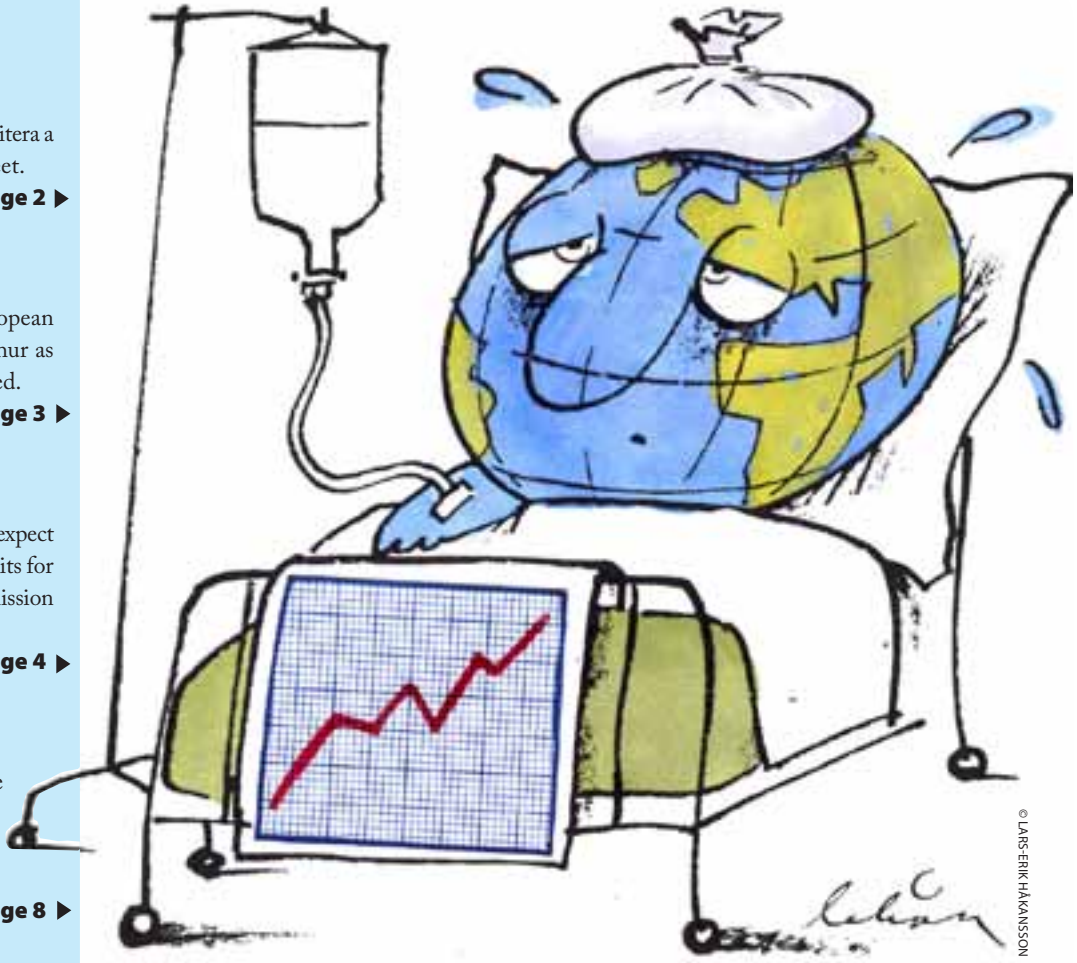
NO. 4, DECEMBER 2009

Acid News



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Welcome to the world at +4° C

A new map published by the British government presents the likely effects of global warming above the +2° goal - a future that seems impossible to cope with.

"We cannot cope with a +4 degrees world," said David Miliband, UK secretary of state, as the British government recently published a map showing the likely effects of a failure to cut greenhouse gas emissions and keep global warming below 2°C. The map has been developed by one of the world's leading climate research institutes, the Hadley Centre.

The map projects the temperatures between 2060 and 2100 if present rates of warming are not slowed. Even more pronounced than earlier projections, it shows the big regional differences in climate change. Since the sea warms more slowly than land areas, average global land temperature will rise by 5.5°C, while

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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 fullfill 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 organizations: Friends of the Earth Sweden, Nature and Youth Sweden, the Swedish Anglers' Association, the Swedish Society for Nature Conservation, and the World Wide Fund for Nature Sweden.

The essential aim of the Secretariat is to promote awareness of the problems associated with air pollution, and thus, in part as a result of public pressure, to bring about the needed reductions in the emissions of air pollutants. The aim is to have those emissions eventually brought down to levels – the so-called critical loads – that the environment can tolerate without suffering damage.

In furtherance of these aims, the Secretariat:

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

Editorial

AirClim

Checklist for Copenhagen

As reported in this issue, the latest research emphasizes the necessity to make drastic cuts in greenhouse gas emissions as quickly and as soon as possible if we are to avoid disastrous climate change.

In the run-up to the Copenhagen summit, Climate Action Network (CAN) has produced a checklist[1] of the essentials for a successful climate agreement. The main essentials are:

☐ **A commitment to keep** warming well below 2°C.
- Reducing greenhouse gas concentrations ultimately to 350 ppm CO_2 equivalents;
- Peaking global emissions within the 2013–2017 commitment period and rapidly declining emissions to at least 80% below 1990 levels by 2050.
- Achieving this in a way that fully reflects the historic and current contributions of developed countries to climate change and the right of developing countries to sustainable development.

☐ **Industrialized countries must cut** emissions by more than 40% by 2020.
- Reductions for individual countries should be assigned based on historic and present responsibility for emissions as well as current capacity to reduce emissions.
- The use of offsets must be limited. As long as developed country targets fall short of ensuring that domestic emissions are reduced by at least 30% below 1990 levels by 2020, there is no room – or indeed need – for offsets.
- Accounting for emissions and removals from Land Use, Land-Use Change and Forestry (LULUCF) must be based on what the atmosphere sees.
- Major sources of emissions must be accounted for, for example forest and peatland degradation.
- LULUCF credits must not undermine or substitute for the significant investments and efforts required to reduce fossil fuel emissions.

☐ **Developing countries must be** supported in their efforts to limit the growth of their industrial emissions, making substantial reductions below business-as-usual.

☐ **Emissions from deforestation and** degradation must be reduced to zero by 2020, funded by at least US$35 billion per year from developed countries.

☐ **Developed countries need to** provide at least US$195 billion in public financing per year by 2020, in addition to ODA commitments, for developing country actions.

☐ **Double counting must be** avoided.

☐ **Copenhagen outcomes must be** legally binding and enforceable.

☐ **Until the international community** agrees to a system that provides better environmental outcomes, a stronger compliance mechanism, and has widespread support, the Kyoto Protocol should continue with a second commitment period.

A complementary agreement should provide emission reduction commitments by the US comparable to other developed countries, incorporate financial commitments, and cover developing country action.

In the run-up to Copenhagen, please use this list to influence your governments.

During and after Copenhagen, use the list as a scorecard to track the progress of the climate negotiations and evaluate the outcomes.

Christer Ågren

1) **Fair, Ambitious and Binding – Essentials for a Successful Deal in Copenhagen** (Nov 2009). Available at: *www.climatenetwork.org/*

Tracking down the worst polluters in Europe

The dirtiest power plants in Europe still emit enormous amounts of air pollutants. The sulphur emissions from one plant match those of ten EU countries combined.

On 9 November, the first inventory of the new European pollutant release and transfer register (E-PRTR) was published. It contains 2007 data on emissions of 91 polluting substances from more than 24,000 industrial facilities in the EU27 and Norway.

The database fulfils a requirement under the Aarhus convention's Protocol on Pollutant Release and Transfer Registers (PRTR), which entered into force on 8 October *(see note)*.

A publicly accessible website has been set up, with a search engine that allows visitors to search using one or more criteria and a map tool. For example, visitors can search emissions from a specific industrial site by name or location.

The Maritsa 2 plant in Bulgaria.

The table showing the "dirty dozen", i.e. the highest-emitting power plant point sources of air pollutants, is based on data from the E-PRTR website.

Despite the existence of EU legislation, such as the IPPC and LCP directives, individual plants can obviously still be allowed to emit enormous amounts of pollution. For example, the Maritsa 2 power plant in Bulgaria alone emits as much SO_2 as ten countries – Austria, Denmark, Finland, Hungary, Latvia, Lithuania, Netherlands, Slovakia, Slovenia and Sweden – combined!

It is notable that the SO_2 emissions from just twelve plants add up to nearly two million tons, representing one quarter of the total SO_2 emissions from all sources in the EU's 27 member states combined.

It is also noteworthy that seven of the twelve highest NOx emitters are located in the United Kingdom, and that eight of the twelve worst CO_2 emitters are to be found in Germany.

Christer Ågren

The E-PRTR register is accessible at: *prtr.ec.europa.eu/*

Note: The Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters seeks to promote greater transparency and accountability by guaranteeing public rights of access to environmental information, providing for public involvement in environmental decision-making and requiring the establishment of procedures enabling the public to challenge environmental decisions. It was adopted in 1998, entered into force in 2001, and has currently 43 Parties. The PRTR Protocol was adopted in May 2003, and has to date been ratified by 20 countries and the European Community.

THE DIRTY DOZEN:

Table: The "dirty dozen" power plants in the EU27 in 2007 for emissions of carbon dioxide (CO_2), sulphur dioxide (SO_2), and nitrogen oxides (NOx). **Source**: *prtr.ec.europa.eu/*

	Plant	CO_2 Tons
1	Niederaussem (DE)	31,300,000
2	Belchatow (PL)	28,300,000
3	Jänschwalde (DE)	24,200,000
4	Drax (UK)	22,600,000
5	Weisweiler (DE)	19,900,000
6	Frimmersdorf (DE)	19,600,000
7	Neurath (DE)	16,800,000
8	Boxberg (DE)	16,300,000
9	Federico II (IT)	14,200,000
10	Agioy Dhmhtrioy (EL)	13,000,000
11	Scholven (DE)	12,600,000
12	Schwarze Pumpe (DE)	12,400,000

	Plant	SO_2 Tons
1	Maritsa 2 (BG)	430,000
2	Magalopolis (EL)	229,000
3	As Pontes (ES)	211,000
4	Andorra (ES)	184,000
5	Turceni (RO)	121,000
6	Patnow (PL)	119,000
7	Galabavo (BG)	116,000
8	Rovinari (RO)	110,000
9	Maritsa 3 (BG)	99,700
10	Belchatow (PL)	93,100
11	Meirama (ES)	90,200
12	Narva (EE)	56,900

	Plant	NOx Tons
1	Drax (UK)	53,900
2	Belchatow (PL)	39,400
3	Andorra (ES)	33,200
4	Compostilla (ES)	30,700
5	Cottam (UK)	25,700
6	Agioy Dhmhtrioy (EL)	24,300
7	Kozienice (PL)	23,700
8	Kingsnorth (UK)	23,100
9	West Burton (UK)	22,900
10	Ratcliffe on Sour (UK)	22,200
11	Cockenzie (UK)	22,100
12	Ferrybridge C (UK)	21,000

One in two EU states will miss emission limits

Only fourteen member states expect to comply with their emission limits for all four air pollutants set by the EU national emission ceilings directive.

Thirteen countries – Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and the UK – are projected to miss their respective ceilings for at least one of the four pollutants if additional actions to reduce emissions are not taken.

Three countries, namely France, Germany and the Netherlands, anticipate missing two of their emission ceilings, while Spain is forecast to miss as many as three.

The national emission ceilings (NEC) directive sets legally binding emission ceilings that each member state must meet by 2010. A new report[1] from the European Environment Agency presents information from the latest reporting round (deadline 31 December 2008) for the four pollutants covered by the directive: sulphur dioxide (SO_2), nitrogen oxides (NOx), volatile organic compounds (VOCs) and ammonia (NH_3).

The latest data available covers past emissions up until 2007 and only few member states have yet fully incorporated the effects of the recession into their projections for 2010. It seems that as a result of the recession, emissions for 2008 will be lower than for previous years for certain pollutants and sectors, and this might improve the chances of some countries to meet their 2010 ceilings.

However, member states must ensure that future emissions stay within their national ceilings after economic recovery, as the NEC directive limits also apply beyond 2010.

In most cases it is the emission ceiling for NOx that poses the greatest problem, with twelve countries predicting they will miss their ceilings, unless they take taking additional measures. Five of them – Austria, Belgium, France, Ireland and Spain – show that even with additional measures, they are unlikely to meet their NOx ceilings in 2010.

The shortfall in absolute values is largest for Spain (298 kilotons), France (295 kt) and the UK (84 kt), and in relative terms for Ireland (58%), Austria (50%) and Belgium (43%).

