

Wind energy – so much potential

We are on track to phase-out and replace fossil fuels with renewable energy. After years of slow growth the wind is now shifting and investment is growing.

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Many loopholes in testing system

European carmakers manipulate emissions testing, so cars on average show 38 per cent lower emissions than under actual driving conditions.

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IPCC : Delaying action implies higher costs

Two-thirds of the carbon budget needed to keep global temperature rise below 2°C has already been spent. To replace fossil fuels we will need to triple our use of zero- and low-carbon energy by 2025.

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Biogas from manure

Making biogas from manure results in reduced greenhouse gas emissions and the production of a renewable fuel. The technology is far from its full potential in Europe, but also has some serious limitations.

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Air quality targets much cheaper than expected

The EU's new climate and energy policy for 2030 opens the way for more ambitious clean air targets.

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Leave fossil gas in the ground

Gas is better than coal, but not good enough. Much of it has to be left in the ground, so its use has to be cut fast.

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Low in ambition, late in timing

The NRMM proposal presented by the EU Commission shows a lack of ambition in both levels and timing.

After a few years' delay, and more than 15 years after the last significant directive, the European Commission finally released its proposal for a revision of the Non-Road Mobile Machinery (NRMM) Directive on 25 September 2014. As the proposed text enters the co-decision process in the European Parliament and in the European Council, many improvements will be sought to ensure more ambitious and consistent legislation. The text is set

to enter into force on 1 January 2018.

With other emission sources getting tighter emission limits over the years, the emissions share of Non-Road Mobile Machinery has increased and is projected to grow further in the coming years as long as there is a discrepancy between the emission limits for NRMM and those for other vehicles. The proposal from the Commission focuses on particulate matter,

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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Assistant editors: Christer Ågren & Reinhold Pape

Printed by Trydells Tryckeri, Laholm, Sweden.
ISSN 0281-5087.

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

A little more than a century ago Fritz Haber invented a way to make synthetic ammonia out of pure air. The process was soon scaled up for industrial use by Carl Bosch. The method known as the Haber-Bosch process revolutionised agriculture. The cheap nitrogen fertilizer gave higher yields. A surplus of grain made it possible to

raise animals on concentrated feed. Meat consumption soared. Today it is estimated that about half of the nitrogen in our food originates from the Haber-Bosch process.

This has come at a price. Nitrogen pollution causes eutrophication, contaminated groundwater, global warming and deteriorating air quality.

An attempt to address some of these problems is found in the Commission's proposal for a new National Emissions Ceilings (NEC) Directive, which is right now under consideration by the European Parliament and the Council. The proposal includes a reduction in ammonia of 27 per cent from 2005 to 2030, with an interim target of 6 per cent by 2020.

Compared with the reduction targets set for other pollutants, it cannot be considered ambitious. But the reduction by 2030 would at least require that the agricultural sector (responsible for more than 90 per cent of emissions) would have to do something more than business as usual.

Farmers' lobbies say that the ammonia abatement will be too costly. In fact measures to reduce ammonia offer a particularly high benefit-to-cost ratio, which is mainly because available "low-hanging fruit" for mitigation has yet to be implemented.

Since the measures to achieve these objectives are not specified in the proposed directive, it is possible for countries to design measures under the rural development

programme to finance some of the costs. Even better, reduced ammonia losses can actually be cost-effective on a farm level, since more nitrogen is left for the crop.

Emissions from agriculture are easily forgotten. Maybe because they do not fit the classic image of emissions – something that leaves a tall smokestack or exhaust

pipe. Normally these emissions are not even visible (though can quite often be smelled).

The fact that they are hard to see does not unfortunately make them harmless. In March this year Paris suffered from acute high levels of particulate matter. This was due in large part to high ammonia emissions in the

region during this period, resulting in the formation of secondary particles. In the future, the role of ammonia for the formation of secondary particles will be even greater. Because of the significantly more ambitious reduction targets for NO_x (69%) and SO₂ (81%).

Eutrophication is another problem caused by ammonia emissions. Under current legislation more than half of all ecosystems in the EU-28 will be exposed to excess nitrogen deposition by 2020. For Natura 2000 areas the figure is even higher.

If the European Parliament and the Member States endorse or better yet reinforce the proposed ammonia targets it will be of great importance for both human health and biodiversity in the EU. While this comes at a price, it neither threatens food security or European agriculture as an economic sector. And the health benefits outweigh by far the abatement costs.

Kajsa Lindqvist

"It will be of great importance for both human health and biodiversity in the EU"





Air pollution cuts India's crop yields by almost half

Ground-level ozone is damaging plants' leaves and black carbon is reducing the amount of sunlight they receive. Both pollutants are also damaging human health.

In a new study, researchers have analysed 30 years of data on yields of wheat and rice alongside data on air pollution and climate in India, and concluded that significant decreases in yield could be attributed to two air pollutants, black carbon and ground-level ozone.

Comparing crop yields in 2010 to what they would be expected to be if temperature, rainfall and air pollution remained at their 1980 levels, it was found that crop yields for wheat were on average 36 per cent lower than they otherwise would have been, while rice production decreased by up to 20 per cent. In some higher population states, wheat yields were as much as 50 per cent lower.

Up to 90 per cent of the decrease in potential food production seems to be linked to air pollution, while changes linked to global warming and precipitation levels accounted for the remaining 10 per cent.

Black carbon is made up of tiny soot particles and emanates mainly from

combustion in rural cookstoves, but also comes from diesel exhausts. Ozone is a secondary air pollutant from precursor pollutants such as nitrogen oxides (NOx) and volatile organic compounds (VOCs) reacting in the atmosphere in the presence of sunlight. The sources of NOx and VOCs are primarily motor vehicle exhaust, industrial chimneys, and chemical solvents.

Ground-level ozone and black carbon are damaging to human health, contributing to premature deaths. Both are known as short-lived climate pollutants that exist in the atmosphere for weeks to months, with ozone damaging plants' leaves and black carbon reducing the amount of sunlight they receive.

"While temperature's gone up in the last three decades, the levels of smog and pollution have changed much more dramatically," says Jennifer Burney, an environmental scientist at the University of California, San Diego, and co-author of the paper, published in the journal *Proceedings of the National Academy*

of Sciences. "But this was the first time anyone looked at historical data to show that these pollutants are having tremendous impacts on crops."

The results are specific to India's seasonal patterns, the crops, and its high pollution levels, but may extend to other places with similar problems, such as China.

Measures such as improved cookstove technology for rural areas, cleaner energy production and particle filters on diesel vehicles in urban areas, could go a long way towards reducing the damaging impacts on both agricultural yields and health.

Source: The Guardian and Reuters, 3 and 4 November 2014

The study: Recent climate and air pollution impacts on Indian agriculture. By Jennifer Burney and V. Ramanathan. Link: www.pnas.org/content/early/2014/10/29/1317275111.abstract

Low in ambition, late in timing

Continued from front page



expressed as mass (PM) and numbers of particles (PN), with most other pollutant emission levels remaining unchanged from stage IIIa, IIIb and IV. Given the fact that technology is ready and already deployed for similar engines in other applications for road vehicles, carbon monoxide (CO), hydrocarbons (HC), PM and PN levels could have been further tightened to reduce the gap between road and non-road applications (see figure). Only NOx emissions are at a similar level for NRMM and road trucks, even though questions must be raised regarding the representativeness of the test cycle for both NRMM and trucks under steady state conditions. NOx emissions are relatively easy to control over a limited range of operating points – much less so over the whole engine map, as witnessed by Euro 6 light-duty vehicles, which exceed the regulatory limits by more than seven times the Euro 6 limit in real-life conditions.

The EU Commission proposal is making slow progress at reducing air pollution from non-road machinery. The proposed text is a regulation, which, once adopted at the European level, won't require national law

transposition. It also increases the type of applications that are included in the legislation. All diesel engines are covered, including the bigger engines above 560 kW that were not covered in the previous legislation. Smaller spark-ignition engines are also covered in a bid to tackle all kinds of applications.

Finally, the Commission proposal starts tackling the particulate number issue, although not uniformly across all categories. Setting a limit at or below 1012 particulates/kWh requires the installation of a particulate filter according to industry sources. Having no PN limits for certain engine types raises substantial concerns that some engines will be exempted from fitting a particulate filter, potentially distorting the market towards more polluting options.

Indeed, big engines above 560 kW do not have a PN limit in the proposal. Also inexplicably, railcars have a PN limit, while locomotives do not. Smaller engines for ships below 300 kW are also exempted from PN limits for now, while bigger engines for inland water vessels

(IWV) above 300kW do have to limit their particulate number emissions, in a bid to trigger a technology switch to liquefied natural gas (LNG) as fuel for IWV, according to informal discussions with a representative from the European Commission.

Leaving these loopholes is likely to provide an incentive for manufacturers and customers to shift their product offerings and demand towards cheaper and more polluting options that also require less maintenance. This is unacceptable, and the reasons given (diesel locomotives to be phased out by 2030, small ships not used intensively and technology not ready for big engines greater than 560kW) are not really up to the challenge of ever-deteriorating air quality across Europe.

Natural gas engines are also favoured to some extent in the proposal, with specific HC limits that can in some circumstances multiply the emission limit by more than 30 times the regulatory limits. Technology neutrality should still prevail, and allowing for higher levels of pollutants and greenhouse gases will be counterproductive in the long run.

The dates for entry into force are also conservative, staggered over three years, from 2019 to 2021. Industry has argued for long development cycles for certain types of engines, especially in the water vessel sector, which will not need to comply with the new legislation before 2020 for engines between 300 and 1000kW, and 2021 for engines larger than 1000kW. With the NEC directive (if maintained) setting an emissions target for the year 2020, this new piece of legislation will not be helpful with such a slow phase-in.

To achieve quicker and more effective emission reductions, the existing engines that are already on the market should also be covered. Most NRMM engines have a long life, usually staying on the market for more than 20 years. Many parts of such long-lasting engines are nevertheless replaced on a regular basis, depending on the frequency and severity of usage by the machine owner. The legislation should provide a framework to have exhaust post-treatment devices fitted to engines during those maintenance operations. The

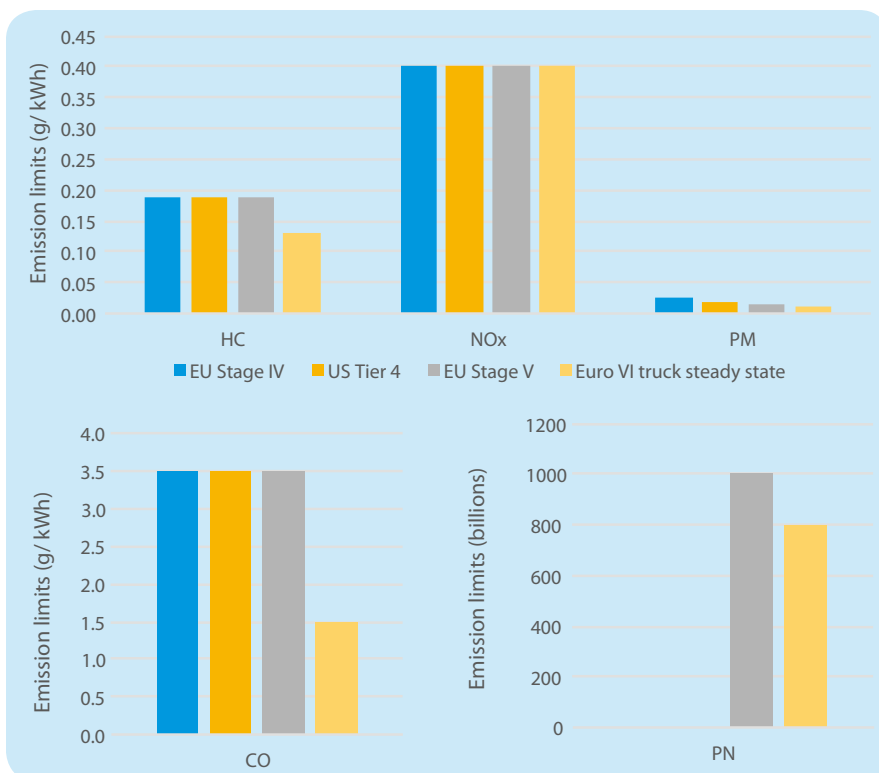


Figure: Emission levels comparison between NRMM EU Stage IV, V, US Tier 4 (for engine power range 130-560 kW), and the Euro VI Truck steady state standard
Note: Steady state tests for trucks and engine tests for NRMM engines are different. PN standard only introduced for EU Stage V and Euro VI.

