioxide (CO_2) by 70 per cent.

Data on cost-effectiveness, expressed as the cost per tonne of avoided pollutant emission, is shown for a number of measures. Regarding SO_2, fuel switching from 2.94 per cent sulphur heavy fuel oil (HFO) to 0.5 per cent sulphur fuel oil is estimated to cost €1,300/tonne, while switching from 2.94 per cent sulphur HFO to 0.1 per cent sulphur marine gas oil (MGO) would cost €3,600-4,300/tonne. If sea water scrubbing is used instead, costs are estimated at €310-550/tonne of SO_2.

All three options would also to a varying degree reduce PM emissions, but it appears as if all of the cost for the fuel switch and scrubber operation, respectively, is allocated solely to the reduction in SO_2.

Application of selective catalytic reduction (SCR) can reduce NOx emissions by 90-95 per cent, at an estimated cost of between €200 and €800 per tonne, depending on factors such as the size of the ship and if the equipment is added to a newly built ship or retrofitted to an existing one.

The JRC points out that to achieve significant reductions of air emissions, fuel- and engine- related technological solutions should be supplemented with other measures. Market-based options addressing both regional and global measures should therefore also be investigated. As an example, the report includes an analysis on how the introduction of market-based policies, such as a GHG Emission Trading Scheme (ETS) for the shipping sector at international level, could be used.

When analysing data and methodologies available to estimate air emissions from ships, the JRC concludes that limited availability of data on shipping movements complicates the design and assessment of air emission reduction strategies. But it suggests that combining data sources could reduce uncertainties.

Christer Ågren

The report "Regulating air emissions from ships: the state of the art on methodologies, technologies and policy options", can be found at: www.jrc.ec.europa.eu/rr

Opportunities and threats of short sea shipping

With freight transports projected to increase rapidly, short sea shipping has been touted as an economical, environmentally friendly alternative to trucking. A new report from Friends of the Earth US, titled "*Expanding short sea shipping in California: Environmental impacts and recommended best practices*", looks at the potentially harmful health and environmental impacts of coastal shipping and ways in which they can be mitigated.

Ships use one of the dirtiest fuels on the planet – bunker fuel – and an increase in short sea shipping may lead to air pollution impacts. Friends of the Earth urges that the best environmental technology and practices should be used in short sea shipping, including advanced engine systems, ultra clean fuel, shore power, and regular equipment maintenance check-ups.

Source: FOE US press release, 27 January 2011.

Norwegian NOx fund renewed

An existing three-year voluntary commitment (2008-2010) by Norway's industrial sector to reduce emissions of nitrogen oxides (NOx) is to be extended by six years, the environment ministry has announced. Sectors involved include shipping, oil and construction.

Participating companies contribute to a fund for investment in reduction measures, in return for which they are exempt from the Norwegian tax on NOx emissions. Fifteen bodies have signed up to the new deal, setting a further reduction target of 16,000 tonnes between 2011 and 2017 for ships, fishing vessels and other sources covered by the agreement.

Source: Norway Environment Ministry press release, 14 December 2010 .

Danes evaluate SECA solutions

The Danish Green Ship of the Future project has launched a new study on alternatives for meeting the air pollution standards applicable to ships sailing in SOx Emission Controlled Areas (SECAs). Three main options will be compared: switching to low-sulphur distillate fuel, using liquid natural gas (LNG) as fuel, and applying exhaust gas cleaning (scrubber) technology. Results are expected before the end of this year.

The overall target for Green Ship of the Future is to develop strategies to reduce shipping emissions of carbon dioxide by 30 per cent, sulphur and nitrogen oxides by 90 per cent each and particulate matter from both existing ships and new builds.

Source: Press release 1 March 2011. Web link: www.greenship.org/

Call for Arctic ban on heavy fuel oil

Members of the European Parliament have called for an international ban on the use and carriage of heavy fuel oil on vessels operating in the Arctic, like that which is to apply to the Antarctic from August 2011, and ask the EU to impose a strict regime limiting soot emissions and the use of heavy fuel oil by vessels calling at EU ports prior to voyages through Arctic waters.

Source: European Parliament, 20 January 2011.

NOx emission control in the Baltic Sea

Designating the Baltic Sea as a NOx Emission Control Area will more than halve ships' NOx emissions by 2040

At a recent meeting in Helsinki of the Baltic Marine Environment Protection Commission (HELCOM), the Baltic Sea countries Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, the Russian Federation and Sweden discussed to propose to the International Maritime Organisation (IMO) that the Baltic Sea should be designated as a NOx Emission Control Area (NECA).

The discussions were based on a report produced by a group of experts under the lead of Finland, according to which about one quarter of the total nitrogen input to the Baltic marine environment comes from atmospheric deposition, i.e. originating from emissions of the air pollutants nitrogen oxides (NOx) and ammonia (NH_3). Shipping has its share in this deposition through large and increasing emissions of NOx, and thus adds to the eutrophication of the Baltic Sea.