Between 1990 and 2007, four countries increased their emissions: Greece (26%), Cyprus (20%), Spain (17%), and Malta (8%).

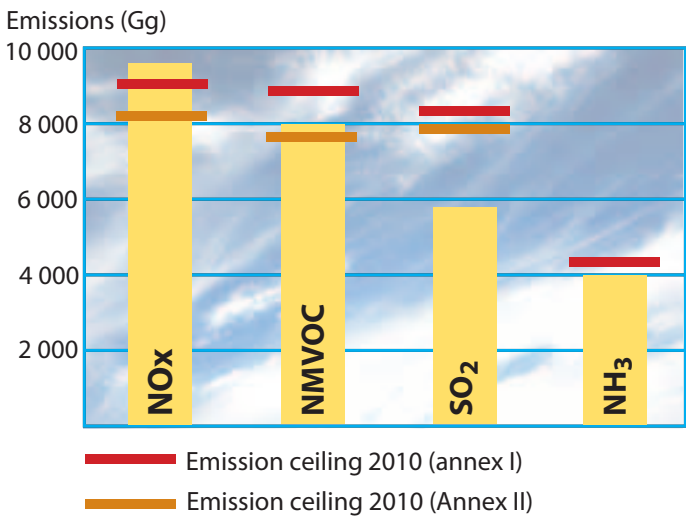


Figure 1. Aggreated "with measures" projected emissions for 2010 reported by member states compared with the EU27 combined emission ceilings as given in Annex I and Annex II of the directive. Annex II does not define a ceiling for NH3.

The projected NOx emissions for the EU27 are six per cent above the aggregated national ceilings for 2010, and 16 per cent above the Annex II ceiling.

Four member states – France, Poland, Portugal and Spain – report that they do not envisage meeting their VOC ceilings in 2010.

Projections for the EU27 as a whole are ten per cent below the aggregated ceiling target, but five per cent above the Annex II ceiling. The largest shortfall in both absolute and relative values is 147 kt (18%) for Poland, 99 kt (15%) for Spain, and 19 kt (8%) for Portugal.

Regarding sulphur dioxide, only the Netherlands does not expect, with the current measures in place, to meet its ceilings in 2010, although it may do so by implementing additional measures.

The EU27 as a whole is projected to be 31 per cent below the aggregate ceiling, and 27 per cent below the Annex II ceiling.

Between 1990 and 2007 all member states except Greece report a decrease in emissions. The biggest reductions were reported by Latvia (97%), Germany (91%), Denmark (87%), Hungary (82%) and Italy (80%).

The major polluters were Spain and Poland, each contributing 15 per cent of total EU emissions.

Twenty-two member states have already reduced ammonia emissions below their respective ceilings. Germany and Spain report that they will not reach the target for 2010 with the current measures in place. However, Germany intends to implement additional measures to reduce emissions.

Among the nineteen countries that provided data for 1990–2007, three in-

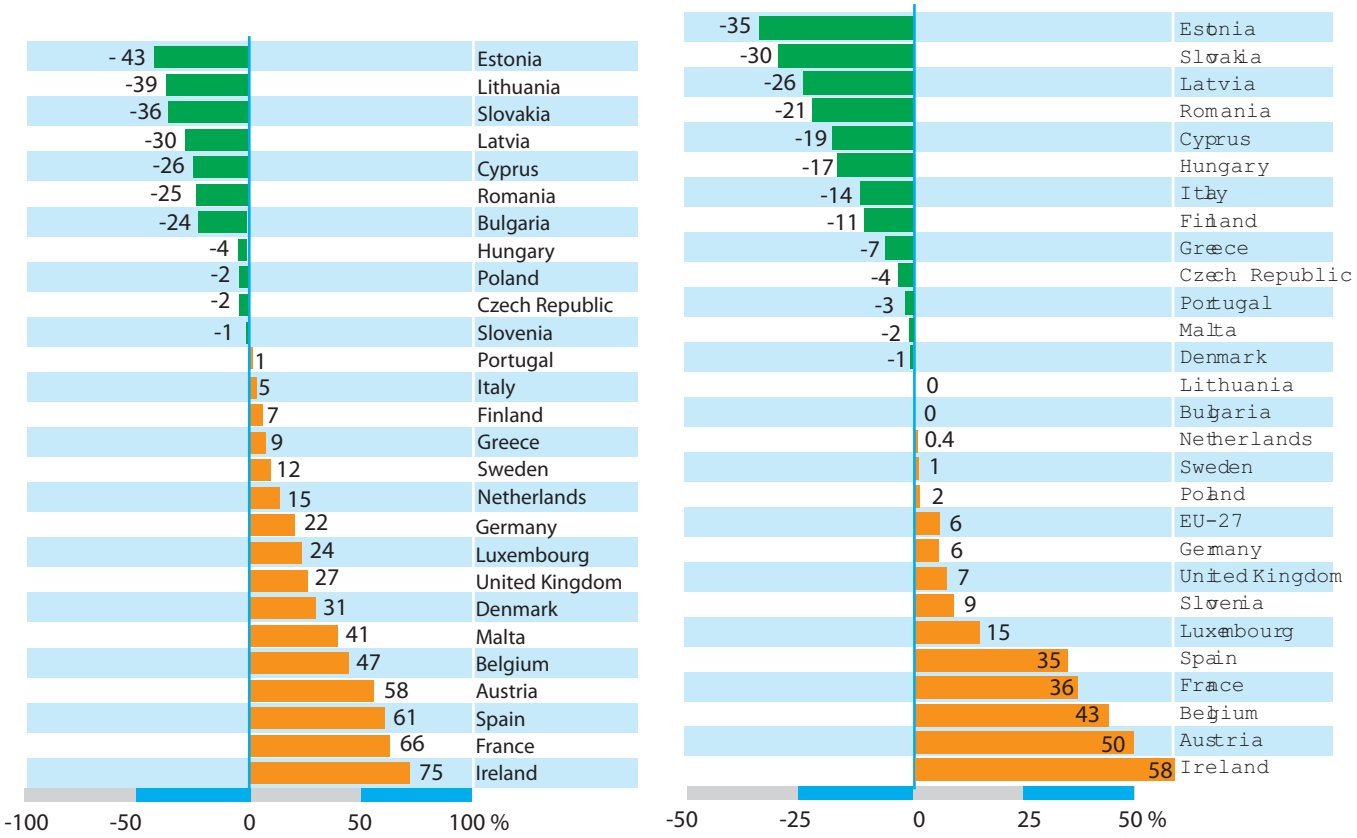


Figure 2. Distance to the 2010 NOx emission ceilings for countries' reported emission levels in the year 2007 (left), and distance to the 2010 NOx emission ceilings according to countries' reported projections of emissions in 2010 under the "with measures" scenario (right).

creased their emissions, namely Spain (25%), Cyprus (12%) and Italy (1%).

The projections for the EU27 are seven per cent below the aggregated EU emission ceiling target for 2010.

The EEA delivers some criticism for the fact that five of the countries submitted their reports too late. Moreover, seven countries failed to submit their data in the standardized format, thus making evaluation more difficult.

After publishing its Thematic Strategy on Air Pollution in September 2005, the European Commission spent more than two years preparing a proposal for a revised NEC directive – the main intention being to set new (stricter) emission ceilings for 2020, and expand the number of air pollutants covered from four to five by adding fine particles ($PM_{2.5}$).

According to the NEC directive's articles 9 and 10, a review was to be completed in 2004, and reports were to be published by the Commission in 2004 and 2008. Each of these reports were to be accompanied by proposals for "further emissions reductions with the aim of meeting, preferably by 2020, the long-term objectives" set out in article 1 of the directive.

However, adoption and publication by the Commission of the revision proposal have repeatedly been postponed. As late as June 2008 the Commission had a draft proposal ready, but decided again to postpone. The outgoing Commission will now hand the file over to the new one, and it is currently not clear when the revision proposal will eventually be presented.

Christer Ågren

1) The EEA report: **NEC Directive status report 2008.** EEA Technical Report No. 11/2009. Available from the EEA: *www.eea.europa.eu/publications/nec-directive-status-report-2008*

About the data

The EEA report is based on the 2008 annual reporting cycle, for which member states provided final emissions data for the year 2006 and preliminary data for 2007, as well as projected data for 2010. By the end of 2009, the countries are again required to submit updated 2010 estimates, together with final 2007 and preliminary 2008 emissions data. The EEA report now also provides emissions expressed on a per capita and per GDP basis.

Data presented in the report is also available through the EEA's NEC directive data viewer. New country-specific profiles presenting key information and parameters for each member state are available at *www.eea.europa.eu/themes/air/nec-directive-member-state-country-profiles.*

Annex I of the NEC directive defines both country-based ceilings and aggregated emission ceilings for the EU27 (which are the sums of the individual member state ceilings in that Annex). Annex II defines SO_2, NOx and NMVOC ceilings for the EU27 as a whole. These ceilings are stricter than those in Annex I and are designed with the aim of attaining by 2010 the interim environmental objectives set out in the directive.

Reducing air pollution mitigates climate change

Measures aiming at reducing air pollutants like ozone and particulate matter (PM) will help reduce global warming, a recent conference concluded.

Air pollution by ground-level ozone is well-known due to its harmful effects on health and vegetation – but ozone is also the third most important greenhouse gas. Particulate matter (PM), another generally known health-damaging air pollutant, includes black carbon (also known as soot), which is a major contributor to global warming.

Consequently, measures aimed at reducing these air pollutants will also help reduce global climate change.

Similarly, by reducing the use of fossil fuels, abatement measures for cutting emissions of the major greenhouse gas carbon dioxide will automatically also reduce emissions of several air pollutants, including sulphur dioxide, nitrogen oxides and particulate matter.

These and many other interactions between air pollution and climate change were intensively debated at an international Air & Climate conference, held in Gothenburg, Sweden, on 19–21 October. The conference was attended by more than 200 leading environmental researchers, experts and policy-makers.

ROGER OLSSON

Should be replaced.

Their conclusions include recommendations on how the impact of air pollution on the climate can be addressed within the various conventions.

"By taking the right measures, we can ensure significant improvements for both air quality and the climate, at a considerably lower overall cost," said Anna Engleryd, from the Swedish Environmental Protection Agency, the main organiser of the conference.

The conference recommended among other things that the climate effects of air pollutants and short-lived climate-forcing gases, including methane, black carbon and carbon monoxide, should be addressed under the ongoing revision of the Gothenburg Protocol of the Convention on Long-Range Transboundary Air Pollution (LRTAP).

Another recommendation was that the LRTAP Convention and the United Nations Environment Programme should explore the need for a northern hemispheric treaty to reduce levels of ground-level ozone.

A number of specific measures were discussed, such as the replacement of open fires for cooking food with alternatives that do not create such large emissions of soot, and the mandatory fitting of particulate traps to all types of diesel engines.

Christer Ågren

> "To a substantial extent, air pollutants and greenhouse gases are emitted from the same sources. As such, a well-designed climate change mitigation strategy can have co-benefits in terms of improved air quality. Similarly, an optimal strategy to decrease air pollution is likely to help combat climate change. With a combined approach we can reduce control costs and avoid major irreversible impacts on society and ecosystems if we act now."
>
> Excerpt from the preface of the book **"Air Pollution & Climate change – two sides of the same coin".** The preface is signed by Jaqueline McGlade (Executive Director, European Environment Agency), Andreas Carlgren (Minister for the Environment, Sweden) and Maria Ågren (Director General, Swedish EPA).

The presentations, conclusions and recommendations from the conference are available at: *www.naturvardsverket.se/airclimconf*

For the Air & Climate conference, a special 168-page book entitled **"Air Pollution & Climate change – two sides of the same coin"** was produced with the aim to aid the understanding of the important links between air pollution and climate change, and highlight the prospects and benefits of co-controlling them. The book can be ordered from: *www.naturvardsverket.se/sv/Nedre-meny/Webbokhandeln/ISBN/1200/978-91-620-1278-6/*

AUGENBLICKE/FOTOLIA

It's not only about CO_2

Faster action on climate change may be possible if nations combine substantial cuts in carbon dioxide (CO_2) emissions with accelerated moves across a suite of other greenhouse gases and pollutants.

Scientists estimate that nearly 50 per cent of the emissions causing global warming in the 21st century are from non-CO_2 pollutants ranging from black carbon and ground-level ozone to methane and nitrogen compounds.

Many of these non-CO_2 gases and pollutants need to be addressed in their own right because of growing concern over their impact on human health, agriculture and ecosystems such as forests.