Commission is only mandated to deal with pre-market entrance, and has no power to enforce post-market introduction regulation. Some progress is also being made towards in-service conformity that will be further discussed and adopted through delegated acts. The forthcoming co-decision process in the Parliament and Council could nevertheless tackle retrofitting to achieve more effective policy-making. The Norwegian NOx fund for domestic ships proved that exhaust devices can be retrofitted and there is enough space on board ships to place additional devices in the exhaust stream, contrary to the arguments often raised by ship manufacturers and operators.

Forthcoming delegated acts will also aim to provide more transparent carbon dioxide emission values for the machines sold, with the engine manufacturer being asked to report carbon dioxide emissions upon request from the customer. Looking ahead, this could be a sound basis for joint greenhouse gas and pollutant legislation for the next revisions, ending the disconnect between pollutant and climate policies in other sectors that have, until recently, very often been set and evaluated by different bodies at different times, with separate calendars.

The NRMM proposal presented by the Commission is making slow progress towards significantly reducing the pollutant and greenhouse gas emissions of the machines covered under the umbrella of the legislation. Transport & Environment and its allies will work to make sure the co-decision process amends the Commission proposal to remove the potential market distortions from lacking or lax emission limits for some engine types. Establishing a more robust and consistent regulation will also make the market more stable and predictable, and should be a win-win for manufacturers' competitiveness, the environment and health protection.

François Cuenot
Policy Officer, Transport & Environment

T&E briefing: www.transportenvironment.org/publications/tackling-emissions-diesel-machines
COM proposal: http://europa.eu/rapid/press-release_IP-14-1044_en.htm

Commission takes legal action against high PM₁₀ levels in Spain and Greece

The Commission recently issued two new reasoned opinions against Greece and Spain for failing to protect citizens from air pollution. Under the Air Quality Directive (2008/50/EC), member states must protect citizens from a number of air pollutants including PM₁₀. Greece and Spain have failed to comply with these limits for a long time.

In the case of Spain, citizens in the agglomerations: "Zonas Rurales" of Andalucía, Central Asturias, Gijón, Barcelona, and Vallès-Baix Llobregat have been more or less continuously exposed to unhealthy levels of PM₁₀ between 2005 and at least 2012.

In Greece, citizens in Thessaloniki have also been exposed to exceeded limits for PM₁₀ since at least 2005.

The Commission has thus issued two "reasoned opinions" for the non-compliance since 2005, giving Spain and Greece two months to take effective measures to bring down the pollution and keep the period of non-compliance as short as possible. If the countries fail to act appropriately, the Commission may refer the case to the Court of Justice of the European Union where they may face a hefty fine.

Source: http://europa.eu/rapid/press-release_MEMO-14-589_en.htm

NEC proposal "well justified"

By substantially reducing emissions of air pollutants, the proposed new National Emissions Ceilings (NEC) Directive would achieve considerable positive impacts on human health and the environment. The benefits of these health improvements far exceed the costs of additional abatement measures. Therefore, the proposal is well justified. However, compliance with the World Health Organization's guidelines for PM_{2.5} and ozone will be still out of reach.

These are the main conclusions of a study undertaken at the request of the European Parliament's Environment Committee, to provide an analysis of the World Health Organization's (WHO) air quality guideline values for health in the context of the revision of the NEC Directive.

The study notes that in 2030 there will still be several emission sources contributing to elevated levels of PM_{2.5}, and that not only primary PM emissions have to be abated, but also sources emitting the PM precursors SO₂, NOx, NH₃ and VOCs. As the share of combustion emissions from traffic will decline, the relative importance

of emissions from agriculture and solid-fuel burning in the domestic sector will rise.

For ozone, the importance of hemispheric background levels is increasing and in order to further decrease the levels of this pollutant in Europe, measures within the EU and internationally will need to go hand in hand.

Current modelling results suggest that additional structural changes are required to achieve substantial further emission reductions, and the authors recommend that, before 2030, health impacts and interferences with other policies (in particular climate change, agriculture and energy) should be reassessed. The currently applied models have shortcomings in analysing the effects of lifestyle and behavioural changes such as a shift to vegetarian diets, which might open further options for emission reductions.

The study: EU Air Quality Policy and WHO Guideline Values for Health (October 2014). By Policy Department A: Economic and Scientific Policy, of the European Parliament's Directorate General for Internal Policies. Available at: www.europarl.europa.eu/studies



UN warns against exceeding “Emissions Budget”

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The gap between what countries have pledged to achieve and what the IPCC has estimated is needed in order to stay within the 2°C target is estimated at 10 GT of CO₂e by 2020.

UNEP's Emissions Gap Report 2014, published in November 2014, examines whether the pledges made by countries are on track to meet the internationally agreed 2°C target with a likely chance of greater than 66 per cent.

Climate Action Network International and more than a hundred countries are demanding that the global temperature increase compared with the pre-industrial level is kept below 1.5°C. Increasing the chance of staying within the 2°C target to 90 per cent or better would give around a 66 per cent chance of limiting warming to 1.5°C according to the new IPCC assessment report published by the IPCC in 2014.

In the UNEP Gap Report the global climate budget – or the maximum amount of carbon dioxide (CO₂) that can be emitted into the atmosphere to stay within a likely chance of 2°C – is estimated at 1000 gigatonnes of carbon dioxide. Exceeding the estimated budget of just 1000 Gton CO₂ would increase the risk of severe, pervasive and irreversible climate change impacts according to UNEP.

“An increase in global temperature is proportional to the build-up of long-lasting greenhouse gases in the atmosphere, especially CO₂. Taking more action now reduces the need for more extreme action

later to stay within safe emission limits,” said Achim Steiner, UN Under-Secretary-General and Executive Director of UNEP. “In a business-as-usual scenario, where little progress is made in the development and implementation of global climate policies, global greenhouse gas emissions could rise to up to 87 Gton CO₂-eq by 2050, way beyond safe limits.”

“By introducing an emissions budget approach, the fifth Emissions Gap Report provides countries with a common platform to negotiate global targets for limiting global warming this century to 2°C beyond 2020, this is because countries are giving increasing attention to where they realistically need to be by 2025, 2030 and beyond,” added Mr. Steiner.

To achieve global climate neutrality between 2055 and 2070, annual anthropogenic CO₂ emissions should hit net zero on the global scale to avoid exceeding the budget. Net zero implies that some remaining CO₂ emissions could be compensated for by the same amount of carbon dioxide uptake, or negative emissions, so long as the net input to the atmosphere due to human activity is zero, the report finds.

Taking into account non-CO₂ greenhouse gases, including methane, nitrous oxide and hydrofluorocarbons, total global

greenhouse gas emissions need to shrink to net zero between 2080 and 2100.

The 2014 Emissions Gap Report defines the emissions gap as the difference between emission levels in 2025 and 2030 consistent with meeting climate targets, versus the levels expected if country pledges are met. The report examines whether the pledges made by countries are on track to meet the 2°C target.

Despite the fact that the gap is not getting smaller, studies show that it could be closed if available global emissions reduction methodologies are fully exploited. Scientists estimate the gap in 2020 at up to 10 Gton of CO₂-eq and in 2030 at up to 17 Gton of CO₂-eq.

In the case of a 1.5°C target the climate budget for a likely chance of staying within this target is 750 Gton of CO₂ according to the IPCC. In 2013 the world emitted 36 Gton of CO₂.

Global CO₂-eq emissions have to be between 70-95 per cent below 2010 emissions by 2050 to reach this target, says the IPCC.

Reinhold Pape

Source: UNEP Press release and IPCC 5AR. The Executive Summary of the report is available at: <http://www.unep.org/pdf/UNEPemissionsGapReport2014.pdf>

National courts must seek air quality compliance

The European Court of Justice (ECJ) on 19 November ruled that the UK must act as “soon as possible” to clean up illegal levels of air pollution. The judgement is the first ever ruling at EU level on enforcing the 2008 Ambient Air Quality Directive, which sets legal limits for the concentration of pollutants in the air.

ClientEarth brought the case against the UK government for breaching nitrogen dioxide limits since they entered into force in 2010. Under current plans, the UK is not expected to meet these limits until after 2030. The case will now return to the UK Supreme Court for a final ruling next year. This should see the UK Supreme Court ordering the British government to take action to meet limits in a much shorter timeframe.

Alan Andrews, the ClientEarth lawyer leading the case against the UK on air

quality, said: “Today is a bright day for those who suffer from the disastrous health effects of air pollution. It means that citizens can hold their governments to account if they fail to act to improve air quality.”

The ECJ ruled that having an air quality plan does not mean a member state has satisfied its obligations. In cases of non-compliance, national courts should order the relevant authorities to establish a plan that will ensure that the period in which the pollution limits are exceeded is as short as possible.

In effect, the ruling binds the courts of all member states and will have an impact on enforcing air quality levels across the EU. The ruling took place amidst growing concerns that the European Commission considers a withdrawal of the Clean Air Package, including a proposal last year by

the Commission to revise the National Emissions Ceilings (NEC) Directive, which is essential to improve air quality.

Arne Fellermann at the European Environmental Bureau said: “This ruling means that member states have to step up their efforts to tackle air pollution and address the all too common breaches of the air quality standards. It underlines the need for adoption of the Clean Air Package, which does not set stricter ambient air quality limits but would provide a stimulus to governments to take the steps needed to comply with the existing limits.”

Sources: EEB and ClientEarth press releases, 19 November 2014

ECJ press release: <http://curia.europa.eu/jcms/upload/docs/application/pdf/2014-11/cp140153en.pdf>

The judgement: www.supremecourt.uk/decided-cases/docs/UKSC_2012_0179_Judgment.pdf

European court supports national subsidy schemes

A positive development for renewables and wind energy in the EU arena is the recent Court of Justice of the European Union (CJEU) ruling of September 2014, which supports national green energy certification schemes favouring local energy producers. The decision confirmed an earlier ruling that EU member states have the right to promote green energy over common market rules. In this case, Flemish electricity supply company Essent had tried to meet its green energy obligation with power produced in Denmark, the Netherlands and Norway, but this was refused by the authorities and the company was subsequently fined around €1.5m. Essent appealed the decision on the basis of a claim of breach of the free movement of goods. However, the CJEU, to which the case was later referred, ruled that the Flemish regulator's decision to restrict its green certificate scheme to local producers was “justified by the public

interest objective consisting in promoting the use of renewable energy sources with a view to protecting the environment and combating climate change”.

The ruling comes two months after a similar decision against the Finnish wind energy producer Ålands Vindkraft's plea for Swedish green certificates.

The judgements are welcomed by the renewables industry, including the European Wind and Energy Association (EWEA), as reassurance that green certificate subsidy schemes could continue to favour national producers in the short term to avoid disrupting the local renewable

energy markets. The decisions properly reflect EU law, as the Renewable Energy Directive gives member states the right to determine which projects are eligible for support, whether these are within national borders or outside.

Sources: Judgment of the Court (Fourth Chamber) of 11 September 2014 (request for a preliminary ruling from the Rechtbank van eerste aanleg te Brussel — Belgium) — Essent Belgium NV v Vlaamse Reguleringsinstantie voor de Elektriciteits- en Gasmarkt (Joined Cases C-204/12 to C-208/12): <http://curia.europa.eu/juris/document/document.jsf?text=&docid=159066&pageIndex=0&doclang=EN&mode=req&dir=&occ=first&part=1&cid=314449>

ENDS Europe, 12 September 2014



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GHG emissions from large facilities in the US

The US Environmental Protection Agency (EPA) has released data on greenhouse gas (GHG) pollution trends and emissions broken down by industrial sector, geographic region and individual facilities. In 2013, reported emissions from large industrial facilities were 20 million metric tons (0.6%) higher than in 2012, driven largely by an increase in coal use for power generation.