The Baltic Sea suffers from a wide range of environmental problems, eutrophication (the over-supply of nutrients, primarily nitrogen and phosphorus) being the most critical one.

Emissions of NOx from shipping in the Baltic Sea are estimated to amount to some 330,000 tonnes. Under current legislation (i.e. in the absence of additional abatement measures), and assuming a two per cent annual growth in traffic, these are projected to rise to approximately 500,000 tonnes by 2040. If it is instead assumed that the Baltic Sea becomes a NECA, all new ships must comply with the stricter Tier III emission standards[1] as from 2016, and ship emissions would then come down to about 160,000 tonnes by 2040.

For comparison, the NO_x emissions from all land-based sources in Denmark, Finland and Sweden combined added up to some 470,000 tonnes in 2008, and are projected to be nearly halved by 2030 under current legislation.

Expected future (by 2045) impacts under a current legislation and a NECA scenario, respectively, were analysed, and three main effects considered. It was found that, as compared to current legislation, introduction of a NECA would result in:

- A noticeable reduction in depositions of oxidised nitrogen compounds, reaching tens of percentage points, to the Baltic Sea area. This difference is more significant over the coastal regions than in the open sea. Moreover, a more pronounced deposition decrease takes place in the summer period, when the sea is most susceptible to excess algae growth.
- Eutrophication – expressed as exceedance of the deposition of nutrient nitrogen over the critical limits for sensitive terrestrial ecosystems – would be reduced by up to 20-30 per cent in several regions around Baltic Sea.
- A lowering of human exposure to nitrogen oxides by up to 50-60 per cent in the coastal areas of the northern part of the Baltic proper and the Gulf of Finland. Looking specifically at harbour areas, NOx concentrations would be up to 10-20 per cent lower.

Potential improvements in human exposure to secondary fine particles ($PM_{2.5}$) or ground-level ozone were not included in the scenario analysis. Neither were reduced exceedance of the critical limits for deposition of acidification of forest and freshwater ecosystems.

Selective catalytic reduction (SCR) was seen as the only current technology that meets the Tier III reduction requirements and for which there is enough informa-

NASA/WIKIMEDIA

Phyto plankton bloom in the Baltic Sea 3 july 2001.

tion to make cost-efficiency estimates. Abatement of one tonne of NOx by installing and operating SCR on ships was estimated to cost between 700 and 3,200 euro, depending on the type of ship and assuming an interest rate of five per cent. However, the average cost is about 1,000-1,400 euro per tonne of NO_x, which equals approximately 3,400-4,500 euro per tonne of nitrogen removed.

It should be noted that these abatement costs are based on the assumption that if a ship leaves the NECA it will shut down the SCR. In practise, however, many ships operate both inside and outside of the Baltic NECA, and if the NECA were extended to cover the North Sea as well, the unit abatement costs would be lowered.

The rise in freight rates for new vessels due to the installation and operation of SCR were estimated at 2-4.6 per cent, depending on vessel type and size. It was concluded that this is a relatively small increase in freight rates, and that the potential for modal shift caused solely by the stricter NO_x standards for new ships that would apply through the NECA designation, will most probably be very small, in most cases non-existent.

Emissions of sulphur dioxide (SO_2) and indirectly also emissions of particulate matter (PM) from international shipping in the Baltic Sea are already regulated through the designation of the Baltic Sea as a SO_x Emission Control Area (SECA), which entered into force in May 2006 as the first SECA ever established under IMO's MARPOL Annex VI.

A formal proposal was expected to be agreed at the March HELCOM meeting, but it was decided to postpone a final decision. The next meeting at which an agreement could be reached is in June.

Christer Ågren

Source: Report of the NECA Correspondence Group on designation of the Baltic Sea as a NOx Emission Control Area. Submitted by Finland on behalf of the NECA Correspondence Group. Discussed at the 32nd meeting of HELCOM's Baltic Marine Environment Protection Commission on 9-10 March 2011 in Helsinki, Finland.

[1] IMO's Tier I NOx emission standard applies globally to all marine diesel engines installed on ships built between 1 January 2000 and 31 December 2010. As from 1 January 2011 the slightly stricter Tier II standards apply, resulting in approximately 15-20 per cent lower NOx emissions. The Tier III standards are set to cut NOx emissions by about 80 per cent, as compared to Tier I, but are restricted to apply only to ships constructed after 1 January 2016 and while operating in NOx Emission Control Areas.

Greener shipping in North America

A new report by DNV suggests that liquid natural gas (LNG) is the most efficient and economical way to meet air emissions requirements in the US and Canada that come into effect in August 2012, when the combined SOx and NOx Emission Control Area (ECA) along the North American coastline enters into force.