"The international community's overarching concern must be to seal a convincing deal at the UN climate convention meeting in Copenhagen – one that puts the world on track towards swift and significant cuts in carbon dioxide while also providing the funding to assist vulnerable countries and communities to adapt," said Adam Steiner, Executive Director of the UN Environment Programme (UNEP).

He pointed out that the time has come for further urgent scientific assessments to determine the precise contribution, impacts and the options for action on non-CO_2 pollutants.

Source: Press-release from UNEP, 4 September 2009. See: *www.unep.org/Documents.Multilingual/Default.asp?DocumentID=596&ArticleID=6299&l=en&t=long*

Strict global carbon budget needed

A strict global carbon budget between now and 2050 based on a fair distribution between rich and poor nations has the potential to prevent dangerous climate change and keep temperature rise well below 2 degrees Celsius, a new WWF report shows.

The report is based on research, calculations and analysis by the consultancy ECOFYS and shows different ways to cut global emissions by at least 80 per cent globally by 2050 and by 30 per cent by 2030 compared to 1990 levels.

According to the analysis, the total carbon budget – the amount of tolerable global emissions over a period of time – has to be set roughly at 1600 Gigatons (Gt) CO_2-equivalents between the years 1990 and 2050. As the world has already emitted a large part of this, the budget from today until 2050 is reduced to 970 Gt CO_2eq excluding land use changes.

The report **"Sharing the effort under a global carbon budget"** can be downloaded at: *www.panda.org/*

Keeping track of climate commitments

The new website Climate Action Tracker provides an up-to-date assessment of commitments and actions proposed by individual countries for greenhouse gas emission reductions in preparation for the UNFCCC conference in Copenhagen, December 2009. It enables the public to track the emission commitments and actions proposed by countries for a Copenhagen climate agreement. It also enables users to evaluate progress towards limiting global temperature increase to 2°C or 1.5°C. The website is a joint effort of Ecofys and Climate Analytics with the Potsdam Institute for Climate Impacts Research (PIK) funded by the European Climate Foundation.

Information: *www.climateactiontracker.org*

MICHAEL WILLIAMS/ FOTOLIA

Turning up the heat.

Fossil fuel CO_2 up by 29 per cent since 2000

The strongest evidence yet that the rise in carbon dioxide emissions continues to outstrip the ability of the world's natural sinks to absorb carbon was published on 17 November in the journal Nature Geoscience.

The scientists report a 29-per-cent increase in global CO_2 emissions from fossil fuel between 2000 and 2008 (the latest year for which figures are available), and a 41-per-cent increase between 1990 and 2008. In spite of the recent global economic downturn, emissions increased by two per cent during 2008.

Source: Science Daily, 17 November 2009

Boreal forest dieback may cause runaway warming

LARS JOHANSSON/FOTOLIA

Carbon sequestration in progress.

The boreal forests, one of the largest carbon stocks on earth, will not be able to respond to global warming by migrating northwards. Massive forest dieback, causing runaway warming, is a more likely scenario.

Under the Kyoto protocol, nations have to account for changes in carbon stock by afforestation, reforestation and deforestation, while leaving old-growth forests intact is not an activity considered to affect the carbon budget. This probably reflects the common perception that old forests do not sequester carbon.

They do, according to a new report from AirClim[1]. Many old-growth forests in the northern hemisphere continue to serve as carbon sinks for centuries and thus hold vast quantities of carbon. Roughly speaking, the boreal forest belt contains about one third of the world´s vegetative carbon and the same amount again of soil carbon. Whether or not this carbon stock can be maintained is not a matter of forest management, since half of the boreal forest belt consists of remote primary forests. Even though the timber frontier is constantly moving north, natural forest dynamics and the response to climate change will decide the fate of most of these forests for the foreseeable future.

In its fourth assessment, the IPCC concluded that for increases in global average temperature exceeding 1.5–2.5°C, forests globally face the risk of major transformations. Boreal forest is likely to be especially affected, because of its sensitivity to warming and the high rates of projected warming in high northern latitudes. Based on a review of recent scientific knowledge on boreal forest and climate change, the AirClim report confirms this and outlines in some detail which transformations can be expected under different climate scenarios. While doing so, the report debunks a number of myths or misconceptions about the interaction between climate change and boreal forests. The idea that old-growth forests are carbon neutral is one such misconception, and the notion of forest management as a cure for the climate threat is another. There are more.

Since temperature is a limiting factor in boreal forest, it might seem reasonable to assume that moderate levels of warming would be beneficial for tree and forest growth. However, the actual response so far is not unequivocal. Warmer temperatures over the last few decades have either improved or decreased tree growth. Inverse growth responses are widespread all over the boreal region and have been recorded for most tree species. Growth decline occurs more frequently in warmer parts of the distribution area of each species, indicating that direct temperature stress might be a cause. Drought stress has also been suggested as a contributing factor. Negative effects on tree and forest growth may be even more widespread as global warming increases.

Vegetation modelling studies generally project that the boreal forest will respond to warming by migrating northwards along with the shift of climate zones. What is generally overlooked is that climate models project the potential distribution of species and plant communities under different climatic conditions, not current conditions. In reality, a wholesale redistribution of forest zones further north is not likely to happen, at least as far as primary, unmanaged forests are concerned. One obvious reason for this is that even with warming of just 2°C, climate zones will shift northwards at a rate of five kilometres per year, which exceeds the recorded migration responses of trees by a factor of ten.

Furthermore, any attempt to predict the future of boreal forest must take into account the impact of natural disturbances, predominantly fire. The disturbance regime is fundamental to boreal forest dynamics and is, in turn, affected by climate. An increase in the frequency and area of wildfires has already been recorded in the boreal region. If global warming exceeds 4°C the area burned in North America could double. Windthrow and insect outbreaks are also expected to increase in frequency with projected changes in global climate.

Thus, the most likely scenario for the boreal forest is a non-linear response to warming, resulting in the creation of hitherto unseen ecosystems and the extinction of species with limited capacity to adapt. Even at moderate levels of warming, extensive decline can be expected in forests and woods. If global warming exceeds 2°C, vast areas of boreal forest may be transformed into open woodland or grassland. The critical limit for large-scale forest dieback may be a rise of 3–5 °C. This has been identified as one of the critical tipping points in global change, through which positive feedback effects on the climate may cause runaway warming – in this case the release of most of the enormous boreal carbon stock into the atmosphere.

Roger Olsson

1) **Boreal Forest and Climate Change.** Air Pollution and Climate series #23. Available at *www.airclim.org.*

The boreal forest belt contains about one third of the world´s vegetative carbon and as much of the soil carbon. Most of this huge carbon stock is in the primary forests in the northern part of the boreal belt (darker green).

Costs for adapting to climate change largely underestimated

Scientists led by a former co-chair of the Intergovernmental Panel on Climate Change will warn that the UN negotiations aimed at tackling climate change are based on substantial underestimates of what it will cost to adapt to its impacts.

The real costs of adaptation are likely to be two to three times greater than estimates for the year 2030 made by the UN Framework Convention on Climate Change (FCCC) in 2007, according to new report published on 27 August by the International Institute for Environment and Development and the Grantham Institute for Climate Change at Imperial College London.

In 2007 the UNFCCC estimated the global costs of adapting to climate change to be US$40–170 billion each year. But the report's authors say that these estimates were produced too quickly and did not include key sectors such as energy, manufacturing, retailing, mining, tourism and ecosystems.

The report **"Assessing the costs of adaptation to climate change: A review of the UNFCCC and other recent estimates"**, can be found at: *www.iied.org/climate-change/key-issues/economics-and-equity-adaptation/costs-adapting-climate-change-significantly-under-estimated*

EU15 on track to meet Kyoto target

All member states of the EU15 except Austria are set to meet their greenhouse gas emission reduction targets under the Kyoto Protocol, according to the latest projections from the European Environment Agency (EEA).

Whereas the protocol requires that the EU15 cut average emissions during 2008–2012 to eight per cent below 1990 levels, the latest projections indicate that the block will go further, reaching a total reduction of more than 13 per cent below the base year.

The ten new member states that have Kyoto targets are also set to meet these, according to the agency. Cyprus and Malta do not have emissions targets.

Source: Greenhouse gas emission trends and projections in Europe 2009 (November 2009). EEA Report No 9/2009. Available at: *www.eea.europa.eu*

"The most destructive project on earth"

The extraction of oil from the second largest reserves in the world has merely begun, but the environmental costs are already skyrocketing. Canadian NGOs claim tar sand development is the most destructive project on earth.

The tar sands of northern Alberta, Canada, are the largest proven oil reserves in the world outside Saudi Arabia. Unlike most other oil reserves, however, these are in the form of solid bitumen, which must be mined, crushed, diluted and cleaned before it can be refined into crude oil. Open strip mines transform vast areas of primary boreal forest into moonscapes, the processing pollutes enormous amounts of water and the greenhouse gas emissions produced during processing are three times greater than for a regular barrel of oil.

If fully developed, the tar sand fields will cover an area twice the size of Ireland. So far, only a minor part has been developed, but high oil prices and an increasingly thirsty market in the US are strong drivers for rapid expansion. The environmental impact is already almost incomprehensible. According to the Canadian NGO Environmental Defence, the tar sand exploration is "the most destructive project on Earth".

Virtually every facet of the tar sands – from the enormous open-pit mines to sprawling refineries and pipelines – affects waterfowl and songbirds that come from all over the Americas to nest in Canada's boreal forest. According to a report by leading environmental organizations, between 6 million and 166 million birds could be lost due to the tar sands development over the next 30 to 50 years.

The mining operations leave huge reservoirs of "tailings" – grey water laden with toxins – that have to be held back behind dams up to 100 metres high, often built on the banks of the Athabasca River. Some of these are among the largest dams on earth, rivalled only by the Three Gorges Dam of China. The leakage from just one of these dams into the Athabasca river has been reported to be 1,600 cubic metres a day.

The tar sand fields of Alberta, Canada, cover an area equal to a lesser European country. (Note the outline map of Belgium in upper left corner - scales are the same.)

In what has been described as a giant slow motion oil spill, the Athabasca – MacKenzie river system is being polluted by mercury, arsenic and polycyclic aromatic hydrocarbons (PAHs), of which some are carcinogenic. The frequency of tumours, lesions, deformed spines and other defects in fish is high and increasing. Arsenic levels in moose meat from the area that are more than 30 times acceptable levels have been recorded. Unusual cancer clusters among humans have also been reported in communities downstream of the tar sand areas.

Furthermore, the waste ponds from extraction were estimated to emit 63,000 tonnes of volatile organic compounds (VOCs) into the air in 2006. With the current production trend this figure may grow to 200,000 tonnes in 2020. There are presently no binding caps on VOC emissions from the tar sand industry. Sulphur dioxide emissions from the tar sands have been estimated at 158,000 tonnes per year, which is somewhat more than Belgium's total emissions. A large part of the sulphur falls as acid rain over Alberta and neighbouring provinces. The mean pH level of precipitation in Saskatchewan, 200 km downwind from the tar sand area has decreased from 5.3 to 4.1 since tar sand extraction begun.

Because extracting the oil from the sand is very energy intensive, the tar sand industry is a major source of greenhouse gas emissions, and as such the fastest growing in Canada. In 2007 the CO_2 emissions were estimated at 40 million tons, not including emissions from burning the oil produced. This roughly equals the national Norwegian emissions. To allow future expansion of the tar sand industry, Canada's government has not issued any emission caps for greenhouse gases, only intensity targets – i.e. targets per unit of production. According to the government's own estimates, these will allow the tar sand CO_2 emissions to almost double until 2020. Since the tar sand industry is spared from binding emission caps, it would be politically impossible to ask more from other sectors. Or, as environmental groups put it, Canada's climate politics is being held hostage by its tar sands.

The ultimate outcome of this is there for all to see. In 2007, Canada's total greenhouse gas emissions were 26 per cent higher than 1990 levels and 34 per cent higher than its agreed Kyoto target.

Capturing the CO_2 emissions from tar sand extraction and storing them underground has been put forward as a central strategy for managing greenhouse gas emissions in this sector, not only by the industry but also by the governments

Greenpeace blocks Suncor´s tar sands operation in Alberta.

of Alberta and Canada. The province of Alberta has put billions of research and development dollars into such CCS (Carbon Capture and Storage) technology. In vain, according to a recent report by WWF UK. Using the oil industry's own best-case estimate – that 30 per cent of carbon emissions could be captured by 2030 and 50 per cent by 2050 – the report notes that this falls far short of the reduction needed to make tar sands oil compare favourably with conventional crude oil. Neither will it be sufficient to meet emerging low-carbon fuel standards in Europe or California.