Over 8,000 large emitters reported direct GHG emissions in 2013, representing approximately 50 per cent of total US emissions. Power plants remained the largest emission source, emitting over 2 billion metric tons of CO₂, roughly 32 per cent of total national GHG pollution. Link: www.epa.gov/ghgreporting/

China needs to act on shipping emissions

Environmental organisation Natural Resources Defense Council (NRDC) in a new report "The Prevention and Control of Shipping and Port Emissions in China" has called on China to introduce an Emissions Control Area (ECA) as part of a solution to alleviate the country's severe air pollution problems. China is home to seven of the world's ten busiest container ports, and shipping is a significant source of air pollution and health problems, particularly in port cities. With oceangoing ships allowed to burn fuel with sulphur levels that are 100 to 3,500 times higher than permitted in on-road diesel vehicles, one container ship cruising along the coast of China emits as much diesel pollution as 500,000 new Chinese trucks in a single day, according to the report.

Link: www.nrdc.org/international/china-controlling-port-air-emissions.asp



Low-emission ship.

Wind energy – so much potential

We are on track to phase-out and replace fossil fuels with renewable energy. After years of slow growth the wind is now shifting and investment is growing.

In the fifth edition of the Global Wind Energy Outlook for 2014, the Global Wind Energy Council and Greenpeace International describe the situation of wind energy and its potential today.

The Global Wind Energy Outlook explores the future of the wind energy industry out to 2020, 2030 and up to 2050. With the IEA World Energy Outlook's 'Reference' scenario as a baseline, three scenarios are used in the publication:

- the 'New Policies' scenario: this scenario is based on an assessment of current directions and intentions of both national and international energy and climate policy, even though they may not yet have been incorporated into formal decisions or enacted into law.
- the GWEO Moderate scenario: this scenario takes into account all policy measures to support renewable energy either already enacted or at the planning stage around the world, and at the same time assumes that the commitments to emission reductions agreed by governments at Cancun will be implemented, although on the modest side.
- the GWEO Advanced scenario: which is the most ambitious scenario, and outlines the extent to which the wind industry could grow in a best-case 'wind energy vision', but still well within the capacity of the industry as it exists today. It as-

sumes an unambiguous commitment to renewable energy in line with industry recommendations, the political will to commit to appropriate policies and the political stamina to stick with them.

The most noteworthy conclusions of the findings of the Global Wind Energy Outlook 2014 are the following:

- Wind power is the least-cost option when adding new generation capacity to the grid, in an increasing number of markets, and prices continue to fall.
- There are commercial wind power installations in more than 90 countries with a total installed capacity of 318 GW at the end of 2013, providing about 3% of global electricity supply last year.
- An end seems near to five years of slower growth mainly due to a combination of the various manifestations of the economic crisis, low or negative demand growth, and policy instability in key markets. The market is set to start to grow again and the most promising areas of new growth are in Brazil, Mexico and South Africa.
- Despite uncertainty about the future in terms of economic conditions and political response to climate change it is certain that wind power still continue to play a significant and growing role in the electricity supply.

Table: The projected wind power share of global electricity (found on p. 14 of the report).

	2013	2015	2020	2030	2040	2050
New policies scenario						
IEA demand projection	3%	5%	6%	8%	10%	11%
Energy Efficiency demand projection	3%	5%	7%	9%	11%	13%
Moderate scenario						
IEA demand projection	3%	5%	7%	13%	15%	17%
Energy Efficiency demand projection	3%	5%	8%	15%	17%	20%
Advanced scenario						
IEA demand projection	3%	5%	8%	17%	22%	26%
Energy Efficiency demand projection	3%	5%	9%	19%	25%	31%



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Wind power provided about 3 per cent of global electricity supply last year

Climate and air pollution policies not in conflict

Air pollution policies do not jeopardise long-term climate policy goals, according to a recent scientific study. Although reductions in sulphur dioxide could have some warming effects, the impacts are only short-term and will never outweigh climate policy's cooling effects. Even stringent air pollution policies would not affect the point at which more energy is absorbed by the Earth's atmosphere than reflected back into space. Stringent air pollution policies are effective in reducing sulphur and aerosols, regardless of climate policy, the study says. However, these efforts are boosted by climate policies' dual benefits. As a result of reduced fossil fuel combustion, air pollution also falls substantially. The researchers conclude that because air pollution policies do not prevent long-term climate targets being reached, there is no conflict between the two policy areas.

Source: Science for Environment Policy, 30 October 2014

The study: Can air pollutant controls change global warming? Streffler J, Luderer G, Kriegler E, and Meinshausen M. *Environmental Science & Policy* 41: 33-43. DOI: 10.1016/j.envsci.2014.04.009.

London plans ultra low emission zone

The London transport authority is consulting on a proposal to develop the world's first "ultra low emission zone" (ULEZ) in central London, which would take effect from September 2020. The ambition is that the ULEZ would at least halve emissions of NO_x and PM from vehicle exhausts, according to the proposal.

All vehicles will be required to meet new exhaust emission standards (Euro 6) when entering the zone, or pay a daily charge. Additional requirements are proposed for taxis and new private hire vehicles, which would need to be zero-emission-capable to obtain a licence from 2018. All double-decker buses operating in central London will need to be hybrid and single-decker buses zero emission by 2020.

Source: Ends Europe Daily, 29 October 2014

The report features a number of results projected along the three baseline scenarios for the years 2013, 2015, 2020, 2025, 2030, 2035, 2040, 2045 and 2050. There are eleven categories covered comprising for instance global cumulative capacity, global annual growth rate, production (TWh), wind power penetration in global electricity generation, CO₂ reduction (with 600g CO₂/kWh), capital costs, investment and jobs created.

The report clearly demonstrates that wind energy generally has a great role to play in supplying the world's electricity. It has a particularly important role to play in the regions and countries where as much as 95% of the population lack access to a modern electricity supply. Many of these "poorer" countries rely on imported fuels, which has a great adverse impact on some countries' economies. Large-scale power production, in many of these regions, is likely to mean large hydro or coal-based generation. Wind power, because of its scalability, can and is beginning to play a key role in both decentralized and centralized systems in several countries. In countries such as Russia, the US and China the potential is great, there is a clear rationale for increasing the share of renewable energy systems (RES). The wind

conditions are suitable but the potential is not fully realized due to a number of issues, such as financial obstacles, regulatory barriers, lack of political will, existence of abundant fossil fuel reserves rendering the necessity of wind power less crucial.

However, given the complexity of the situation and the varying framework conditions, the report clearly demonstrates that the technology exists and wind power is increasingly a low-cost option. In several countries, including countries in Eastern Europe, the EU Directive on Renewable Energy, which the candidate and potential candidate countries are forced to transpose prior to EU accession, is creating a demand and political will for investments into RES such as wind energy. It is hoped that the run-up to the Paris climate talks at the end of 2015 and the aftermath of an international agreement on global greenhouse gas reductions will further propel the shift towards RES giving us a chance to realize the Advanced scenario.

Miriam Markus-Johansson

This is the first article in a series of Acid News articles covering sustainable energy policy with a focus on renewable energy sources and energy efficiency policy and legislation at EU and international level.

Methane and black carbon cuts won't buy us time

Two new scientific studies say that the effectiveness of cutting a range of non-CO₂ gases such as methane and black carbon to limit global warming to 2°C has been strongly and consistently overestimated.

The Guardian reports that the global warming effect of black carbon, or soot, has been greatly exaggerated due to mistaken assumptions about the atmospheric altitude at which its particles are concentrated, according to a study by Norwegian researchers. "Uncertainty surrounds the exact influence of black carbon on global warming, partly because of the difficulties involved in estimating how much of it is there is. Soot particles are also enigmatic substances, with warming and cooling properties that depend on the atmospheric conditions they encounter as they drift upwards. In the upper troposphere at tropical and middle latitudes, they have the potential to absorb and emit heat and solar radiation. But if they do not rise that far, they may stabilise lower-lying clouds that block the sunlight, so reducing temperatures. Global warming efforts should focus on CO₂, not soot particles known as black carbon", says the Norwegian team.

The New Scientist reports on a new study published by the International Institute for Applied Systems Analysis, which states that to prevent dangerous

climate change, there is no alternative to ending human emissions of carbon dioxide. The study says that "suggestions that cutting a range of non-CO₂ gases like methane might do at least part of the job are based on faulty accounting." Some scientists and governments have in the past argued that there is a third way to curb warming. Action to reduce other types of greenhouse gas emissions might be cheaper and quicker, buying time for later action on CO₂. The US government and the UN Environment Programme have both promoted cutting emissions of methane and soot as an effective emergency response to global warming. The study says "that the potential for preventing 2°C of warming by controlling these pollutants has been strongly and consistently overestimated."

The authors of the study explain according to the New Scientist that "the problem is twofold. Because gases like methane have much shorter atmospheric lifetimes than CO₂ they don't accumulate in the atmosphere in the same way, lessening their contribution to warming. Secondly, these other gases often have the same sources as CO₂ emissions, such as burning fossil fuels. This means that

the impact of cutting these gases on curbing climate change has already been included in calculations of cutting CO₂ emissions, so those gases have in effect been 'double-counted'. Many studies haven't considered this."

Reinhold Pape

Sources:

New Scientist, 5 November 2014 by Fred Pearce, Journal reference: PNAS, DOI: [10.1073/pnas.1415631111](https://doi.org/10.1073/pnas.1415631111)

Disentangling the effects of CO₂ and short-lived climate forcer mitigation. By Rogelj J, Schaeffer M, Meinshausen M, Shindell D, Hare W, Klimont Z, Velders G, Amann M, Schellnhuber HJ. Proceedings of the National Academy of Sciences (PNAS). Link: <http://www.pnas.org/content/111/46/16325.short>

Arthur Neslen, Guardian, 26 September 2014

How shorter black carbon lifetime alters its climate effect. By Hodnebrog O, Myhre G, Samset BH. Nature Communications 5. Link: <http://www.nature.com/ncomms/2014/140925/ncomms6065/abs/ncomms6065.html>

The warming effect of soot has been exaggerated.

Many loopholes in testing system

European carmakers manipulate emissions testing, so cars on average show 38 per cent lower emissions than under actual driving conditions.

Differences in CO₂ emissions between test results and real-life driving have increased in recent years; in 2001 the gap was 8 per cent and in 2013 it had risen to 31 per cent for cars sold to private individuals. For company cars the difference was even larger, at 45 per cent. The average gap is now 38 per cent.

The EU CO₂ rules for cars, which require carmakers to produce cars that on average do not exceed a certain level of CO₂ per km, were adopted in 2009. However by manipulating testing, instead of investing in true technology improvements, half of the gains achieved since 2008 is actually hot air. There are substantial differences between carmakers. General Motors is the worst offender, with less than 30 per cent of claimed emission reductions actually delivered on the road. Daimler is also among the worst, with barely 40 per cent of the claimed progress reflected in real driving conditions. At the other end of the scale, Fiat and BMW deliver more than 80 per cent.

The loopholes in the testing system undermine the CO₂ rules for cars, which in the end lead to higher CO₂ emissions and delayed advancements towards low-carbon technology.

Furthermore, it becomes more difficult for car buyers to make informed choices in terms of fuel efficiency. There is also the risk that the consumer-driven technology development will subside.

The weaknesses of the current testing system are several:

- The test cycle used is thirty years old and no longer representative of modern driving. For example, it contains only conservative accelerations and moderate speeds.
- The test procedures contain many loopholes that carmakers are increasingly exploiting.
- The carmakers use specially prepared prototype cars. This can mean tires with low rolling resistance, special lubricants in the engine for increased efficiency and a minimal interior in the car to reduce weight.



Tests and real world driving differs substantially.

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- During the test, accessories such as air-conditioning and media systems remain switched off.
- The test exaggerates the benefits of new technologies, such as stop-start, since the car is stationary for 20 per cent of the cycle.

A first step would be to introduce the new global Worldwide Harmonised Light Vehicle Test Procedure (WLTP), which better replicates real-world driving. The European Commission and the European Parliament have already proposed that it should be introduced in 2017, but several member states (under pressure from carmakers) want to delay its introduction.

Greg Archer, T&E Clean Vehicles manager, said: "Unless Europe introduces the new global test in 2017 as planned, carmakers will continue to cheat laws designed to improve fuel efficiency and emissions reductions. The cost will be borne by drivers who will pay an additional €5,600 for fuel over the lifetime of the car compared to the official test result."