According to DNV, constructing a ship for LNG use ship may add about US$3.6 million to the cost of a typical domestic cargo ship. But over the operating life of the vessel, at today's gas rates, LNG fuel would save more than US$4 million over scrubbers and US$12 million over low-sulphur distillate fuel.

Specifically, the use of LNG fuel instead of fuel oil would practically eliminate emissions of sulphur dioxide and particulate matter, reduce nitrogen oxides emissions by 85-90 per cent, and cut greenhouse gas emissions by 15-20 per cent.

Source: DNV press release, 21 February 2011.
Web link: www.dnv.com/resources/reports

No new scrubber guidelines

Exhaust gas cleaning systems (EGCS), also known as scrubbers, can be used by ships as an alternative to low-sulphur fuels to achieve emission reductions, and scrubber guidelines were adopted by the International Maritime Organisation's (IMO) Marine Environment Protection Committee (MEPC) in 2009, but with a caveat that the wash-water discharge criteria should be revised as more data became available on the contents of discharge and its effects on the environment.

Norway had previously pointed out issues to be resolved, regarding demonstration of equivalence for EGCS with emission reductions from using low-sulphur fuels, and approval, enforcement and compliance of EGCS.

In February an IMO technical committee agreed – after some discussion – that revision of the 2009 guidelines should be further delayed.

Source: Sustainable Shipping News, 18 February 2011.

Recent publications from the Secretariat

Market-based instruments for NOx abatement in the Baltic Sea

By Per Kågeson, November 2009. This report assesses potential market-based instruments for reducing emissions from existing vessels and an early introduction of efficient NOx abatement technologies for newly built ships.
A rough calculation of the emission reduction potential indicates that application of an emissions charge, as outlined in the report, could cut NOx emissions from ships in the Baltic Sea by around 60 per cent.

Boreal Forest and Climate Change

By Roger Olsson, November 2009. Reviews recent scientific findings on the fate of the world´s boreal forests under climate change. The effects of climate change are already evident in all parts of the boreal forest, and change will be far more dramatic as temperature continues to increase.

Two degrees of warming may trigger the creation of new, hitherto unseen ecosystems. Three to five degrees warming may be the critical limit for massive forest die-back in the boreal region.

Additional, regional perspectives on the topic is given in *"Boreal Forest and Climate Change - regional perspectives"* (by the same author, April 2010). The expected rate of warming varies considerably within the Arctic region, as does the state of the forest. This means that the possible climate effects - and the possibilities to mitigate them - will be different.

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Coming events

CLRTAP Working Group on Strategies and Review. Geneva, Switzerland, 11-15 April 2011. Information: *www.unece.org/env/lrtap/*

Nitrogen and Global Change: Key findings — Future Challenges. Edinburgh, UK, 11-15 April 2011. Information: www.nitrogen2011.org

Southeast European Congress on Energy Efficiency and Renewable Energy. Sofia, Bulgaria, 13-15 April 2011. Information: *http://tinyurl.com/SofiaCongress*

Health Effects Institute Annual Conference 2011. Boston, Massachusetts, USA, 1-3 May 2011. Information: www.healtheffects.org

The Arctic as a messenger for Global Processes – Climate Change and Pollution. Copenhagen, Denmark, 4-6 May 2011. Information: *www.amap.no*

World Renewable Energy Congress 2011. Linköping, Sweden, 8-13 May 2011. Information: *www.wrec2011.com*

ECOMM 2011. European Platform on Mobility Management. Toulouse, France, 18-20 May 2011. Information: *www.ecomm2011.eu*

International Transport Forum. Leipzig, Germany, 25-27 May 2011. Information: *www.internationaltransportforum.org*

International EFCA-symposium on Ultrafine Particles. Brussels, Belgium, 26-27 May 2011. Information: *www.efca.net*

Acid Rain Conference 2011. Beijing, China, 6-9 June 2011. Information: *www.acidrain-2010.org*

European Biomass Conference and Exhibition. Berlin, Germany, 6-10 June 2011. Information: *www.conference-biomass.com*

UNFCCC meeting of the subsidiary bodies. Bonn, Germany, 6-17 June 2011. Information: http://unfccc.int

EU Environment Council. Luxembourg, 10 June 2011.

IMO Marine Environment Protection Committee. London, UK, 11-15 July 2011. Information: *www.imo.org*

CLRTAP Working Group on Strategies and Review. Geneva, Switzerland, 12-16 September 2011. Information: *www.unece.org/env/lrtap/*

UNFCCC 17th Session of the Conference of the Parties and 7th Session of the Meeting of the Parties to the Kyoto Protocol. South Africa, 28 November - 9 December 2011. Information: http://unfccc.int

CLRTAP Executive Body. Geneva, Switzerland, 12–16 December 2011. Information: *www.unece.org/env/lrtap/*