Roger Olsson

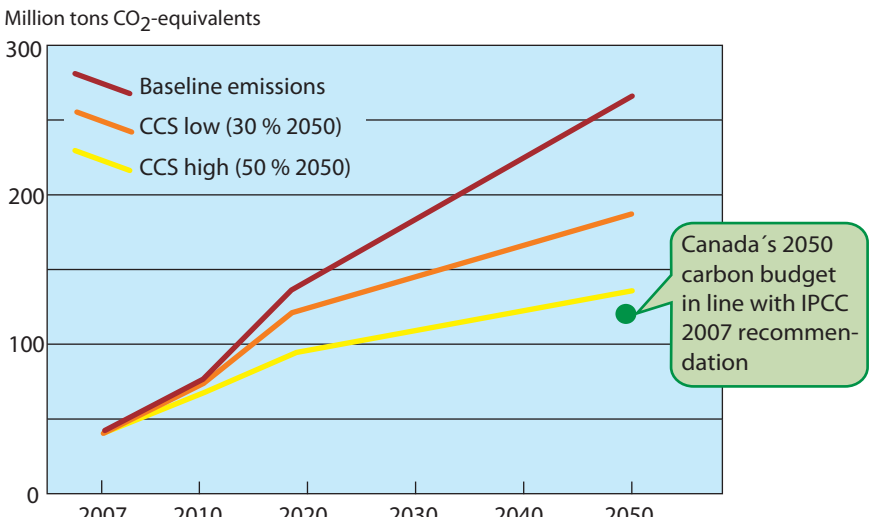
Sources:

Hatch, C & Price, M: **The most destructive project on earth.** Environmental Defence, Canada, 2008.

Wells, J: **Danger in the Nursery: Impact on birds of tar sands oil development in Canada's Boreal forest**. NRDC report December 2008.

Carbon capture and storage in the Alberta Oil sands – a dangerous myth. WWF UK 2008.

The carbon emissions from Alberta´s tar sand extraction will exceed Canada´s entire carbon budget if IPCC´s recommendation of an 80 per cent cut until 2050 should be met. The graph shows the emissions from well to tank if the industry continues to grow rapidly. In the baseline scenario no effect of carbon storage is included, while the CCS high scenario represents the industy´s own best-case CCS estimates. (From the WWF UK report)



Pledged reductions are not enough

Total greenhouse gas (GHG) emission reductions currently proposed by industrialized countries fall short of the pathway to reach a two-degree target, despite the fact that the cost of meeting these pledges is much lower than anticipated.

According to a study by the International Institute for Applied Systems Analysis (IIASA), by 2020, total GHG emissions of industrialized (Annex I) countries would decline by between only 5 and 17 per cent, relative to 1990.

"Our analysis strongly suggests that the costs to Annex I countries implied by their current negotiation offers are indeed very low with respect to their GDP," says Markus Amann at IIASA. "Even for the most optimistic 17 per cent emissions reduction, mitigation costs would not exceed 0.01–0.05 per cent per annum of the GDP of all Annex I countries, and this is insignificant compared to a 42-per-cent increase in GDP that is assumed between now and 2020 for these same countries."

IIASA's analysis also reveals significant co-benefits for local air quality as a result of reduced GHG emissions. Despite the low ambition, implied mitigation measures would cut SO_2, NOx and particulate matter (PM) emissions by approximately 10 per cent at no extra costs, which will reduce negative health and environmental impacts accordingly.

In November, IIASA published two new reports analysing the implications of the current economic crisis for Annex I greenhouse gas mitigation potentials and costs, and updating the cost implications of the emission reduction pledges made by Annex I Parties.

Application of abatement measures for which cost savings over their technical life time exceed the up-front investments (i.e., measures with negative mitigation costs over their life cycle), could reduce total Annex I emissions by 23 per cent below 1990 levels without net costs over the life cycle. For a pre-crisis projection this potential was estimated at only 14 per cent.

All three reports can be downloaded from IIASA's website:
gains.iiasa.ac.at/index.php/gains-annex-1

Welcome to the world at +4° C

Continued from front page

temperatures in high northern latitudes will increase by ten degrees or more. Likely effects of such extreme temperature change are – among other things – permafrost collapse over vast areas and massive melt-down of the Greenland ice-sheet.

A +4 degrees world is not science fiction or a nightmare scenario. At present emission trends it may be reality before the end of this century, according to Richard Betts at the Climate impacts research team at Hadley Centre.

"Two degrees is already gone as a target," said Chris West, director of the UK Climate Impacts programme at a conference on the four degrees scenario, hosted by the University of Oxford earlier this autumn.

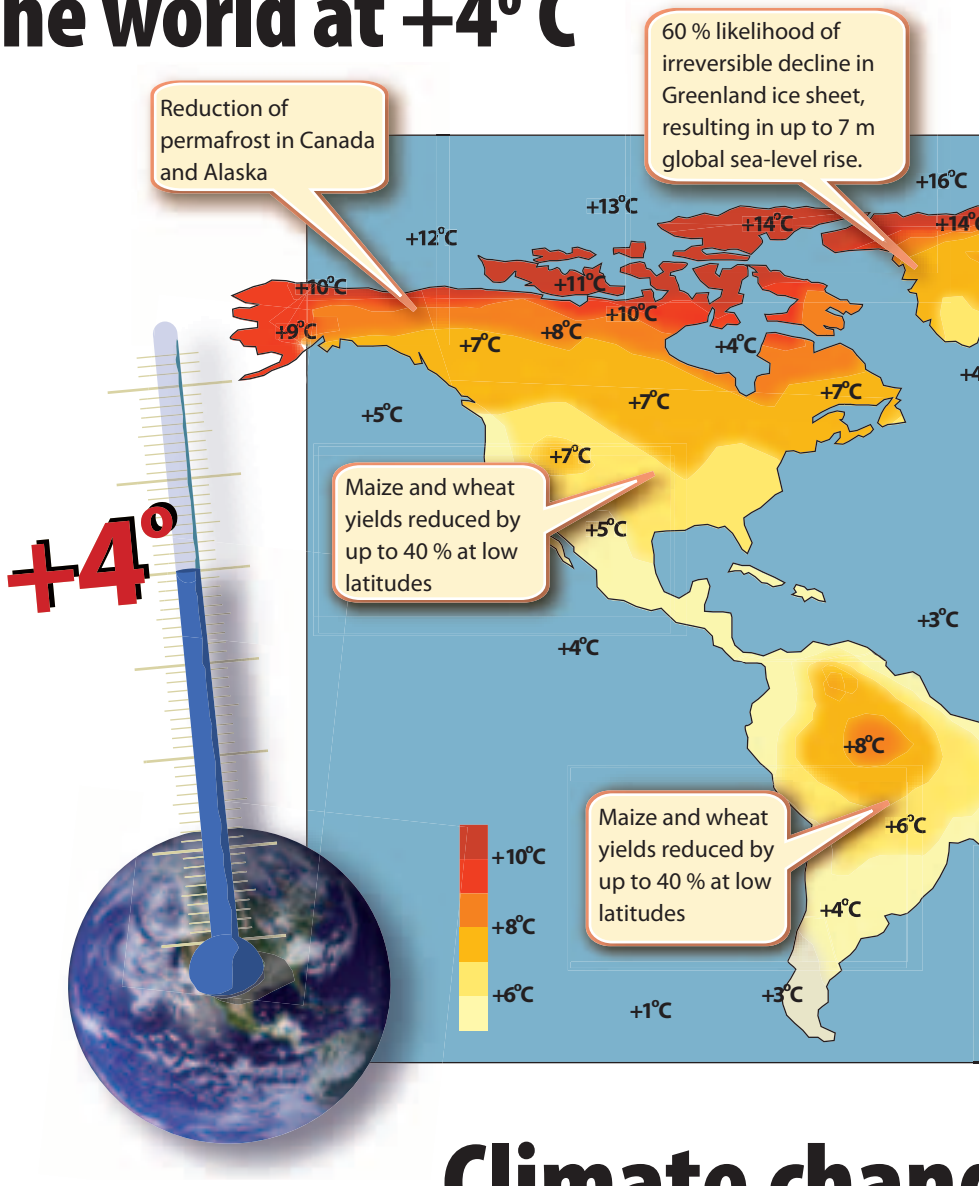
"Reaching four degrees by 2060 is a plausible, worst-case scenario. By 2100, 5.5 degrees is possible," Richard Betts said at the conference.

The planet has warmed 0.74 degrees over the past 100 years. The present rate of warming is 0.16°C per decade, according to the UN's Intergovernmental Panel on Climate Change (IPCC). As previously reported in Acid News (*see 2/09 p. 9*) global carbon dioxide emissions are presently increasing at an ever faster rate. Over the last decade emissions have exceeded those of IPCC's most fossil-intensive scenario, projecting a mean temperature increase of up to 6.4°C by the end of this century.

In a +4 degrees world the hottest days will be up to 12 degrees warmer than today in some regions, making them more or less uninhabitable. Other likely or possible consequences pointed out at the Oxford conference were:

- one to two billion people will not have access to fresh water because of major shifts in rainfall patterns.
- up to 15 per cent of existing or potential cropland will become too dry and too hot for food production. Africa will lose 40 per cent.
- flooding will affect at least 500 million people.
- the ability of the oceans to absorb carbon could be reduced. Presently, about half of the anthropogenic carbon emissions are soaked up this way. In a +4 degrees world ocean absorption could be reduced to one third, which would speed up warming further.

Roger Olsson



The figure is based on the map published by the UK Government this October, showing the effects of a global mean temperature increase of four degrees. Temperature patterns are simplified. The boxes give a few examples of the information on consequences provided in the interactive map. Check it out at: *www.acton-copenhagen.decc.gov.uk/content/en/embeds/flash/4-degrees-large-map-final.*

Sources:

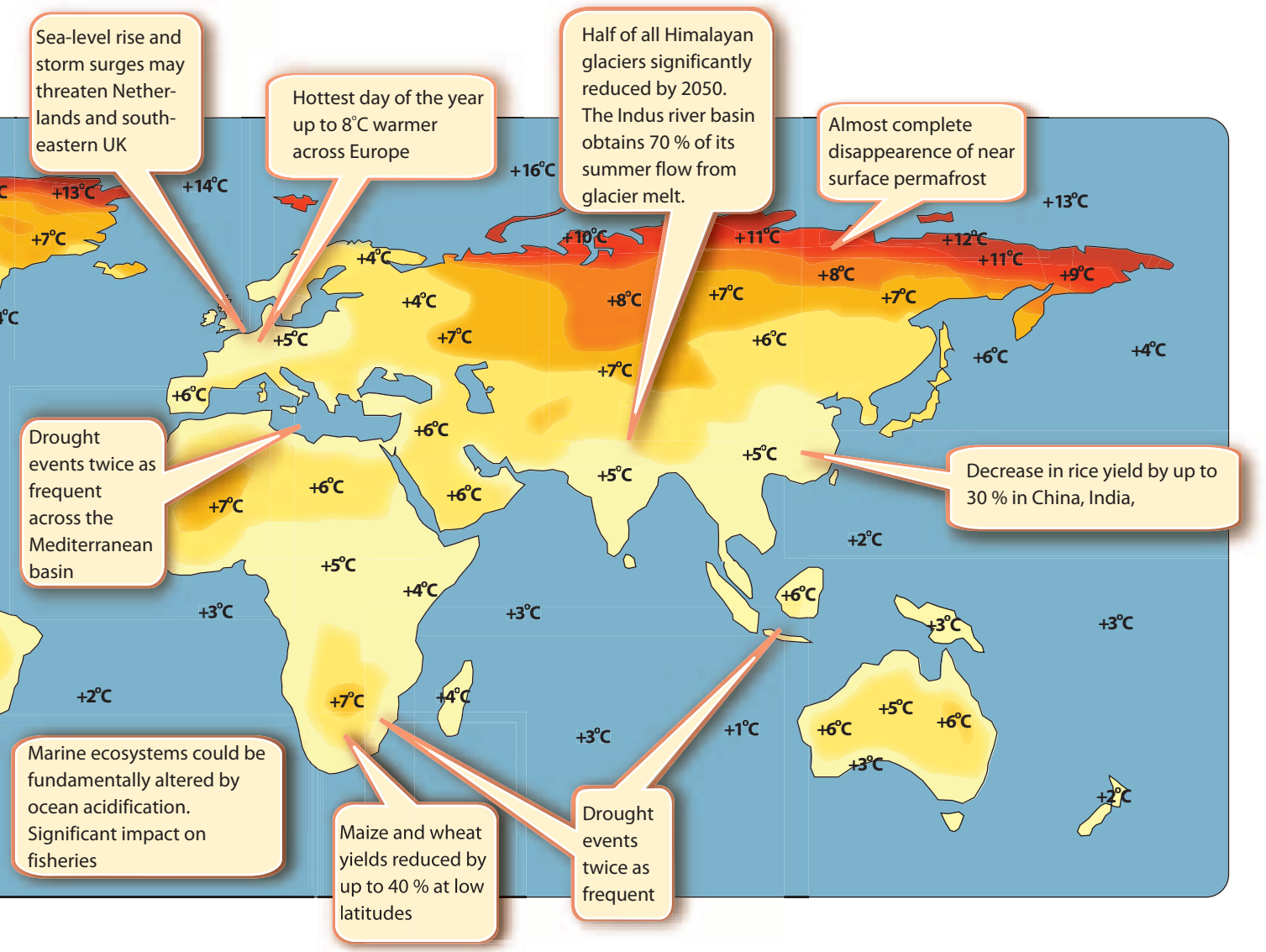
What an average temperature rise of 4°C would really mean for the planet. The Independent, 23 October 2009.