But it is difficult to design tests that fully reflect reality. Also the WLTP is estimated to show about 15 per cent better results than on the road. In order to provide robust data for labelling (which

can also be used as a basis for differentiated vehicle taxes), the WLTP test value needs to be supplemented with data on emissions from energy-intensive components such as lights, air conditioning and heating. One way forward according to T&E would be to update the EU Car Labelling Regulation from 1999.

Another major problem with the current system is that the organisations performing the testing services are paid directly by the carmakers and are not therefore independent of the industry. As a result they end up competing by helping their customers to find the best ways to cheat the system. The introduction of a European Type Approval Authority would ensure that tests are performed consistently and independently.

Kajsa Lindqvist

Manipulation of Fuel Economy Test Results by Carmakers: Further Evidence, Costs and Solutions. Transport & Environment, November 2014. Available at: <http://www.transportenvironment.org/publications/manipulation-fuel-economy-test-results-carmakers>

IPCC warns that delaying action implies higher costs

Two-thirds of the carbon budget needed to keep global temperature rise below 2°C has already been spent. To replace fossil fuels we will need to triple our use of zero- and low-carbon energy by 2025.

In the most comprehensive, authoritative and scrutinised assessment of climate change ever produced, the Intergovernmental Panel on Climate Change (IPCC) has offered its starkest warning yet about the challenges facing humanity. Not only does the IPCC show that climate change is real and that its impacts are happening faster than ever, but for the first time it lays out the true extent of human influence on the climate system. While previous estimates say human activity – primarily the burning of fossil fuels – is responsible for more than half of all warming, the latest report shows we are actually responsible for all warming since 1951.

But the main takeaway for decision makers is this: governments can no longer just talk about emissions reductions, they need to work towards a complete phase-out of fossil fuel emissions globally. The IPCC makes it clear that emissions need to fall to zero if the world is to keep global warming below the internationally agreed limit of 2°C. In the words of experts and observers tracking the IPCC process: “The science is in and it’s game over for fossil fuels.” For the first time, the Fifth Assessment Report includes a strict carbon budget for governments, of which over two-thirds have already been used up. At current rates the world would burn through the rest in less than 30 years. For the best chance of avoiding severe levels of warming, governments will need to peak emissions, rapidly phase fossil fuels down to zero and transition to 100 per cent renewable energy.

Such a transition is not only possible, but is economically viable, according to the IPCC. Rapid development of renewables since the body’s last Assessment Report in 2007 means that clean energy is cheaper and stronger than ever before, and bringing multiple societal benefits – including

increased energy access, jobs and improved public health. Continuing down such a path and investing in renewable energy in the next few decades will also be cheaper than paying a rapidly growing bill for “severe, pervasive, and irreversible impacts”. Such cost savings would vastly outweigh the costs associated with the clean energy transition, says the IPCC.

Requested and endorsed by governments, the release of this report – which ends a five-year process covering 30,000 pieces of evidence and involving over 2000 scientists – should act as a guide for governments working on a new global climate agreement, which is due for sign-off in Paris next December. Speaking at the launch press conference, IPCC Chair Rajendra Pachauri said the scientists were now “passing the baton to policymakers and the decision-making community” to act on the report’s findings. UN Secretary-General Ban Ki-moon warned that “the science has spoken, there is no ambiguity in the message. Leaders must act now, time is not on our side.”

Looking at the IPCC AR5 report in its entirety, it confirms and underlines what many scientists have been saying for some time: there is now extreme certainty – more than ever before in the history of climate science – that climate change is happening and that humans have caused the majority of it. In fact, the report makes it clear that all warming since 1951 is due to human activity. As global carbon emissions have reached record levels and keep rising, the AR5 report also confirms that climate change is already impacting all continents and the oceans, resulting in changes that are often unprecedented and could partly be – or soon become – irreversible.

With current warming of 0.85°C compared to 1880 levels, significant impacts

of climate change are affecting communities worldwide. The atmosphere and oceans have warmed, sea levels have risen, and the amounts of snow and ice have diminished. If the world stays on its current path, the picture only becomes grimmer. The AR5 report shows that the scientific understanding of future risks has been strengthened in recent years, and that escalating temperatures are expected to slow economic growth, erode food security and exacerbate social and economic inequalities.

According to the IPCC, using scenarios which roughly equate to continuing business-as-usual, global temperature rise will reach a range of 4°C above pre-industrial times, which would be catastrophic for people and the planet. The governments of the world have previously agreed on the need to limit global temperature rise to less than 2°C above pre-industrial times, with many of the most vulnerable nations on Earth calling for a cap at 1.5°C. The AR5 report doesn’t rule out the possibility to achieve this, but paints a picture of massive changes in how we power our economies in order to get there.

To this end, the IPCC has – for the first time – outlined a carbon budget. This budget states that for a two-thirds chance of keeping warming below the 2°C threshold, the world will need to cap total emissions, since 1870, at 2900 gigatonnes. However, as of 2011, two-thirds of this budget had already been spent. Therefore, in order to keep global temperature rise below 2°C by the year 2100, significant emission reduction efforts will be required over the coming two decades (and accordingly, even more significant and even faster measures to stay below 1.5°C).

Efforts of this magnitude are possible, but will require large-scale changes in



our current energy system – given that two-thirds of man-made emissions result from burning fossil fuels. The IPCC is quite clear that we will stand no chance of preventing catastrophic warming if we do not leave the majority of the world's fossil fuel reserves where they are now: in the ground. Furthermore, the report shows that if we want to keep emissions at a safer, stable low level we have to completely phase out unabated oil, coal and gas use, with global (net) CO₂ emissions peaking and then declining toward zero in the long term.

To replace fossil fuels, the IPCC says we will need to triple our use of zero- and low-carbon energy by 2025. With renewable energy having improved dramatically in performance and cost-efficiency in recent years, the AR5 report paints existing technologies such as wind and solar as increasingly attractive options, with even stronger future prospects. This is particularly the case if governments put in place stronger enabling policies, for example encouraging a switch in investments from dirty to clean energy, the elimination of perverse subsidies, and incentives to use less energy overall in buildings, transport and industry, which in turn can save money.

In fact, the IPCC lays out a stark choice for us: we can go down the clean energy

path on which economic growth is strong, or we can take the carbon pollution path on which economic growth is derailed by climate change. In business-as-usual scenarios, consumption grows by 1.6 to 3 per cent per year, not including the need to pay for the cost of worsening impacts. Ambitious mitigation would reduce this growth by only around 0.06 percentage points a year, i.e. 2.94 per cent growth instead of 3 per cent growth. The IPCC's economic assessments of the cost of mitigation don't even include the co-benefits of taking action – such as better public health and increased energy efficiency – or the cost savings which result from avoiding future impacts. Looking at the low costs, the co-benefits and the savings, it's clear that climate mitigation is an economic no-brainer.

No surprise then that the IPCC also warns that delaying mitigation action now is a bad idea and implies higher costs of acting later. But even if we don't wait, the costs of action can still differ significantly, depending on which energy options we choose. In the context of zero- and low-carbon energy sources, for example, the report also references nuclear energy and carbon capture and storage (CCS), in addition to renewables. It points out, however, that nuclear is expensive and holds many risks, and that CCS is more theory than practice and has not been proven at scale – major roadblocks not faced by the booming and mature renewables industry.

The controversial topics of geoengineering and carbon removal are also discussed in the report, but with multiple caveats – including the fact that they carry with them severe risks, come at a very high cost, and have not been proven at scale. The IPCC's approach to such technologies reflects the fact that they are widely seen as a distraction when cheaper, safer and cleaner solutions such as renewable energies are available but haven't been fully tapped yet. One particular technology receiving some attention in the report is Bioenergy with Carbon

Capture and Storage (BECCS). BECCS is an essential part of some low-emission scenarios in the AR5 report, but it comes with drawbacks including high costs and the need to use arable land and water resources to produce biofuels.

In New York, in September, government leaders put climate change back on the political agenda. Now the IPCC report provides them with a roadmap to a new global climate agreement, which is due next December in Paris. A few months after hundreds of thousands of people took to the streets in New York and elsewhere around the world in an unprecedented call for government action to tackle climate change, government leaders know they can no longer ignore the will of the people and businesses for accelerated climate action and need to deliver if they don't want to end up on the wrong side of history.

Laying the foundations for success in Paris, governments are expected to pen a draft agreement this December at the UN climate talks in Lima, and follow up with national climate action plans by March. Those national commitments and the climate agreement in Paris will signal a collective decision by governments to get serious about speeding up the just transition of the global economy that is already underway.

The IPCC presents governments – which ordered and endorsed this report – with a clear choice: invest in clean energy or spend the future dealing with climate disaster after climate disaster. The people have spoken, businesses are demanding action, investors want long-term certainty, and the science is clearer than ever. 2015 provides governments with a critical opportunity to show that the fossil fuel age is over, and a new era of renewable energy has begun.

Ria Voorhaar

Climate Action Network International

Christian Teriete

Global Call for Climate Action

IPCC Fifth Assessment Synthesis Report, Approved Summary for Policymakers, 1 November 2014, Available at: http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_SPM.pdf



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People's Climate March in New York 21 September.

China: 670,000 smog-related deaths a year

Around 157 million people in China lived in areas where the annual PM_{2.5} concentration in 2012 was higher than 100 µg/m³ – ten times the safety limit set by WHO.

Tiny smog particles (PM_{2.5}), emanating from air pollution from coal burning, were linked to 670,000 premature deaths from four type of diseases – strokes, lung cancer, coronary heart disease and chronic obstructive pulmonary disease – in China in 2012.

This health damage translates to an external cost of 166 yuan (€22) for each tonne of coal consumed. But authorities levied only about 5 yuan as a pollution fee per tonne of coal used by consumers, including power companies and iron, steel and cement producers.

Moreover, mining and transport of coal add additional external costs of 94 yuan per tonne, through impacts such as damage to groundwater resources, subsidence, deaths and occupational diseases.

These figures come from a study by researchers from Tsinghua and Peking universities, the China Academy of Environmental Planning and other government-backed institutes, that tries

to put a price tag on the environmental and social costs of China's heavy reliance on coal.

Damage to the environment and health from coal burning added up to 260 yuan (€34) for each tonne produced and used in 2012, said Teng Fei, an associate professor at Tsinghua University.

“With existing environmental fees and taxes of between 30 to 50 yuan for each tonne of coal, the country's current pricing system has largely failed to reflect the true costs,” Teng said.

“The health cost of the study is only based on the premature death figures due to the limitations of our research data,” said Li Guoxing from Peking University's School of Public Health. “It could be way higher if we also include medical costs for other chronic illnesses.”

Teng estimates there would be a further cost of 160 yuan per tonne, on top of the 260 yuan calculated in the study, if the long-term social impact of climate change

from coal burning were also considered.

According to the study, in 2012 more than 70 per cent of the population was exposed to annual PM_{2.5} pollution levels higher than 35 micrograms per cubic metre (µg/m³), the country's benchmark for healthy air quality.

The World Health Organisation (WHO) recommends that annual PM_{2.5} concentrations should not exceed 10 µg/m³. In 2012, some 157 million people in China lived in areas where the annual PM_{2.5} concentration was higher than 100 µg/m³ – ten times the WHO's recommendation.

Source: South China Morning Post, 5 November 2014.

Link: <http://www.scmp.com/news/china/article/1632163/670000-deaths-year-cost-chinas-reliance-coal>

MICHAEL DAVIS-BURCHAT/FLICKR.COM/ CC BY-ND



Ocean acidification record-high

The rate of ocean acidification is the highest in millions of years. A CBD synthesis and new research show a grim picture in which organisms on the sea floor are particularly at risk.

Historically, the ocean has absorbed approximately 30 per cent of all CO₂ released into the atmosphere by humans since the start of the industrial revolution, resulting in a 26 per cent increase in the acidity of the ocean (see AN1/14).

The Secretariat of the Convention of Biological Diversity (CBD) has now published “An Updated Synthesis of the Impacts of Ocean Acidification on Marine Biodiversity”. It furthers past research and work on ocean acidification and its consequences. Among other things the 2014 report provides a more detailed explanation of how ocean acidification impacts the physiology, sensory systems and behaviour of marine organisms, which undermines ecosystem health. Impacts due to ocean acidification are already happening and the future projected impacts may have drastic irreversible effects on marine ecosystems.