Leahy, S: **Four degrees of devastation.** IPS, 9 October 2009.

Climate chang

The speed and scope of climate change is now surpassing even the most sobering predictions of the last report of the IPCC.

A new analysis of the latest, peer-reviewed science indicates that many predictions at the upper end of the Intergovernmental Panel of Climate Change's (IPCC) forecasts are becoming more likely. Some events – such as ocean acidification, losses of glaciers, and shrinking of ice-sheets – thought likely to occur in the long-term are already happening or will happen far sooner than had previously been thought, according to a new report issued by the United Nations Environment Programme (UNEP), entitled "Climate Change Science Compendium 2009."



ge impacts coming faster and sooner

Scientific knowledge on climate change and forecasting of the likely impacts has been advancing rapidly since the landmark 2007 IPCC report, and the UNEP compendium reviews some 400 major scientific contributions to our understanding of Earth Systems and climate change that have been released through peer-reviewed literature, or from research institutions, over the last three years.

Global growth in carbon dioxide emissions has exceeded even the most fossil-fuel intensive scenario developed by the IPCC at the end of the 1990s. Global emissions grew by 1.1 per cent each year from 1990–1999 and this accelerated to 3.5 per cent per year from 2000–2007.

The observed increases in greenhouse gas concentrations are raising concern that warming of between 1.4 and 4.3 degrees above pre-industrial surface temperatures could occur. This exceeds the range of 1–3 degrees perceived as the threshold for many "tipping points", including the end of summer Arctic sea ice, and the eventual melting of Himalayan glaciers and the Greenland ice sheet.

Recent estimates of the combined impact of melting land-ice and thermal expansion of the oceans suggest a plausible average sea level rise of between 0.8 and 2.0 metres above the 1990 level by 2100. This compares with a projected rise of between 18 and 59 centimetres in the last IPCC report, which did not include an estimate of large-scale changes in ice-melt rates, due to lack of consensus.

"The science has become more irrevocable than ever. Climate change is happening. The evidence is all around us. And unless we act, we will see catastrophic consequences including rising sea-levels, droughts and famine, and the loss of up to a third of the world's plant and animal species," writes UN Secretary-General Ban Ki-moon.

According to the scientists, it may still be possible to avoid the most catastrophic impacts of climate change, but this will only happen if there is immediate, cohesive and decisive action to both cut emissions and assist vulnerable countries to adapt.

To download the full report, visit *www.unep.org/compendium2009.*

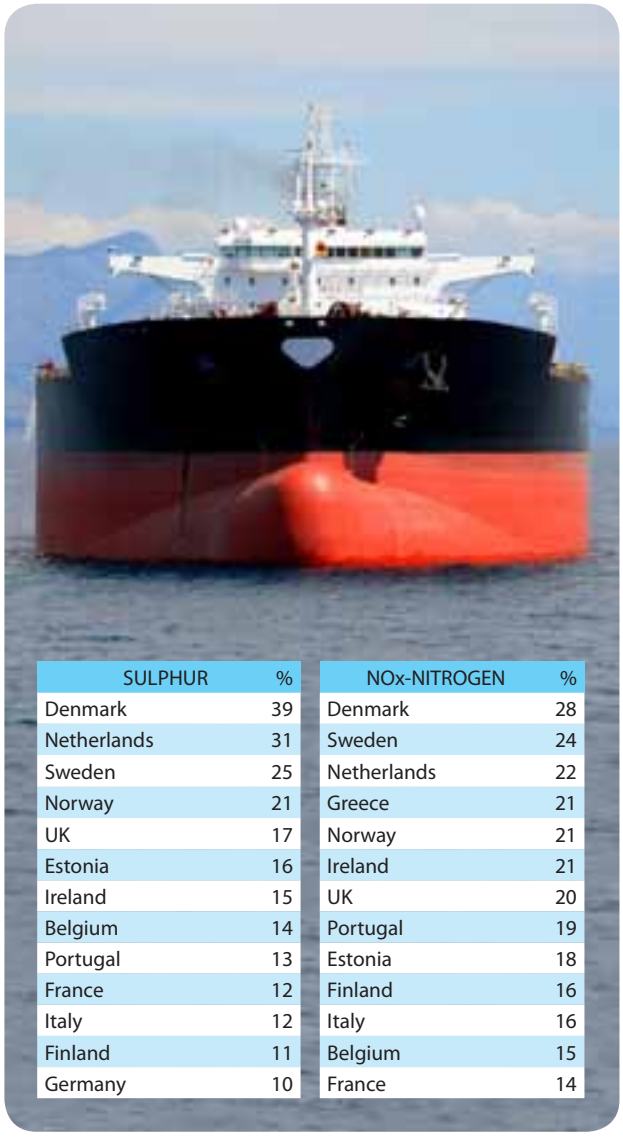
Shipping emissions up - land-based slightly down

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

Since 1980, total European emissions of sulphur dioxide (SO_2) – the most significant acidifying pollutant – from land-based emission sources have fallen by more than three-quarters, from around 53 million tonnes in 1980 to 11.7 million tonnes in 2007.

Emissions of nitrogen oxides (NOx), non-methane volatile organic compounds (VOCs), and ammonia have also gone down, although to a lesser extent. VOCs have nearly halved since 1980, NOx emissions have dropped by 32 per cent, and ammonia by 31 per cent.

Since the late 1990s, emissions of fine particles ($PM_{2.5}$) have been gaining increasing attention, primarily because of their negative impacts on health. However, these emissions are not as well documented as those of other air pollutants, and many countries lack emission data for the 1990s. Between 2000 and 2007 it is estimated that emissions of $PM_{2.5}$ from land-based sources have fallen by about 20 per cent, from 3.0 to 2.4 million tonnes.



XPIX/FOTOLIA

SULPHUR	%	NOx-NITROGEN	%
Denmark	39	Denmark	28
Netherlands	31	Sweden	24
Sweden	25	Netherlands	22
Norway	21	Greece	21
UK	17	Norway	21
Estonia	16	Ireland	21
Ireland	15	UK	20
Belgium	14	Portugal	19
Portugal	13	Estonia	18
France	12	Finland	16
Italy	12	Italy	16
Finland	11	Belgium	15
Germany	10	France	14

Table 2. Examples of European countries where the proportion of air pollutant depositions of sulphur and oxidised nitrogen coming from ships is most marked.

Source: EMEP (2009)

Although overall emissions continue to fall, the downward trend has flattened out over the last few years. In the case of NOx, small reductions in most countries were negated by an increase in Russian emissions of more than one million tonnes between 2000 and 2007.

Emissions from international shipping in European waters show a steady increase. Since 1990, ship emissions of SO_2 have gone up from 1.8 to 2.6 million tonnes, and those of NOx from 2.4 to 3.9 million tonnes – increases of 45–60 per cent.

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

The Convention's EMEP programme keeps track of the ways in which emissions from one country affect the environment in others. The EMEP report also provides an overview of calculations for source-receptor relationships, covering acidifying, eutrophying, photo-oxidant, and particle pollution.

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

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

For 2007 it was estimated that ship emissions were responsible for ten per cent or more of the total deposition of both sulphur and oxidised nitrogen compounds in at least fourteen European countries *(see table 2)*.

In some countries, such as Denmark, Sweden, Norway, the Netherlands, Ireland, and the United Kingdom, ship emissions already make up approximately one fifth or more of total pollutant depositions.

Christer Ågren

1) **Transboundary acidification, eutrophication and ground level ozone in Europe in 2007.** EMEP Status Report 1/2009. Available at the EMEP website: *www.emep.int*. In Table 1, data for 2000 and 2007 are from this new report, while data for 1980 and 1990 are from earlier EMEP reports.

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

	SULPHUR DIOXIDE				NITROGEN OXIDES				VOCs				AMMONIA			
	1980	1990	2000	2007	1980	1990	2000	2007	1980	1990	2000	2007	1980	1990	2000	2007
Austria	360	74	32	26	246	212	204	220	437	284	179	180	52	69	66	66
Belgium	828	361	171	126	442	382	330	260	274	305	201	145	89	112	87	70
Bulgaria	2 050	2 007	918	859	416	363	184	187	309	214	123	82	144	144	56	58
Cyprus	28	46	51	32	13	19	25	20	14	16	16	10	8	5	6	5
Czech Republic	2 257	1 876	264	217	937	742	398	284	275	374	266	174	156	157	76	60
Denmark	452	176	27	23	307	266	188	167	193	166	127	104	138	134	105	75
Estonia	287	274	96	88	70	74	37	34	81	71	38	36	24	26	9	10
Finland	584	259	74	83	295	299	235	183	210	221	154	129	39	38	33	35
France	3 214	1 333	613	435	2 024	1 829	1 390	1 345	2 734	2 414	1 658	1 199	795	787	789	737
Germany	7 514	5 289	630	493	3 334	2 878	1 855	1 284	3 224	3 584	1 569	1 278	835	758	646	624
Greece	400	487	493	543	306	299	328	374	255	281	295	204	79	79	73	65
Hungary	1 633	1 011	486	84	273	276	194	190	215	252	187	148	157	124	71	71
Ireland	222	186	131	54	73	119	129	117	111	111	90	57	112	114	123	106
Italy	3 440	1 795	752	339	1 585	1 945	1 377	1147	2 032	2 023	1 538	1 194	441	405	424	418
Latvia	96	97	10	3	83	69	34	43	152	73	58	58	38	47	12	15
Lithuania	311	263	43	39	152	158	49	69	100	136	78	74	85	82	43	36
Luxembourg	24	26	4	1	23	20	33	14	15	16	13	9	7	7	7	5
Malta		29	26	18		14	12	11		8	8	3		1	1	2
Netherlands	490	189	72	60	583	549	389	300	579	491	267	165	234	249	152	133
Poland	4 100	3 278	1 507	1 131	1 229	1 581	838	885	1 036	832	606	596	550	511	321	292
Portugal	253	317	306	170	158	243	285	233	189	273	282	283	96	55	64	56
Romania	1 055	1 310	727	754	523	527	331	331	829	517	378	330	340	289	252	198
Slovakia	780	542	127	71	197	215	109	83	252	122	86	74	63	66	32	32
Slovenia	234	198	99	14	51	63	60	45	39	53	51	39	24	25	20	19
Spain	2 913	2 166	1 489	1 108	1 068	1 247	1 477	1357	1 392	1 135	1 162	921	285	329	388	422
Sweden	491	117	52	33	404	306	217	165	528	443	282	178	54	55	58	50
United Kingdom	4 852	3 699	1 173	591	2 580	2 932	1 857	1486	2 100	2 396	1 348	942	361	382	337	289
Sum EU27	**38 868**	**27 405**	**10 373**	**7 395**	**17 372**	**17 627**	**12 565**	**10 834**	**17 575**	**16 811**	**11 060**	**8 612**	**5 206**	**5 050**	**4 251**	**3 949**
Albania	72	74	32	31	24	23	22	27	31	30	29	33	32	23	22	24
Belarus	740	888	162	97	234	379	208	161	549	497	340	222	142	215	142	144
Bosnia & Herzegovina	482	484	420	431	79	73	53	51	51	48	40	43	31	21	17	17
Croatia	150	178	60	65	60	88	77	82	105	105	80	114	37	53	53	43
Iceland	18	9	9	8	21	9	9	12	8	12	9	13	3	4	4	4
Norway	136	53	27	20	191	224	224	192	173	295	379	198	20	20	23	23
Macedonia	107	110	90	100	39	46	39	35	19	21	25	26	17	15	14	7
Moldova	308	175	13	16	115	131	27	25	105	123	42	37	53	61	28	27
Montenegro	-	-	-	48	-	-	-	21	-	-	-	21	-	-		9
Russia	7 323	6 113	2 263	1 710	3 634	3 600	2 457	3 509	3 410	3 659	2 445	2 294	1 189	1 204	663	558
Serbia[1]	406	593	396	428	192	165	137	130	142	158	141	126	90	74	64	57
Switzerland	116	42	19	14	170	156	101	78	323	262	130	95	77	68	60	60
Ukraine	3 849	3 921	1 599	1 363	1 145	1 753	861	732	1 626	1 053	641	408	729	682	485	213
Sum Non-EU	**13 707**	**12 640**	**5 090**	**4 331**	**5 904**	**6 647**	**4 215**	**5 055**	**6 542**	**6 263**	**4 301**	**3 630**	**2 420**	**2 440**	**1 575**	**1 186**
Sum Europe	**52 575**	**40 045**	**15 463**	**11 726**	**23 276**	**24 274**	**16 780**	**15 889**	**24 117**	**23 074**	**15 361**	**12 242**	**7 626**	**7 490**	**5 826**	**5 135**
Int. ship: Baltic Sea	139	168	216	205	215	236	303	350	5	8	10	12	-	-		
Int. ship: Black Sea	35	45	58	66	52	62	80	92	1	2	3	3	-	-		
Int. ship: Mediterran.	725	858	1 108	1 294	1 000	1 234	1 593	1 852	21	41	54	64	-	-		
Int. ship: North Sea	277	361	464	442	395	508	652	754	9	18	23	27	-	-		
Int. ship: N.E. Atlantic	550	384	492	575	772	565	724	837	15	19	24	29	-	-		
Sum internat. ship.	**1 726**	**1 816**	**2338**	**2582**	**2 434**	**2 605**	**3 352**	**3 885**	**51**	**88**	**114**	**135**	**-**	**-**		
Sum Europe + ships	**54 301**	**41 861**	**17 801**	**14 308**	**25 710**	**26 879**	**20 132**	**19 774**	**24 168**	**23 162**	**15 475**	**12 377**	**7 626**	**7 490**	**5 826**	**5 135**
Turkey	1 030	1519	2 122	1 612	364	691	942	926	359	636	563	550	321	373	403	409

1) Figures for 1980, 1990 and 2000 including Montenegro emissions.

Make ships pay for their NOx emissions

A differentiated en-route charge would be an efficient method to bring down NOx emissions from shipping in the Baltic, a new AirClim report claims.

Large emissions of nitrogen oxides (NOx) are a cause of major environmental problems, and ships account for a large and growing share of these emissions.

In spite of the somewhat strengthened emission standards for new ships adopted in 2008 by the International Maritime Organization (IMO), NOx emissions from international shipping in European sea areas are projected to increase by nearly 40 per cent between 2000 and 2020.

If no additional abatement measures are taken, this means that by 2020 the emissions from shipping around Europe are expected to equal or even surpass the total from all land-based sources in the 27 EU member states combined.

ANGELIKA BENTIN & OLIVIER TUFFÉ/FOTOLIA

Entering the Baltic Sea - a future view.

In addition to the NOx requirements for new ships from 2011, the IMO decided that in designated Emission Control Areas (ECAs) more stringent rules will apply from 1 January 2016. Here, ships built after that date will have to reduce emissions of NOx by about 80 per cent from the current limit values.

There are currently no NOx-ECAs in place, but the countries surrounding the Baltic Sea are cooperating through the Baltic Marine Environment Commission (HELCOM) to prepare a proposal to the IMO to designate the Baltic Sea as a NOx-ECA.

In March, the United States and Canada jointly proposed to that most areas of their coastal waters – extending 200 nautical miles from the coast – be designated as an ECA for the control of sulphur oxides, particulate matter and NOx emissions. After being approved in principal by the IMO in July, the proposal is set for formal adoption in March 2010.

However, a problem in the context of the new IMO NOx standards is that they will apply to new ships only, and the turnover of the fleet is slow. Ships tend to become 25-35 years old before being scrapped.

Consequently, in order to not only limit the growth in ships' NOx emissions, but to actually reduce them, there is a need to both cut emissions from existing vessels and to speed up the introduction of efficient NOx abatement technologies in new buildings (i.e. ahead of 2016).

A new study[1] by the Swedish environmental economist Per Kågeson has investigated a series of different market-based instruments that could be used for this purpose, and also assessed the potential additional emission reductions that could be achieved by applying such instruments. The study focuses on the Baltic Sea, but the general conclusions are most probably applicable also to other sea areas.

Three technologies are identified that can achieve emissions that meet the stringent ECA-requirements: Selective Catalytic Reduction (SCR), Humid Air Motor (HAM) and engines fuelled by gas (LNG = liquified natural gas).

When comparing the abatement costs with the monetised health benefits from reducing NOx from Baltic Sea shipping by these technologies, it is concluded that the benefits are about five times the average cost, provided that a pay-off time of ten years is allowed. There are also other, less expensive, technologies that can reduce emissions, which is relevant when considering the economic efficiency of retrofitting old engines.

After having analysed several types of economic instruments – such as emissions trading, differentiated fairway and port dues, and emissions charging – the report proposes the introduction of a NOx-differentiated en-route charge, largely along the lines of the current Norwegian NOx-charge.

From 1 January 2007 Norway introduced a charge of NOK 15 per kilo (equivalent to €1,765/ton) on NOx emissions from ship engines above 750 kW. However, a number of Norwegian business organizations have entered into an agreement with the Ministry of the Environment to establish the Business Sector's NOx Fund, effectively reducing the charge to NOK 4/kg (€470/ton) for the participants. Through the NOx Fund, NOK 600 million per year will be allocated to NOx reduction projects over three years. The NOx Fund selects the most cost-effective projects, which may receive 75 per cent of the investment costs. The Fund will also support operational costs, such as urea for SCR.

A NOx-differentiated en-route charge would be relatively easy to operate. It is suggested that port authorities around the Baltic Sea would be mandated to assist a common authority that collects a mandatory charge reflecting the calling ship's emissions of NOx during its latest trip in Baltic Sea waters. The charge would correspond to emissions emitted from the point of entry into Baltic Sea waters or since departure from another Baltic port.

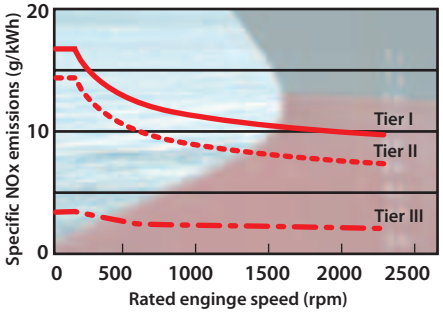


Figure: The IMO's NOx emission standards for new ship engines: Tier I applies from year 2000, Tier II from 2011, and Tier III from 2016 (the Tier III-standards apply only within NOx Emission Control Areas).

It is argued that as long as the revenues are not recycled to the industry, the scheme runs the risk of being legally challenged by third parties. Thus the proceeds could be used to finance grants to ships along the lines used for recycling the revenues from the existing Norwegian NOx Fund.

A charge of the size similar to that of the Norwegian NOx Fund (€470 per ton NOx) may be sufficient when the proceeds are used for grants. The combined effect of a grant and a modest charge should, for frequent visitors, be enough to justify investment in SCR in engines with a remaining life of about ten years or more. Ships should be equally eligible to the grants regardless of flag and ownership.

Ideally there should be only one fund for the Baltic Sea run jointly by the participating coastal states. To improve the overall efficiency it may be worthwhile widening the scheme to cover also the North Sea.

A rough calculation of the emission reduction potential indicates that application of an emissions charge, as outlined above, could cut NOx emissions from ships in the Baltic Sea by about 72 per cent. If it is assumed that only four out of five of ship owners respond to the incentives in the way foreseen, the actual effect on emissions would be lowered to 58 per cent. This would correspond to an annual reduction of about 270,000 tons in NOx, from an expected business-as-usual level of approximately 460,000 tons in 2015.

Christer Ågren

1) **Market-based instruments for NOx abatement in the Baltic Sea** (Nov 2009), APC-report No 24. By Per Kågeson. Published jointly by AirClim, T&E and EEB. Available at www.airclim.org.

ANDREW BREEDEN/FOTOLIA

Smile, you're on candid camera!

Global monitoring system for ship emissions underway

A new emissions monitoring system will allow vessels worldwide to continuously monitor pollutants and readily report findings to regulatory agencies and inspectors.

The Continuous Emissions Monitoring System (CEMS) is said to be able to continuously monitor, analyze, and record emissions from all of a ship's smokestacks. It analyzes and records nitrogen oxides (NOx), sulphur oxides (SOx), carbon dioxide (CO_2), and particulate matter (PM). An interface with the Global Positioning System (GPS) provides real-time vessel location data from a single system, which can support the control of regulatory requirements in Emission Control Areas (ECAs).

The patent-pending system has been developed by the US-based information technology and engineering firm WR Systems Ltd, and product release is scheduled for spring 2010.

Information: www.*wrsystems.com/emissions_monitoring.asp*

New greenhouse gas targets for global shipping and aviation

In October, EU environment ministers agreed to put forward a proposal to cut greenhouse gas emissions from aircraft by 10 per cent and from shipping by 20 per cent by 2020 (relative to 2005). The proposal, which has been approved by EU heads of government, is now an EU negotiating mandate for the climate change summit in Copenhagen in December.

However, EU finance ministers failed to agree that income from financial instruments used to reduce greenhouse gases from aircraft and ships – which could be tens of billions euro a year – should mainly be used for developing countries.

Environmental group T&E gave a cautious welcome to the agreement, but condemned the low levels of ambition and stressed the need for climate finance to be part of the proposals.

"We question why aviation and shipping are still being given special treatment," said T&E policy officer Bill Hemmings. "The agreed reduction targets will still allow emissions from the two sectors more than one third above 1990 levels, while the EU says it will reduce emissions from other sectors by 20 per cent, and possibly even 30 per cent."

International aviation and shipping together generate over five per cent of total global carbon dioxide, but the figure is rising quickly. The two sectors are not covered by the emissions reduction targets of the Kyoto Protocol, and environmentalists are keen to get an agreement at Copenhagen to avoid the International Civil Aviation Organisation (ICAO) and International Maritime Organisation (IMO) being given continued responsibility for emissions reduction.

In spite of twelve years now having passed since the signing of the Kyoto Protocol, neither IMO nor ICAO have managed to produce any binding agreements to reduce GHG emissions from the two sectors.

Source: T&E Bulletin, 16 November 2009

ANTONY MCAULEY/FOTOLIA

Don´t breathe!

Ship emissions impact on Danish air quality

Ship emissions of sulphur dioxide (SO_2) in Danish waters are expected to come down by more than 90 per cent between 2007 and 2020, as a result of the strengthened sulphur requirements adopted by the International Maritime Organisation (IMO) in October 2008.

On the other hand, emissions of nitrogen oxides (NOx) are expected to rise by either fifteen or two per cent in the same time period – the lower figure could be achieved provided that the Baltic Sea and the North Sea become Emission Control areas (ECAs) for NOx. The increasing NOx emissions result from the fact that the weak IMO requirements for NOx are more than outweighed by the expected growth in shipping traffic.

The figures come from a study[1] by the National Environmental Research Institute (NERI), prepared for the Danish Ministry of the Environment.

Concerning the amount of ship traffic, an annual increase of 3.5 per cent has been assumed for transport of goods from 2011 and onwards, while passenger traffic is assumed unchanged. Fuel consumption is projected to increase by 15 per cent.

Ships' contribution to air pollutant concentrations in Denmark was also calculated. Between 2007 and 2020, the share from ships is expected to come down from 37 to 10 per cent for SO_2, while it is expected to increase from 21 to 34 per cent for NO_2, and from 18 to 24 per cent for modelled fine particles ($PM_{2.5}$).

The concentration of nitrogen dioxide (NO_2) in urban background air in Copenhagen is expected to be lowered from 16 to 9 micrograms per cubic metre ($\mu g/m^3$) in the period up to 2020. This improvement is due to reductions in NOx emissions from land-based sources. If assuming that ECA-requirements will apply from 2016, the absolute contribution from shipping remains essentially unchanged. However, the relative contribution from ship traffic to the urban background concentrations is expected to increase from 12 to 21 per cent between 2007 and 2020.