There are ample knowledge gaps, making it difficult to assess how future changes to ocean pH will affect marine ecosystems, food webs and ecosystems, and the goods and services they provide. Surface waters in polar seas and upwelling regions are increasingly at risk of becoming undersaturated with respect to calcium carbonate, thus dissolving shells and skeletons that are not protected by an organic layer. Acidification may interact

with many other changes in the marine environment, local and global, making the consequences difficult to predict. Hence, further investigation of existing variability in organism response to ocean acidification in order to assess the potential for evolutionary adaptation is necessary, which also needs to involve a range of stressors.

The findings of the 2014 CBD synthesis are further underpinned by two new studies.

The first study: the so-called “lugworm study” by Dr Lewis, from Exeter University, suggests that the effects of acidification may be even more pervasive than earlier thought and also that the biological effects of the chemical change in the oceans are hard to predict. Until now studies have identified species with calcium-based shells as most in danger from changing chemistry. Dr Lewis has found that other creatures will also be affected because as acidity increases it creates conditions for animals to take up more coastal pollutants such as copper. Creatures like sea urchins, unable to control their internal body chemistry,

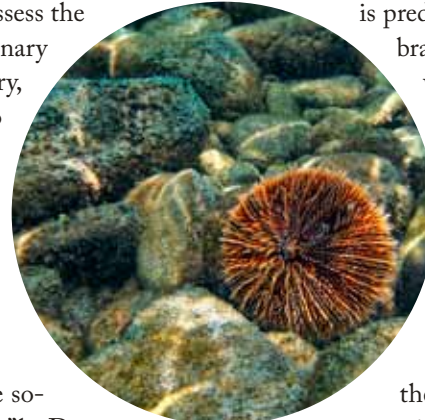
are also harmed by uptake of copper. This adds to the damage they will suffer from increasing acidity as it takes them more and more energy to calcify their shells and spines. Regarding corals, it

is predicted that many of the branching and table corals, which provide shelter for tropical fisheries, are unlikely to last out the century.

Secondly, research by Andy Ridgwell and Daniella N. Schmidt in “Past constraints on the vulnerability of marine calcifiers to massive carbon dioxide release”, applies a model that compares current rates of ocean

acidification with the greenhouse event at the Paleocene-Eocene boundary, about 55 million years ago, when surface ocean temperatures rose by around 5–6°C over a few thousand years. On the basis of their approach of comparing model simulations of past and future marine geochemical changes, the authors infer a future rate of surface-ocean acidification and environmental pressure on marine calcifiers, such as corals, unprecedented in the past 65 million years, and one that challenges the potential for plankton to adapt. They also argue that for organisms that live on the sea floor, rapid and extreme acidification of the deep ocean would make their situation uncertain.

Miriam Markus-Johansson



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Sea urchins are harmed by higher levels of copper in the acidified water.

Selected key messages for future consideration in this area based on CBD synthesis report:

- ✗ Research interest in and political awareness of ocean acidification have increased exponentially in the past few years
- ✗ International cooperation and interdisciplinary research have helped to advance the science of ocean acidification
- ✗ Many intergovernmental bodies have initiated activities on ocean acidification
- ✗ Research should be solution-oriented, covering the scale from local to global, and should prioritize the ecosystems and societies most at risk
- ✗ For corals, many studies show reduction in growth and increased sensitivity with ocean acidification, but this response is variable
- ✗ Most adult molluscs are negatively impacted by ocean acidification, but some species can live in low pH
- ✗ Future ocean acidification has the potential to impact immune functions in marine organisms. It could also affect the virulence and persistence of pathogens
- ✗ Ocean acidification can alter sensory systems and behaviour in fish and some invertebrates
- ✗ Polar oceans are expected to experience the impacts of ocean acidification sooner than temperate or tropical regions.

Sources: “An updated synthesis of the impacts of ocean acidification on marine biodiversity”, CBD Technical Series No. 75, 2014

Andy Ridgwell and Daniella N. Schmidt, “Past constraints on the vulnerability of marine calcifiers to massive carbon dioxide release”, *Nature Geoscience*, 2014

Anna L. Campbell, Stephanie Mangan, Robert P. Ellis, and Ceri Lewis, “Ocean Acidification Increases Copper Toxicity to the Early Life History Stages of the Polychaete *Arenicola marina* in Artificial Seawater”, *University of Exeter, Environ. Sci. Technol.*, 2014, 48 (16), pp 9745–9753



Biogas from manure

Making biogas from manure results in reduced greenhouse gas emissions and the production of a renewable fuel. The technology is far from its full potential in Europe, but also has some serious limitations.

Producing biogas from manure has many advantages. Compared to present management of manure, increased biogas production can reduce greenhouse gas emissions (nitrous oxide and methane), while providing a renewable source of energy that can replace fossil fuels.

How widespread the technology is differs considerably between EU member states, also between countries with similar conditions. For example in 2012 Germany had around 7800 agricultural biogas plants in operation (plants processing only biomass included), while France only had around 100.

The European Biomass Association made in 2009 a rough estimate in different EU member states of the potential in terms of energy production (table 1). Even if there are limitations in terms of logistics and availability of suitable co-digestion materials is the potential far from being fully developed. In Denmark, one of the member states where biogas digestion is most spread still only 7 per cent of the manure is processed.

At present most of the manure digested to biogas is in the form of slurry (fluid animal manure). It is technically possible to make biogas also of solid manure, but the technology is not as developed. The process is slower, and it has so far been more difficult to make those systems economically viable, even with the subsidies available.

When slurry is produced, stored in slurry tanks and applied to agricultural land, methane and nitrous oxide is released into the atmosphere. The same comes to other types of manure. If the manure is fed through a biogas plant a good share of the carbon content is broken down to methane and later on when used as a fuel to carbon dioxide (one molecule of carbon dioxide affects the climate 25 times less than a methane molecule). Also nitrous oxide emissions from storage and fields will be reduced compared to a situation where manure is handled without degassing.

The digestate is also easier to handle as a fertilizer than untreated manure as it is more concentrated and the process makes

nutrients more easily accessible to crops compared to the non-digested manure. The odour of the digestate is also less compared to untreated manure.

Dry matter, thus organically bound nitrogen, is degraded when manure is processed in a biogas plant. In that way substrate gets a lower content of organically bound nitrogen and a higher content of inorganically bound plant-available ammonium-nitrate. More than 80 per cent of the nitrogen in the digestate from manure is in the form of ammonium nitrate. This can be compared to 20-25 per cent for deep litter and 50-75 per cent for slurry.

This can lead to an increase to the nitrogen efficiency since more of the nitrogen can be absorbed directly by the plants compared to the untreated manure. However since the fraction of ammonia is higher there also a greater risk for ammonia losses. Another factor that contributes further is that the pH rises during the biogas process and a higher pH normally corresponds to an increased

risk of ammonia emissions. Therefore it is particularly important that the digestate is not spread out-of growing season and directly incorporated into the soil. As manure, the digestate needs to be stored in a way that minimise ammonia losses, with a cover or even more preferably with an airtight lid. So with correct management ammonia losses for digestate is on the same level as manure.

One crucial factor for the sustainability of the technology is however that there is a need to add organic material to the slurry to make the process efficient. This could be organic waste fractions from food industry, public kitchens or households. However this resource could be limited, because of lacking infrastructure or high demand. For some organic waste fractions there might also be competition from other industries, e.g. as feed in fur farming.

Another option is to use biomass. Either straw, a residue from growing grains, or growing plants specifically for this purpose. Straw could be a limited resource since it could be burned and used directly for district heating and electricity production.

In Germany and Denmark maize has become a popular biogas plant, mainly to be processed by itself but also together with slurry. However many green groups criticize this development, as maize monocultures outcompetes farming for food and farming that contributes more to biodiversity. Other crops (beets, grains, grass, clover grass and Jerusalem artichokes) could also be used for this purpose, some of them may be better for biodiversity than maize, but the risk of unwanted land-use change and competition with food productions persists.

Catch crops (sown after harvest of the main crop to prevent nitrogen leaching by incorporating excess nitrogen from the soil) might be a better option, since they are not in direct competition with food production. Therefore, harvesting of these crops (instead of mulching) can increase the available amount

of additional biomass for the biogas production.

Deep litter (solid manure mixed with a lot of straw) is also a suitable component to mix with slurry, since it has a high content of dry matter and because the mechanical influence by the animals stamping has made the straw more degradable. This has also the advantage that the farmer can avoid applying deep litter to the fields. Since nitrogen use efficiency for the digestate is higher than for deep litter, nitrogen losses to air and water are reduced.

One disadvantage with the digestate as a fertilizer compared to both deep litter and slurry is the lower content of organic matter. This might lead to depletion of soil

organic matter and in the long run loss of carbon stock. The use of straw and catch crops for biogas instead of incorporating the biomass directly into the soil might also reduce levels of organic matter. This balance needs to be looked into more in detail, especially in regions with already depleted soils.

Another limitation for the technology is logistics. Biogas plants tend to be most profitable in regions with large-scale industrial animal farms and high concentrations of animals, since there are enough raw materials for large reactors and transport distances are small. The long-term sustainability of this kind of

farming is by reason questioned. And it is possible to argue that investments in biogas plants in some areas could lead to the conservation of an essentially unsustainable system.

This doesn't mean that it is not possible to introduce biogas to at least medium-sized farms or in regions with moderate concentrations of animals. However, one must be aware that there are regions in Europe where the herds are too small and animal farms are too sparse for biogas to be a reasonable alternative.

Kajsa Lindqvist

Table: Estimation of biogas potential from manure for 2020 by European Biomass Association.

Country	Total manure from cattle and pigs	Biogas potential from manure 35% of manure used		
	Mt	Mtoe	PJ	TWh
Austria	34	0.132	5.523	1.53
Belgium	48.6	0.189	7.894	2.19
Bulgaria	10.7	0.042	1.738	0.48
Cyprus	1.7	0.007	0.276	0.08
Czech Republic	24.6	0.095	3.996	1.11
Denmark	47.2	0.183	7.667	2.13
Estonia	4.1	0.016	0.666	0.18
Finland	15.7	0.061	2.550	0.71
France	299.1	1.160	48.584	13.49
Germany	225.8	0.876	36.678	10.19
Greece	10.5	0.041	1.706	0.47
Hungary	17.2	0.067	2.794	0.78
Ireland	97.2	0.377	15.789	4.39
Italy	102.9	0.399	16.715	4.64
Latvia	6.1	0.024	0.991	0.28
Lithuania	13.9	0.054	2.258	0.63
Luxembourg	2.9	0.011	0.471	0.13
Malta	0.4	0.002	0.065	0.02
Netherlands	73.7	0.286	11.971	3.33
Poland	113.4	0.440	18.420	5.12
Portugal	24	0.093	3.898	1.08
Romania	53.8	0.209	8.739	2.43
Slovakia	9.2	0.036	1.494	0.42
Slovenia	7.4	0.029	1.202	0.33
Spain	138.6	0.538	22.513	6.25
Sweden	25	0.097	4.061	1.13
United Kingdom	149.3	0.579	24.252	6.74
EU27	1556.9	6.040	252.895	70.25

Note: Assumed methane content in biogas 65%; assumed yield of 20 m³ biogas per ton of manure

This article partly based on an unpublished text by Jacob Sørensen and Bente Hesselund Andersen, developed in the project "Pathways to a Nordic food system that contributes to reduced emissions of greenhouse gases and air pollutants".

Other sources:

A Biogas Road Map for Europe (2009) by European Biomass Association

http://www.aebiom.org/IMG/pdf/Brochure_BiogasRoadmap_WEB.pdf

Task 37 Biogas Country Overview (January 2014) IEA Bioenergy

<http://www.iea-biogas.net/files/daten-redaktion/download/publications/country-reports/november2013/Countryreport2013.pdf>

Air quality targets much cheaper than expected

The EU's new climate and energy policy for 2030 opens the way for more ambitious clean air targets. The air pollution limits for 2030 proposed by the Commission last December could be achieved at €5.5bn less cost per year when the climate and energy package for 2030 is factored in.