Christer Ågren

1) **Ship emissions and air pollution in Denmark. Present situation and future scenarios**. Environmental Project No. 1306, 2009, 134 pp. Available from the Danish EPA: *www.mst.dk/English/Publications/*

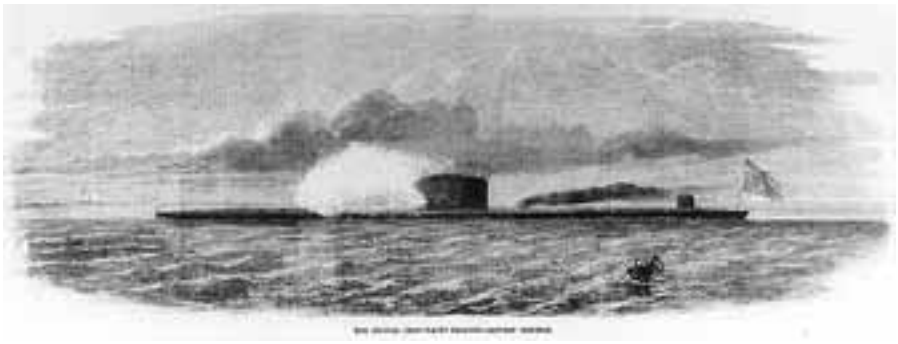
New US ship emission rules ban high-sulphur fuel

The US EPA has drafted rules that would prohibit the production and sale of high-sulphur marine fuel. Shipping interests have negotiated exemptions for some old steamers.

In mid-November, the US Environmental Protection Agency (EPA) sent draft new rules that would prohibit the production and sale of high-sulphur marine fuel and limit ship emissions to the White House for review.

The regulation is a part of a broader strategy to slash harmful emissions from shipping. In March, the United States and Canada asked the International Maritime Organization (IMO) to designate an emission control area (ECA) within 200 nautical miles of the North American coast, a move that would tighten emission standards on all ships operating in those waters *(see AN 2/09)*. The IMO is expected to formally approve the request at the next meeting of its Marine Environment Protection Committee (MEPC) in March 2010, and the designation would come into effect in 2012.

The EPA announced its draft rule to limit emissions from ocean-going ships in July, published it in late August, and the comment period closed on 28 September. In their comments, several Great Lakes shipping interests requested the Great Lakes should be excluded from the low-sulphur fuel regulation. Eventually, in late October, a compromise was found that would effectively exempt 13 very old US flagged steamships that haul iron ore, coal and other freight on the Great Lakes from the proposed federal rule.



One of the exemptions?

EPA is under a legal deadline to finalize the rule by 17 December. If finalized, the draft rule would drastically cut air pollution nationwide by requiring US-flagged vessels with large diesel engines (so-called category 3 engines) to curb their emissions of sulphur and nitrogen oxides. The proposed emissions limits for nitrogen oxides are equivalent to those adopted by the IMO in the revised MARPOL Annex VI *(see AN 4/08, p. 6)*.

EPA is also proposing to forbid the production and sale of marine fuel oil with sulphur content above 1,000 ppm (0.10%) for use in the waters within the proposed US ECA and internal US waters.

According to the EPA, air pollution from large ships, such as oil tankers and cargo ships, is expected to more than double in the next twenty years, if no action is taken. Implementation of the domestic and international strategy is expected to reduce annual emissions from large marine diesel engines in 2030 of nitrogen oxides (NOx) by about 1.2 million tons, sulphur dioxide emissions by 1.3 million tons and particulate matter (PM) emissions by about 143,000 tons.

Compared to current (2009) emissions, the coordinated effort would by 2030 reduce sulphur emissions from these ships by 87 per cent, PM emissions by 65 per cent, and NOx emissions by four per cent.

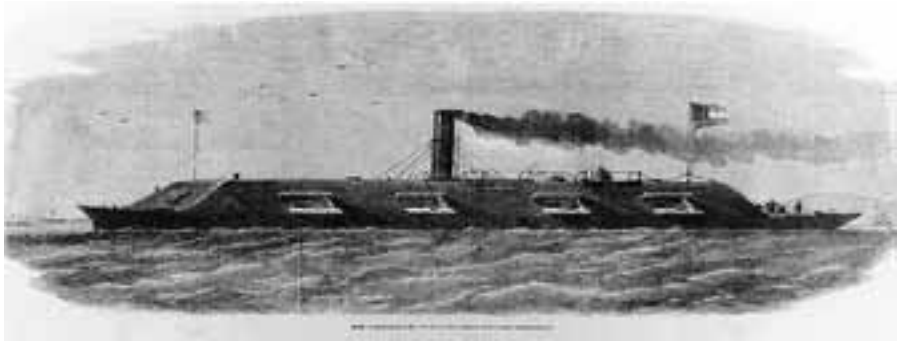
The emission reductions from the proposed strategy would yield significant health and welfare benefits that would span beyond US ports and coastlines, reaching inland areas. EPA estimates that in 2030, this would prevent between 13,000 and 33,000 premature deaths, 1.5 million work days lost, and 10 million minor restricted-activity days.

The estimated annual health benefits in 2030 amount to between US$110 and 280 billion, and the annual costs are projected at approximately US$3.1 billion, resulting in a benefit-to-cost ratio as high as a ninety to one.

Christer Ågren

For more information, see EPA's website: *www.epa.gov*

One of the exemptions?



Green investments will create more jobs

Investment in renewables and energy efficiency would create seven times more green jobs over the next ten years than would be lost in the coal and nuclear sectors in Europe, according to a new study by Greenpeace and the European Renewable Energy Council (EREC), and backed by trade unions.

A switch from dirty energy to renewables and energy efficiency would not just avoid over 470 million tons of carbon dioxide emissions in Europe, but would create 30 per cent more jobs by 2020 than if we continue investing in fossil and nuclear fuels.

If Europe chooses a clean energy pathway, over 380,000 jobs would be created in renewables and energy efficiency over the next decade, as opposed to some 50,000 that would be lost in the coal and nuclear sectors.

For more information, see: *www.greenpeace.org/eu-unit/press-centre/press-releases2/green-jobs-14-09-09*

Coal pollution undermines health

Coal pollutants affect all major body organ systems and contribute to four of the five leading causes of mortality in the United States: heart disease, cancer, stroke, and chronic lower respiratory diseases, concludes a scathing report entitled "Coal's Assault on Human Health" and issued by Physicians for Social Responsibility.

Each step of the coal lifecycle – mining, transportation, washing, combustion, and disposing of post-combustion waste – impacts human health. Coal combustion in particular contributes to asthma, lung cancer, heart disease, and stroke, diseases that affect large portions of the US population. Exposure to the emissions from coal combustion interferes with lung development, increases the risk of heart attacks, and compromises intellectual capacity due to mercury exposure, the report warns.

The report is available at: *www.psr.org/resources/coals-assault-on-human-health.html*

EU weakening fuel efficiency standards

On 28 October the European Commission proposed legislation to reduce the average CO_2 emissions of light commercial vehicles (vans) to 175 grams per kilometre. The proposal will be phased in from 2014 to 2016, and contains a long-term emission reduction target of 135 g/km by 2020. This is a weakening of the Commission's initial proposals from 2007, which suggested 175 g/km should be reached by 2012 and 160g by 2015. Further softenings of the Commission's original proposals are the postponement of plans to include bigger vans and minibuses, and the fact that the target of 135 g/km to be reached by 2020 will now be subject to review rather than fixed.

HAYLEY AHERN/FOTOLIA

VFELCV (Very Fuel Efficient Light Commercial Vehicle).

Average emissions from new vans in 2007 were 203 g/km, and for the average new van to meet the 175 g target by 2016 will thus mean a 14 per cent reduction over nine years. According to the European Federation for Transport and Environment (T&E) the best diesel cars have improved their CO_2 performance by up to 27 per cent between 2007 and 2009, and with much of the technology for diesel cars being adaptable to vans, T&E says the standards should have been a lot stricter.

"The EU is once again weakening vehicle fuel efficiency standards," said T&E policy officer Kerstin Meyer. "It would be far better to invest precious financial resources in low-carbon technology than to waste them on importing oil."

The vehicles affected by the legislation are vans, which account for around 12 per cent of the market for light-duty vehicles. This includes vehicles used to carry goods weighing up to 3.5 tons (vans and car-derived vans) and which weigh less than 2610 kg when empty.

Information: The European Commission : *ec.europa.eu/environment/air/transport/co2/co2_cars_regulation.htm*, and T&E : *www.transportenvironment.org/*

Dutch kilometre charge proposed

Vehicle registration and circulation taxes in the Netherlands would be scrapped and replaced by a kilometre charge from 2012 under a legislative proposal sent to the Dutch parliament on 13 November. CO_2 and PM emissions from road transport would be cut by more than 10 per cent under the plans, the government says, while over half of car owners would pay less in taxes than they do currently.

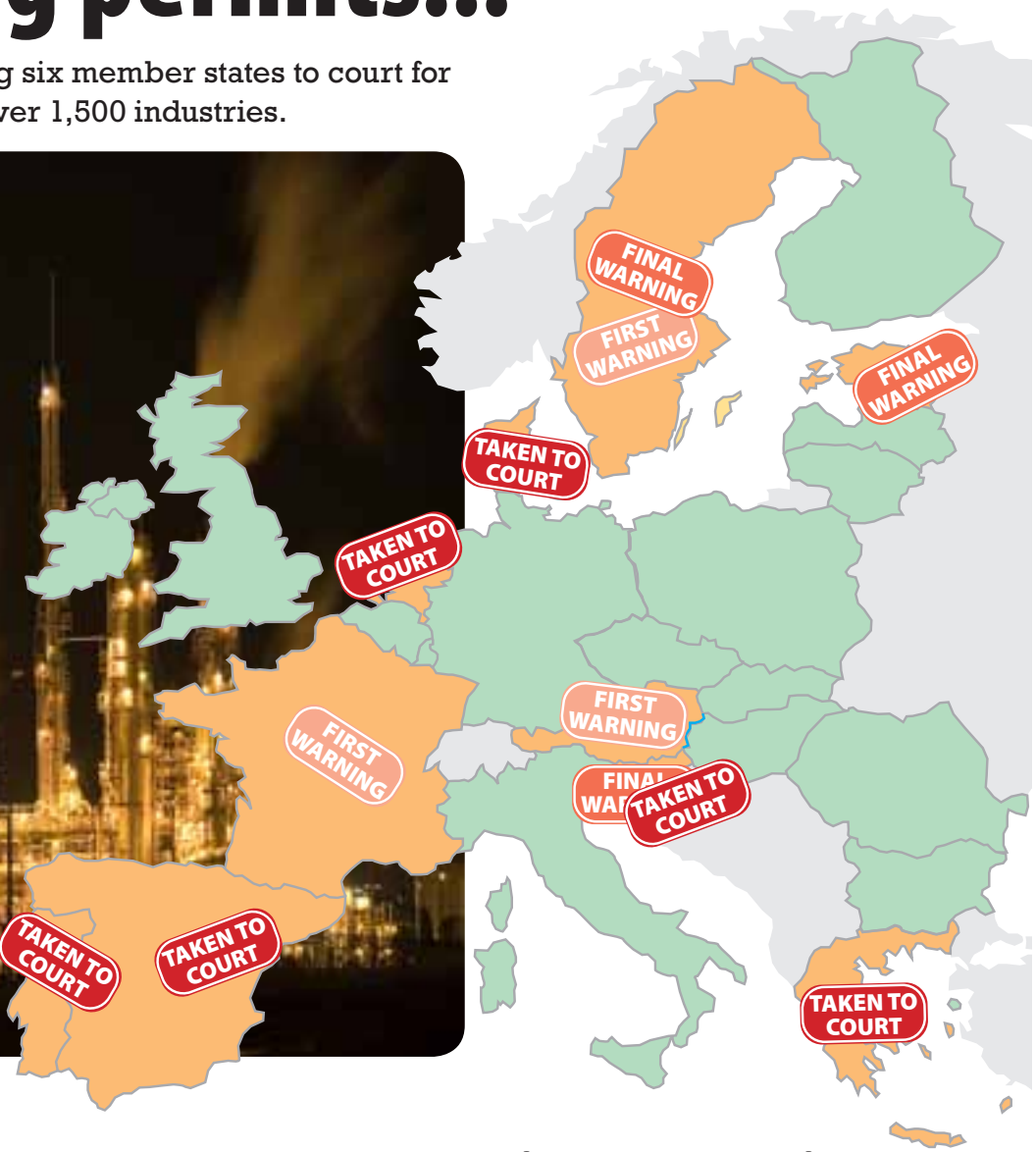
The basic charge for cars would rise from €0.03 to €0.067 over the period 2012–18. Each car would be equipped with a GPS system to record when and where it is driven and how far. Revenues would go to a transport infrastructure fund. There would be an "alternative payment system" for foreign vehicles.

Source: ENDS Europe Daily, 16 November 2009

EU Commmission acts on missing permits...

The EU Commission is taking six member states to court for failing to issue permits for over 1,500 industries.

SHARIFF CHELAH/FOTOLIA



Oooops, forgot about the permit....

The European Commission is taking six member states – Denmark, Greece, the Netherlands, Portugal, Slovenia and Spain – to the European Court of Justice for failing to issue new or updated permits for over 1,500 industrial installations operating there.

The Commission is also sending first written warnings to Austria, France and Sweden over a further 1,700 installations operating without permits. The infringements concern the 1996 directive on Integrated Pollution Prevention and Control (IPPC), and in all cases the permits should have been issued by 30 October 2007.

Information: The European Commission : *europa.eu/rapid/pressReleasesAction.do?reference=IP/09/1649*

...and on air quality

On 29 October the European Commission sent a final written warning to Estonia, Slovenia and Sweden over breaches of the EU air quality standards for fine particulate matter (PM_{10}). The standards entered into force in 2005 and none of the three member states has requested a time extension to meet them.

The two binding air quality limit values for particulate matter (PM_{10}), based on daily and annual average concentrations, entered into force on 1 January 2005. The 2008 directive on ambient air quality and cleaner air for Europe allows member states, under strict conditions, to notify a time extension enabling them to extend the deadline for compliance with the PM_{10} standards until 10 June 2011.

Information: The European Commission : *europa.eu/rapid/pressReleasesAction.do?reference=IP/09/1650*

Move towards global mercury treaty

At a UN environment programme (UNEP) working group meeting in Bangkok on 23 October, world governments have agreed on the timetable and rules for formal talks to draw up a binding global treaty on mercury pollution. A first meeting of the International Negotiating Committee (INC) will be held in Stockholm in June 2010. A total of five INC meetings will be held before the treaty's expected adoption in 2013.

The environmentalist coalition Zero Mercury Working Group welcomed a decision that will allow green groups to participate in the INC meetings. Technical and financial assistance for the treaty's implementation in developing countries should also be "addressed early on", the coalition said.

Information: *www.zeromercury.org*

Vast hidden costs of energy use

A recent report by the US National Research Council entitled "Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use" (October 2009), concludes that airborne emissions from coal-fired electricity generation and the transportation sector are responsible for most of the estimated US$120 billion in annual environmental damage in 2005 that is not counted in energy prices, though the damage is likely much larger as the panel did not quantify expected damage from climate change and other hidden "externalities."

Besides excluding monetary damage from climate change, the report does not monetize harm to ecosystems, the effects of some air pollutants such as mercury, and risks to national security – damage with a monetary value that numerous environmental groups and some economists argue should be reflected in the cost of various energy uses, thus making the estimated value far lower than the actual damage.

Source: Car Lines, October 2009

GENO SAJKO / FOTOLIA

American daredevils.

Toxic fish in lakes across 47 states

Fish from lakes and reservoirs across the United States are riddled with toxic chemicals, according to a new study entitled "The National Study of Chemical Residues in Lake Fish Tissue" recently released by the US Environmental Protection Agency.

Mercury and PCBs were detected in every fish sample from 500 freshwater sources selected randomly from the estimated 147,000 target population of lakes and reservoirs in the 48 states. The data showed mercury concentrations in game fish exceeding EPA's recommended consumption levels at 49 percent of all lakes and reservoirs nationwide, and polychlorinated biphenyls (PCBs) in game fish at levels of potential concern at 17 per cent of lakes and reservoirs.

Burning fossil fuels, primarily coal, accounts for nearly half of mercury air emissions caused by human activity in the US, and those emissions are a significant contributor to mercury in water bodies.

The report is available at: *www.epa.gov/waterscience/fish/study/*

New sulphur dioxide standard proposed

The US Environment Protection Agency (EPA) is taking public comment on a proposal to establish a new national one-hour SO_2 standard, suggesting that between 50 and 100 parts per billion (ppb) may be allowed in the air during in any one hour period. The American Lung Association recommends EPA adopt a standard of 50 ppb – the most protective level under consideration.

The new standard is designed to protect against short-term exposures ranging from five minutes to 24 hours. Spikes in SO_2 concentrations occur primarily in areas near coal-fired power plants.

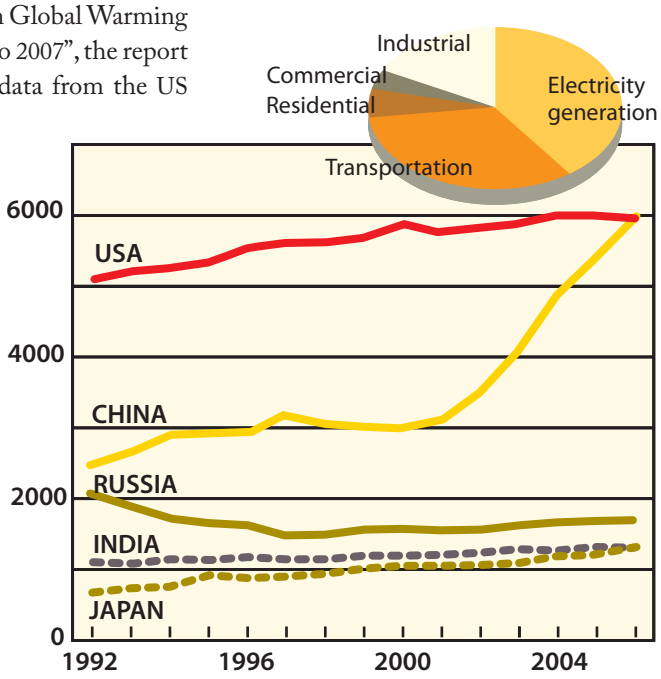
It is estimated that the revised standards would yield health benefits valued between US$16 billion and 100 billion.

Source: Environment News Service, 17 November 2009

Carbon emissions in the US up 19 %

Emissions of carbon dioxide (CO_2) increased by 19 per cent in the United States from 1990 to 2007, according to a new report by Environment America. Entitled, "Too Much Pollution: State and National Trends in Global Warming Emissions from 1990 to 2007", the report uses the most recent data from the US Department of Energy on state-by-state fossil fuel consumption to look at trends in carbon dioxide emissions.

Information: *www.environmentamerica.org/*



Total carbon dioxide emissions (million tons) from fossil fuels in the USA and other top five emitting nations in the world. Pie chart shows contributions from different sectors to US emissions.

LISOV SERGEY/FOTOLIA

You get a better view of it these days.

Congestion tax improved air quality and health

An evaluation of the effects of a congestion tax trial in Stockholm shows a decrease of 8.5 per cent in nitrogen oxide (NOx) emissions and of 13 per cent in coarse particle (PM_{10}) emissions in the congestion zone. Total road use was estimated to be reduced by 15 per cent within the charge area. Calculations indicate that a permanent congestion tax system would reduce the annual average NOx concentrations for the streets with the densest traffic by up to 12 per cent and for PM_{10} by 7 per cent.

Source: Science for environment policy, 5 November 2009

RECENT PUBLICATIONS

Black Carbon e-Bulletin (No. 1, July 2009).

Aims to bring together the scientific findings on Black Carbon and climate change, available abatement technologies, and other policy relevant information.

Published by the United Nations Environment Programme (UNEP)*www.unep.org/dec/Information_Resources/black-carbon.asp*

European Community emission inventory report 1990–2007 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP) (August 2009).

Emissions reporting show decreasing emissions – between 1990 and 2007, SO_2, VOCs and NOx dropped by 72, 47 and 36 per cent respectively. PM_{10} and $PM_{2.5}$ emissions fell 12 and 11 per cent respectively since 2000.

EEA Technical report No 8/2009, published by the European Environment Agency: *www.eea.europa.eu/publications/lrtap-emission-inventory-report-1990-2007*

Annual European Community greenhouse gas inventory 1990–2007 and inventory report 2009 (May and August 2009).

EU greenhouse gas emissions decreased in 2008 for the fourth consecutive year. Compared to 2007, the annual reduction is estimated to be about 1.3 per cent for the EU15 and 1.5 per cent for the EU27. Emissions in 2008 were 6.2 per cent below the Kyoto base-year emissions for the EU15, and 10.7 per cent below the 1990 level for the EU27.

Published by the European Environment Agency: *www.eea.europa.eu/highlights/new-estimates-confirm-the-declining-trend-in-eu-greenhouse-gas-emissions*

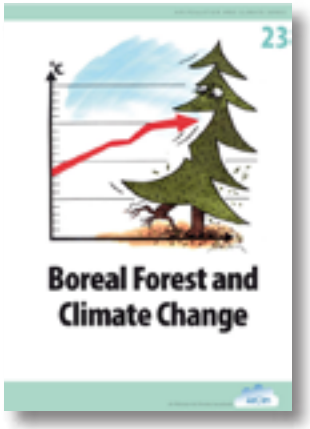
Extended Analysis of the American Cancer Society Study of Particulate Air Pollution and Mortality. (HEI Research Report 140)

Reports strong associations between exposure to particulate matter (PM) and premature death, especially in the case of ischemic heart disease (IHD), one of the leading causes of death in the United States.

The study found that for each increase of 10 µg/m^3 in exposure to fine PM air pollution, there was a 13-per-cent increase in the risk of premature death from all forms of cardiopulmonary disease.

Published by the Health Effects Institute: *pubs.healtheffects.org.*

Recent publications from the Secretariat



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.

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.

Carbon Capture and Storage in Norway

By Tore Braend, October 2008. Strong economic and political motives, combined with a partly positive and partly silent NGO community, has contributed strongly to the present powerful commitment towards the use of CCS in Norway.

The overall effect of this commitment has been a negative impact on efforts to reduce emissions of greenhouse gases in other sectors, especially the transport sector, where emissions are growing fastest.

How to order

Single copies of the above mentioned material can be obtained from the Secretariat (free of charge within Europe). Please call for quotation if more copies are required. Reports can also be downloaded in pdf format from www.airclim.org

Same, same but different...

Since 1 October 2008 the Swedish NGO Secretariat on Acid Rain has a new name.

From now on we are the **Air Pollution & Climate Secretariat.**

Please note our new web address, **www.airclim.org**, and new mail addresses: *info, christer.agren, reinhold.pape, acidnews*; all followed by *@airclim.org*

Coming events

UN FCCC COP 15 and COP/MOP 5. Copenhagen, Denmark, 7–18 December 2009. Information: *unfccc.int/*

GLOBAL DAY OF ACTION – International Demonstrations on Climate Change. 12 December 2009. Information: *www.globalclimatecampaign.org/*

CLRTAP Executive Body. Geneva, Switzerland, 14–18 December 2009. Information: *www.unece.org/env/lrtap*

EU Environment Council. 22 December, 2009. Information: *www.consilium.europa.eu/*

Fourth International Renewable Energy Conference. New Dehli and Uttar Pradesh, India. 17-19 February 2010. Information: *mnes.nic.in/pdf/irec-mnre.pdf*

GreenPort2010. Stockholm, Sweden, 24–25 February 2010. Information: *www.green-port.net/*

7th Green Ship Technology Conference. Copenhagen, Denmark, 16-18 March, 2010. Information: *www.greenshiptechnology.com*

CLRTAP Working Group on Strategies and Review. Geneva, Switzerland, 12–16 April 2010. Information: *www.unece.org/env/lrtap*

Fifth Global Conference on Oceans, Coasts and Islands. Paris, France, 3-7 May 2010. Information: *www.globaloceans.org*

ECOMM 2010 - European Conference on Mobility Management. Graz, Austria, 5-7 May 2010. Information: *www.ecomm2010.eu*

Transport and Air Pollution – 18th International Symposium. Zürich, Switzerland, 18–19 May 2010. Information: *ettap09.inrets.fr*

International Transport Forum - Innovation in Transport. Leipzig, Germany, 25-28 May 2010. Information: *internationaltransportforum.org*

Meeting of the UNFCCC Subsidiary Bodies. Bonn, Germany, 31 May – 11 June 2010. *Information*: http://unfccc.int/

Air Pollution 2010: 18th International Conference on Modelling, Monitoring and Management of Air Pollution. Kos, Greece 21-23 June 2010. *Information*: www.wessex.ac.uk

Cities for Mobility World Congress 2010. Stuttgart, Germany, 4-6 July 2010. Information: *www.cities-for-mobility.net*

15th IUAPPA World Congress. Vancouver, Canada. 11-16 September 2010. Information: *www.IUAPPA2010.com*

16th Session of the Conference of the Parties to the UNFCCC and 6th Session of the Meeting of the Parties to the Kyoto Protocol. Venue to be confirmed. 8-19 November 2010. Information: unfccc.int/