A new study estimates that meeting the air pollution targets proposed last December, will be €2.2bn cheaper than business as usual, whereas the European Commission predicted it would be €3.3bn more expensive. All in all, implementing the climate and energy package will therefore cut the annual costs of meeting the proposed national emission reduction commitments (ERCs) for a number of air pollutants by €5.5bn in 2030.

Moreover, after analysing the economically optimal ambition level, the researchers conclude that the Commission's proposed "gap closure" – the improvement in health impacts that the legislation could bring about on a scale ranging from business as usual to the maximum technical feasible emissions reduction – should be raised by a further 7 percentage points, from 67 per cent to 75 per cent.

The study was undertaken at the request of the European Parliament's Environment Committee, to provide a complementary impact assessment, exploring the interactions between the EU's air quality policy and its climate and energy policy.

In December 2013, the Commission proposed a revision of the National Emission Ceilings (NEC) Directive that should reduce premature mortality from PM_{2.5} by 52 per cent in 2030 compared to 2005, and yield an additional 2.22 million life years to the EU's population annually. (See AN 1/2014, pp 1-5.)

It is well known that climate and energy policy measures also reduce emissions of air pollutants, with immediate benefits for human health and ecosystems. At the same time, improved energy efficiency and the replacing of fossil fuels by renewable sources of energy lower fuel consumption, which in turn will decrease the need and

costs for installing and operating technical air pollution control systems.

The main reason for this new impact assessment is that, due to the different timings of the two policy proposals, these interactions and the potential savings in air pollution control costs under a more stringent climate and energy policy were not fully taken into account when the Commission set the targets for the Clean Air Policy package.

So the new study compares the costs for achieving proposed air quality improve-

ments in a scenario that closely resembles the EU's new climate and energy targets – i.e. by reducing greenhouse gas (GHG) emissions by 40 per cent, achieving a 27 per cent share in renewable energy, and a 30 per cent improvement in energy efficiency by 2030 – against those presented in the Commission's air quality impact assessment that did not consider these new climate and energy targets. The comparison uses the same model tool, databases and assumptions as were used for the Clean Air Package.

Table: EU air pollutant emissions (kilotons) and health impacts (million years of life lost) in 2005 and projections for 2020, 2025 and 2030 under various scenarios.

Year	Scenario	SO ₂	NO _x	VOC	NH ₃	PM _{2.5}	YOLL
2005		8172	11,538	9259	3928	1647	358.0
2020	ERC	3361	6664	6641	3693	1279	253.0
	CLE-REF	2685	5591	6152	3693	1370	238.2
	CLE-CEP	2641	5611	5927	3686	1364	237.0
2025	CLE-REF	2446	4616	5604	3658	1266	222.3
	CLE-CEP	2306	4372	5505	3656	1209	215.4
	75%-CEP	1600	3891	4599	2771	808	180.0
	MTFR-REF	1589	3527	3308	2566	693	162.6
	MTFR-CEP	1499	3361	3276	2565	664	158.6
2030	CLE-REF	2211	4051	5460	3663	1200	212.4
	CLE-CEP	2070	3725	5240	3653	1085	200.9
	ERC	1530	3599	4598	2871	804	172.0
	75%-CEP	1413	3212	4394	2749	700	160.0
	MTFR-REF	1382	2948	3191	2568	607	152.1
	MTFR-CEP	1304	2726	3118	2560	565	146.8

CLE = Current legislation; Assumes implementation of existing legislation.

REF = Reference; Based on the "old" energy scenario used for the Commission's Clean Air Package proposal.

CEP = Climate and energy policy; Based on the "new" climate and energy policy scenario up to 2030, i.e. a 40% reduction in GHGs, a share of 27% renewables, and a 30% improvement in energy efficiency.

ERC = Emission Reduction Commitment; as proposed in the Commission's Clean Air Package proposal.

75%-CEP = A 75-per-cent gap-closure target for reducing PM health damage using the "new" climate and energy policy scenario.

MTFR = Maximum technically feasible reductions; Assumes a gradual introduction of currently available emission control technologies to new emission sources.

The results show that, as a co-benefit of the climate and energy policy, the changes in energy consumption would lead to lower air pollutant emissions, with the exception of ammonia emissions, which emanate primarily from agriculture. In 2030, and in the absence of any additional air pollution controls beyond what is already laid down in current legislation, PM_{2.5} emissions would be 10 per cent lower than in the reference scenario, NO_x emissions 8 per cent, SO₂ emissions 6 per cent, and VOC emissions 4 per cent lower (see Table).

These emission cuts would reduce population exposure to PM_{2.5} by 5.5 per cent and gain 138,000 life years annually, extending life expectancy of EU citizens by 11.5 million life years in total. Less combustion of fossil fuels will also reduce the need for air pollution control equipment, thereby cutting overall emissions control costs by €3.6 bn/yr, compared to the reference scenario.

Also the incremental cost for achieving the Commission's proposed national emission ceilings for 2030 will come down as the remaining need for additional emission reductions shrink. In effect, the cost for additional measures would come down from €3.3 to €1.4 bn/yr. Because costs for implementing already existing pollution control legislation are also lower, the total costs for attaining the proposed NECs would decline from €93.5 to €88.0 bn/yr, i.e. by €5.5 bn/yr.

Altogether, the cost for achieving the proposed NECs by 2030 would actually be €2.2 bn/yr below the cost for the current legislation case under the "old" energy scenario, which was used as the benchmark for the cost analysis in the Commission's air quality impact assessment.

Following the approach for target setting used by the Commission, the study also analysed what new level of ambition would be seen as "economically rational" under the new energy policy scenario. According to this approach, this would occur at the point where marginal health benefits of further emission reductions equal marginal costs.

Using the most conservative economic valuation of premature mortality, a target of a 75 per cent "gap closure" emerged as the economically optimal rational ambition level. (Using higher values of

economic valuation resulted in up to a 92 per cent gap closure being economically optimal.)

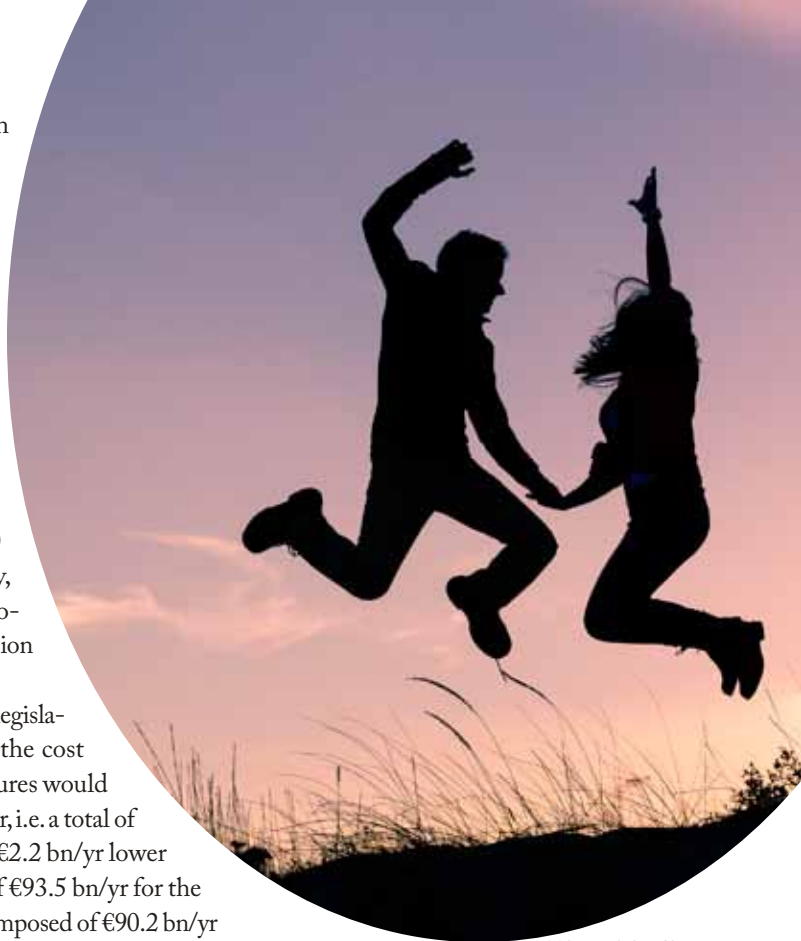
A 75 per cent gap closure in 2030 would reduce premature mortality from PM_{2.5} by 55 per cent compared to 2005, saving an additional 140,000 life years annually, compared to the proposed national emission ceilings.

On top of current legislation (€86.6 bn/yr), the cost for additional measures would amount to €4.7 bn/yr, i.e. a total of €91.3 bn/yr. This is €2.2 bn/yr lower than the total cost of €93.5 bn/yr for the original proposal, composed of €90.2 bn/yr for current legislation and €3.3 bn/yr for additional measures. So when compared to the "old" current legislation costs, the additional cost for achieving the 75 per cent gap closure under the new energy scenario is €1.1 bn/yr, which is two-thirds lower than costs for the original NEC proposal of €3.3 bn/yr.

An economically rational ambition, based on the most conservative valuation of human life, would therefore, according to the study, aim for a 7 per cent more stringent health target compared to the Commission proposal. The additional health benefits range between €8.4 and 50.8 bn/yr, i.e. they are much higher than the additional costs.

Based on the same approach, the study also analysed economically optimal ambition levels for the years 2025 and 2020, and found that in 2025, such an ambition level would save annually 114,000 life years more than the level discussed in the impact assessment of the Clean Air Policy package. At a cost of €1.7 bn/yr (equivalent to 0.012% of EU GDP in that year), the additional measures would yield health benefits of between €6.6 and 39.6 bn/yr.

For 2020, the Commission settled for a very low ambition level in its proposal. The national ERCs for this year are the



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same as in the revised Gothenburg Protocol of the Convention on Long-range Transboundary Air Pollution, which was negotiated during the deep economic recession three to five years ago. Raising the 2020 ambition level to what is seen as economically optimal would therefore annually save as much as 680,000–870,000 life years, with benefits ranging between €40 and 300 bn/yr. Matching the most conservative estimate of health benefits would increase air pollution control costs by €3.4 bn/yr.

The parliament's environment committee will debate the proposed revision of the NEC Directive, starting in March next year. British MEP Julie Girling of the European Conservatives and Reformists (ECR) group has been appointed as the Parliament's rapporteur.

Christer Ågren

The study: Complementary Impact Assessment on interactions between EU air quality policy and climate and energy policy (October 2014). By the International Institute for Applied Systems Analysis (IIASA). Available at: [www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_STU\(2014\)528802](http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_STU(2014)528802)

Action needed to cut emissions from domestic solid-fuel burning

Air pollutant emissions from residential heating with solid fuels (wood and coal) are estimated to cause 61,000 annual premature deaths in Europe.

Small-scale domestic heating with wood and other biomass is popular in many countries in Europe and North America. Heating your home with wood is often actively encouraged and biomass is being touted as a renewable fuel that can assist with climate change mitigation and contribute to energy security.

The health impacts of wood and coal burning for residential heating, as well as policy options to reduce domestic emissions, are the focus of a thematic report by the Joint Task Force on the Health Aspects of Air Pollution, which is a joint body of the World Health Organization European Centre for Environment and Health and the Executive Body for the Convention on Long-range Transboundary Air Pollution.

In many places household wood combustion for heating is increasing as a result of government incentives, increasing costs of other energy sources and the public perception that it is a green option. Small-scale wood combustion can emit high levels of particulate matter (PM_{2.5} and PM₁₀) and volatile organic compounds

(VOCs). Wood smoke is also rich in black carbon – biomass fuels combusted for household heating and cooking contribute an estimated 34–46 per cent of total global black carbon emissions.

If current trends continue, emissions from household heating are expected to keep on increasing, due to climate policies (with biomass being considered a renewable fuel), the potential for economic hardships to increase dependence on solid fuels, slow adoption of state-of-the-art technologies, and the lack of strong incentives to exchange the current inefficient stoves and boilers in use.

According to the report, short-term exposure to particles from wood combustion is as harmful to health as particles from the combustion of fossil fuels. Hundreds of epidemiological time-series studies, conducted in different climates and populations, link daily increases in outdoor PM concentration with increased mortality and hospitalizations.

In 2010 an estimated 61,000 premature deaths in Europe were caused

by outdoor PM_{2.5} pollution originating from residential heating with solid fuels (wood and coal), about the same number as in 1990. Outdoor air pollution from household heating with solid fuels also caused 1 million disability-adjusted life years (DALYs) across Europe in 2010. (See table.)

Globally, Europe has the highest percentages of outdoor PM_{2.5} concentrations attributable to household heating with solid fuels, with 12 per cent in Western Europe, 21 per cent in Central Europe and 13 per cent in Eastern Europe in 2010. In comparison, 8 per cent of the total ambient PM_{2.5} in Canada and the United States comes from household heating with solid fuels.

In the EU, specific regulations are being developed under the Ecodesign Directive for addressing the energy efficiency of and emissions from solid-fuel space heaters and solid-fuel boilers, particularly those that use various forms of woody biomass fuel (wood logs, pellets and biomass bricks). Some European countries (e.g. Austria, Denmark, Germany, Norway and Sweden)

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Table. Residential heating contribution to outdoor PM_{2.5} and burden of disease.

Selected regions	PM _{2.5} from residential heating (%)		PM _{2.5} from residential heating (µg/m ³)		Premature deaths, per year		Disability-adjusted life years (DALYs), per year	
	1990	2010	1990	2010	1990	2010	1990	2010
Central Europe	11.1	21.1	3.5	3.4	18,000	20,000	370,000	340,000
Eastern Europe	9.6	13.1	2.0	1.4	24,000	21,000	480,000	410,000
Western Europe	5.4	11.8	1.3	1.7	17,000	20,000	280,000	290,000
High-income North America	4.6	8.3	0.9	1.1	7500	9200	140,000	160,000
Central Asia	9.9	8.3	2.4	1.6	5500	4200	180,000	110,000
Global	3.0	3.1	0.9	0.7	120,000	110,000	2,800,000	2,200,000

have issued national emission standards for small residential heating installations. The most comprehensive regulation is a German law from 2010.

Canada introduced new standards for new wood-burning appliances in 2010. In 1988 the United States introduced a new source performance standard (NSPS) for residential wood stoves, which is expected to be updated to a level equivalent to the more recent Canadian CSA standard.

It is noted that virtually all of these existing standards cover only new installations, and that they usually also are limited in scope – the Canadian standard and the NSPS, for example, cover only wood-stoves, but not fireplaces, masonry heaters, pellet stoves, indoor and outdoor wood boilers, furnaces and heaters.

As residential solid-fuel combustion for heating is likely to persist in many parts of the world in the near-term future, the report presents a list of recommendations regarding biomass and other solid fuel use for heating and energy production, summarised below:

- Any renewable energy or climate change-related policies that support wood combustion should consider air pollution impacts and promote only the use of lowest emission or best available combustion technologies.
- Introduce legal regulations for improved efficiency of new heating appliances. These regulations should include tight limits for the primary emissions of PM, gaseous hydrocarbons and carbon monoxide in particular.
- Prepare heater exchange regulations or voluntary programmes. This type of action will be most successful if financial

compensation is offered to incentivize the replacement of old heaters with those meeting tight energy efficiency and emission limit regulations.

- Define urban areas with dense populations or special geographical features where residential heating by solid fuels (wood, coal) is not permitted at all or is at least limited to registered models of low-emission wood combustion devices. Coal burning in small-scale appliances should be permanently prohibited, at least in communities of developed countries.
- Introduce regulatory use of “no wood burning” days or morning and evening hours during unfavourable meteorological conditions in vulnerable, densely populated areas and more generally in valleys of mountainous areas.
- Implement community-wide information campaigns to inform the residents about the climate and health benefits of locally emission-free alternatives for house heating (e.g., district heating by well-controlled combined heat and power plants, geothermal energy for single houses or as a larger local installation, and heat pumps for single houses or apartments). Distribute information on how to properly dry and store wood logs and how to properly use current small-scale heaters.

Christer Ågren

Residential heating with wood and coal: health impacts and policy options in Europe and North America. ECE/EB.AIR/2014/6. By the Joint Task Force on the Health Aspects of Air Pollution. 26 September 2014. Can be downloaded at: www.unece.org/env/lrtap/



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Benefits of company cars are under-taxed

An OECD policy brief shows that perverse tax incentives in many countries are encouraging company car owners to drive up to three times as much as people with private cars. On average, OECD governments only tax about half the benefits accrued by employees from company car use under personal income tax regimes. A separate OECD study, “The Diesel Differential”, argues that applying lower tax rates to diesel goes against efforts to reduce emissions and air pollution.

“The cost of driving a car today does not properly reflect the impact on the environment and to society. Taxing diesel fuel and company cars correctly would help to fix this,” said OECD Environment Director Simon Upton. “Governments should stop offering financial incentives to drive cars and to run them on fuels with a heavy environmental footprint.”

Link: <http://www.oecd.org/environment/under-taxing-drivers-is-bad-for-environment-and-health.htm>

Potential for huge GHG reductions in cities

A policy brief by the OECD and Bloomberg Philanthropies notes that choices made in cities around low-carbon and climate-resilient infrastructure can help to avoid the worst impacts of a warming climate. Recommendations include empowering cities to meet this challenge. In particular, providing incentives for cities within national policies can ensure a “race to the top” among cities, leading to the potential for huge reductions in global greenhouse gas emissions.

Link: www.oecd.org/.../Cities-and-climate-change-2014-Policy-Perspectives-Final-web.pdf

Ecodesign rules set for new solid fuel boilers

In mid-October, member states agreed new eco-design standards setting minimum requirements on energy efficiency and air pollutant emissions for solid fuel boilers (< 500 kW) and solid fuel space heaters, which are currently responsible for more than 40 per cent of primary PM emissions in the EU.

After long negotiations, a compromise was reached by watering down the proposed emission limits for particulate matter (PM), organic gaseous compounds (OGC), carbon monoxide and nitrogen oxides (NOx). The application of the boiler requirements was pushed back two years (to 2020) and for local space heaters four years (to 2022), compared to the original Commission proposal. The changed timelines and relaxed emissions standards will delay energy savings and benefits from air quality improvements.

The new requirements are set down in implementing directives under the Ecodesign Directive, which seeks to make products on the EU market more energy efficient and reduce their environmental impact. The European Parliament will have three months to scrutinise the texts before their final adoption.

Source: Ends Europe Daily, 17 October 2014



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Leave fossil gas in the ground

Gas is better than coal, but not good enough. Much of it has to be left in the ground, so its use has to be cut fast. This is actually happening in Europe. Gas use fell by 13 per cent between 2010 and 2013.

Natural gas is an important source of energy in Europe. Twenty-three per cent of primary energy supply came from gas in 2012. It is important in many other countries as well.

Of the 5000 TWh of gas used in the EU, about 40 per cent is used for heating, 25-30 per cent for power, and most of the remainder in industry.

A few years ago many believed gas would soon be depleted, but this is not the case.

Proven reserves are estimated at 185.7 trillion m³. New reserves are added each year. The confirmed reserves have doubled since 1987, despite burning some three trillion m³ every year. Even if no more gas is discovered, the present reserves, if combusted, would emit 377 billion tons of CO₂ directly, a bit more indirectly.

Much of the gas must be left in the ground.

This follows from the IPCC's carbon budgets. The remaining CO₂ budget, if we accept a 66 per cent probability of staying within two degrees of global warming from 2015 onwards, is 1200 Gtons of CO₂.

Two degrees is not safe, and 66 per cent is not sure. But even with such a generous budget there is no way that we can shoehorn in another 400 Gtons of CO₂, an extra third, from gas reserves.

The remaining budget in say 10 years will be much diminished. Even if the world stops building coal power plants right now, and many old coal power plants are retired, most newer fossil power plants will be around for several years, as will most of the petroleum-burning cars, lorries, ships and aeroplanes.

The rug is being pulled from under our feet, so some gas infrastructure will have to be retired or downgraded well before it has reached the end of its technical or economic life.

If a "natural gas budget" could be defined, Europe could hardly claim priority for a large share of it, over China, for example. China is being suffocated by coal combustion and has to act on every front simultaneously to improve its air quality and its economy: cleaner coal, more renewables, more nuclear, more gas, more efficiency. China doubled its gas consumption during the same period, but it is still only at half the level of the EU – for a much larger population. China will probably double its gas power between 2013 and 2020, while continuing to develop renewables at breakneck speed.

Europe has much more of a choice than China. The EU uses about 15 per cent of global gas. This can change. It actually reduced its gas consumption by 13 per cent between 2010 and 2013. Most or all of this reduction took place in the power sector. In 2012 alone, gas for power dropped by 17 per cent.

Some of that gas was replaced by cheaper coal. But renewable electricity also increased by 186 TWh in the period 2010-2013. Electricity production fell by 112 TWh.

Almost 10 per cent of EU electricity has become either renewable or obsolete, in just three years.

This unforeseen development hurt gas power first, and (for other reasons) nuclear. It hurts coal power as well, so coal use fell during 2013.

There is now also political momentum for cutting gas consumption in the EU for reasons of security of supply.

Carbon budget logic says that Europe will soon have to cut its use of all fossil fuels sharply, including natural gas. This is not universally recognized, however, even within the NGO community. The Greenpeace 2012 Energy (R)Evolution



Carbon budget logic says that Europe will soon have to cut its use of all fossil fuels sharply, including natural gas.

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scenario for OECD Europe, roughly equivalent to the European Union, prescribes an 11-per-cent increase in natural gas from 2009 to 2020.

BUND, a leading German NGO, also foresees a substantial use of natural gas in Germany through 2040, but not 2050.

The German Solar Energy Support Club has more recently expressed the view that gas power is an acceptable transitory solution.

The reasons for such views are not hard to see.

With coal, lignite and nuclear phased out fast (in Germany), gas seemed much less harmful and also a good way of balancing the increasing share of renewables.

It is indeed much less harmful. A natural gas power plant does not emit particles or SO₂ and much less NO_x than a coal power plant. The CO₂ emissions are also much lower. A coal power plant emits about 1000 grams of CO₂ per kWh. The worst lignite power plants in Germany, for example Vattenfall's Jämschwalde, emit more than 1200 grams. A new gas power plant emits less than 340 grams, a bit more over the full life cycle. Even 340 grams is much more than emissions from wind, solar, biomass and, above all, better efficiency.

Much gas is used for heating, where it has no climate advantages. The alternative to gas for heating is nowadays seldom coal or oil. It is heat pumps, district heating, and electric heating. The electricity can be, and often is, renewable. Energy for district heating can also be supplied from renewables or waste heat. Another alternative is improved efficiency, such as better windows. It takes time to change heating system, but efficiency measures can cut gas use in the meantime.

Gas for power is easier. Renewables and efficiency measures can reduce the need for fossil and nuclear power very fast. They do, in fact.

Gas has some role to play in balancing the increasing wind and solar power, but it should not be overrated.

Balance can be achieved by several other means, such as hydro, biopower, import/export, geothermal power, concentrated solar power with heat storage, compressed air, flywheels and batteries. Hydro is now used for balancing in Sweden, for example, but nowhere near its limits.

In shorter timescales wind power and photovoltaic technologies can provide some grid support. The electronics between the windmill and the grid can supply "synthetic

inertia", so as to maintain voltage and frequency for several seconds and also give a very rapid response to disruptions in the grid.

The best and cheapest balance comes from demand-side management. This has not been much explored so far, because it has not been needed. But it has huge potential, as many users, big and small, can shift their use of heating, cooling, pressure and some motive power for minutes or hours without detriment, if the incentive is there and if the technology is simple and automatic.

If some fossil power plants are shut down, the drive for demand-side management will be correspondingly stronger.

It would be simpler if we had a high steady emission price for CO₂, so coal would have to go first and gas after, but things do not happen in an orderly manner. There is no reason to panic over the demise of a few gas power plants along with many coal and nuclear power plants.

Fredrik Lundberg

PM pollution requires EU-wide action

Particle pollution is not a purely local problem. Transboundary pollution transport is a major contributor to urban PM_{2.5} levels, and reductions in both primary PM and secondary precursor emissions are needed to bring down PM_{2.5} to safe levels.

In 2009, the annual average urban roadside PM_{2.5} concentrations exceeded the World Health Organization's recommended level in cities in most member states. It is estimated that 400,000 people die prematurely every year across the EU because of air pollution, which means that poor air quality kills ten times as many people as road traffic accidents. At the same time, many cities are struggling to meet the EU air quality standards. There is a strong need for emission reductions, both to achieve legal compliance and to protect public health.

A new report presents an assessment of source contributions to PM_{2.5} levels at air quality monitoring stations in cities in 21 EU member states. The present situation (based on data for 2009) is compared with the envisaged result in 2030 of the Commission proposal for a revised National Emissions Ceilings (NEC) Directive. The focus is on the attribution of PM_{2.5} concentrations at urban roadside stations to the different source sectors and also to

show the spatial contributions, i.e. if the sources are of local, national, international or natural origin.

The source allocation shows that while source contributions vary widely between individual countries, all spatial domains contribute. In particular, it becomes clear that PM pollution cannot be considered a purely local problem. For several member states, such as Belgium, Czech Republic, Netherlands, Hungary, and Austria, transboundary transport of PM and PM precursor pollutants is a major contributor to urban PM_{2.5} levels. It is therefore very difficult for these countries to decrease their urban PM_{2.5} to safe levels without coordinated international action. On the other hand, several regions show very high local increments, pointing to the need for local measures to reduce ambient PM_{2.5}.

Transboundary transport is dominated by secondary pollution, while primary PM plays a role mostly for local sources. Hence, reductions in both primary PM

and secondary precursor emissions will be needed to bring down PM_{2.5} to safe levels.

Emissions from household heating and road vehicles are the dominant sources of primary PM. In many member states, especially those with very high PM concentrations (e.g. Poland, Czech Republic, Slovakia, Romania, and Bulgaria), solid-fuel combustion for domestic heating is the largest single source sector.

The introduction of particle filters for diesel vehicles is expected to reduce primary PM from road transport by almost two thirds up to 2030, so the remaining PM emissions from this sector will be mainly from non-exhaust sources (road abrasion, brake and tyre wear). Unless new action is taken, household heating will remain an important source of PM emissions, particularly in areas where coal or inefficient biomass burning is used. More stringent product standards for domestic heating appliances (stoves, boilers, etc.) and accelerated substitution of inefficient solid-fuel burning by cleaner

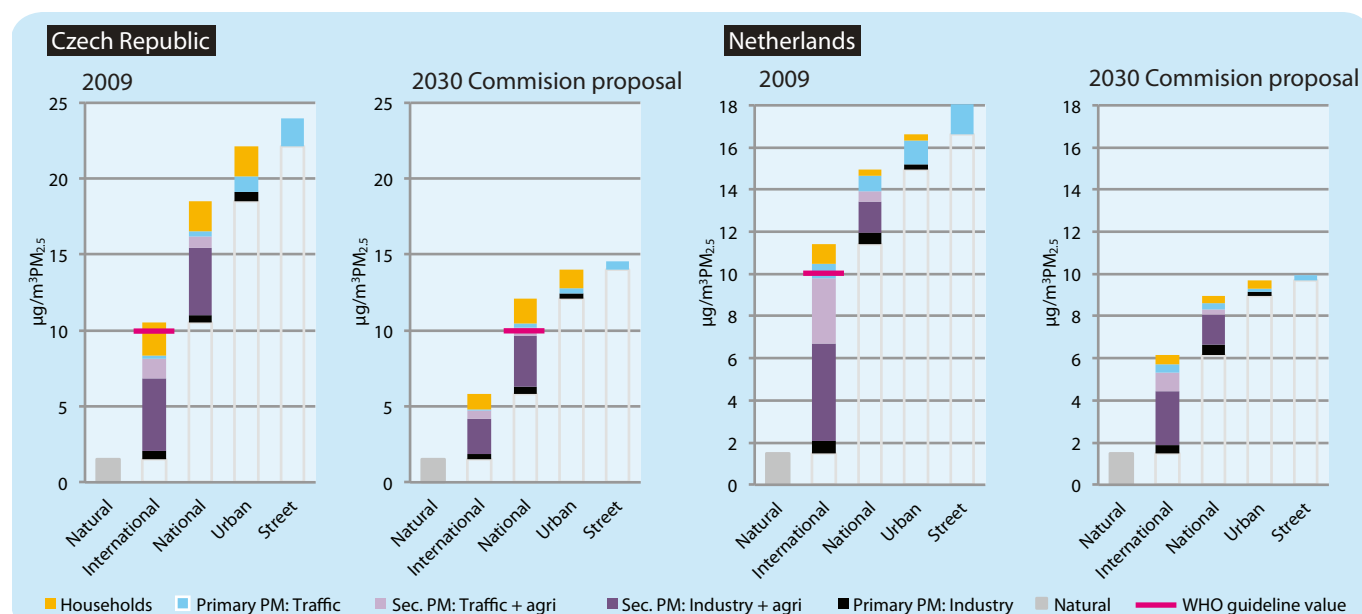


Figure: Source contributions to ambient PM_{2.5} at urban traffic stations in the Czech Republic and the Netherlands, in the base year 2009 and for 2030 assuming adoption of the Clean Air Policy Package proposed by the Commission. Source: IIASA GAINS



J. AARON FARR/FLICKR.COM/CC BY

Emissions from household heating and road vehicles are the dominant sources of primary PM.

Euro 6 for new cars

On 1 September 2014 the Euro 6 standards for new passenger cars entered into force. They include stricter emission limits, such as a new NO_x standard for diesel cars at 80 mg/km, down from the Euro 5 limit of 180 mg/km (for petrol cars, the standard is set at 60 mg/km), as well as the introduction of a particle number standard for gasoline direct-injection vehicles, and flex-fuel vehicle low-temperature emission testing for biofuel.

They do not include real-driving emissions requirements, which are expected to come into force on 1 September 2017. On that date, the particle number standard for gasoline direct-injection vehicles will also be tightened to the same level as that for diesel cars. The Euro 6 requirements for light commercial vehicles will follow in one year, from 1 September 2015.

Source: AECC Newsletter September-October 2014.

Alternative fuels infrastructure

The new EU directive for promoting development of infrastructures for alternative fuels was published in the Official Journal on 28 October 2014.

Directive 2014/94/EU requires member states to set 2020 targets for electric vehicle recharging points accessible to the public, and mandates a common plug right across the EU. For the development of Liquefied Natural Gas (LNG) for road transport, member states have to ensure a sufficient number of publicly accessible refuelling points, with common standards, ideally every 400 km, to be built by the end of 2025. It also requires a minimum coverage to ensure availability of LNG in main maritime and inland ports.

Member states are to ensure a sufficient number of publicly accessible Compressed Natural Gas (CNG) refuelling points both in urban and suburban areas, ideally every 150 km, to be built by the end of 2025.

Information: http://ec.europa.eu/transport/themes/urban/cpt/index_en.htm

The directive: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_2014_307_R_0001&from=EN

alternatives such as district heating, heat pumps, natural gas or efficient biomass combustion could achieve additional emission reductions that are not considered in the Commission's proposal.

Overall, the Commission's proposal would cut primary PM emissions by half by 2030. As a consequence, secondary aerosols are expected to become the dominant contributor to the remaining PM_{2.5} concentrations.

The formation of secondary aerosols involves several pollutants from different source sectors, and the various chemical processes make it difficult to uniquely trace them back to a single source. However, the formation of ammonium sulphate and ammonium nitrate is critically steered by the availability of ammonia (NH₃). Ammonia emissions come primarily from agricultural sources, and form, together with sulphur dioxide (SO₂) and nitrogen oxides (NO_x) from power generation, industry and transport, secondary inorganic particles.

It is concluded that future trends in secondary PM will very much depend

on measures to reduce agricultural NH₃ emissions. The Commission's NEC Directive proposal for 2030 aims to cut NH₃ emissions by only 27 per cent relative to 2005. At the same time, NO_x should be reduced by 69 per cent, and SO₂ by 81 per cent.

Altogether, implementation of the Commission's proposal is expected to reduce ambient PM_{2.5} levels by 50 per cent or more in most member states by 2030. This would, according to the report, result in attainment of the WHO guideline value for average, urban roadside PM_{2.5} levels in seven member states, although concentrations at some peak locations could still be higher, which would require additional local measures.

Christer Ågren

The report: Urban PM_{2.5} levels under the EU Clean Air Policy Package (October 2014). TSAP Report 12, Version 1.0. Report to the European Commission by the International Institute for Applied Systems Analysis (IIASA). Available at: www.iiasa.ac.at/web/home/research/researchPrograms/MitigationofAirPollutionandGreenhousegases/TSAP-reports.en.html



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447,000 premature deaths/year in EU due to bad air quality

Elevated levels of air pollutants, primarily fine particulate matter and ground-level ozone, are the top environmental cause of premature death in Europe.

In 2012, about 92 per cent of the EU urban population was exposed to levels of fine particulate matter (PM_{2.5}) exceeding the air quality guidelines established by the World Health Organization to protect people's health. And about 98 per cent of EU urban citizens were exposed to ozone levels exceeding the WHO's guideline value.

In its annual air quality report, the European Environment Agency (EEA) presents new estimates of the health impacts of air pollution based on 2011 data on concentrations and exposure. Long-term exposure to PM_{2.5} was responsible for about 458,000 premature deaths in 40 European countries, of which 431,000 in the EU, while short-term exposure to ground-level ozone (O₃) lead to about 17,400 premature deaths, as a total for the same 40 countries, and about 16,200 in the EU.

The table shows the best estimate figures for total mortality due to exposure to PM_{2.5} and O₃ per country, for all the European countries included in the analysis.

Germany, the country with the largest population in the list, shows the highest number of premature deaths due to PM_{2.5}

pollution, with nearly 70,000 per year. It is followed by Italy and Poland, with almost 65,000 and 42,400 premature deaths per year, respectively.

Twelve countries with average annual PM_{2.5} concentrations above 20 µg/m³, mostly in eastern Europe, account for 28 per cent of the total mortality in Europe due to PM_{2.5} exposure, even though their populations make up only 20 per cent of the European population. These countries are Albania, Bosnia and Herzegovina, Bulgaria, Cyprus, the Czech Republic, Macedonia, Greece, Hungary, Montenegro, Poland, Serbia, and Slovakia.

When calculating the health impacts attributable to ozone exposure, a cut-off concentration of 35 ppb (70 µg/m³) was applied.

Italy, with the fourth-largest population of the countries studied, has the highest estimate of premature deaths due to O₃ pollution, in total almost 3400 per year. It is followed by Germany, France and Spain, with over 2300, 1800 and 1700 premature deaths per year, respectively. Poland, Greece, the United Kingdom, Romania and Hungary all have more

than 500 premature deaths a year due to O₃ exposure.

In view of the uncertainty regarding the presence of a 'no-effect threshold' for ozone impacts on health, an alternative estimate using a cut-off concentration of 10 ppb (20 µg/m³) was also made, and according to this estimate the number of premature deaths due to O₃ pollution would amount to 73,700, i.e. more than four times higher.

The choice of cut-off concentration has the highest impacts for countries in the north-western part of Europe (Belgium, Ireland, the Netherlands, the Scandinavian countries and United Kingdom), where the use of a lower cut-off concentration results in 5-10 times higher impacts. In the Mediterranean countries, on the other hand, the difference is lower, about a factor of three, when changing the cut-off from 35 to 10 ppb.

Christer Ågren

The report: Air quality in Europe — 2014 report (November 2014). EEA Report No 5/2014. By the European Environment Agency. Available at: www.eea.europa.eu

AirClim staff member receives EEB Environment Award

Table: Best estimates of premature deaths attributable to exposure to PM_{2.5} and O₃ in 40 European countries.

Country	PM _{2.5}	O ₃
Austria	6,768	309
Belgium	10,304	220
Bulgaria	10,806	425
Cyprus	710	41
Czech Republic	10,872	376
Germany	69,762	2,342
Denmark	3,979	117
Estonia	647	27
Spain	25,046	1,772
Finland	2,046	74
Greece	10,700	796
Croatia	5,437	246
Hungary	15,952	556
Ireland	1,229	28
Italy	64,544	3,377
Lithuania	2,556	85
Luxembourg	284	10
Latvia	1,789	58
Malta	247	15
Netherlands	12,634	229
Poland	42,412	1100
Portugal	5,707	330
Romania	28,582	633
Sweden	4,221	181
Slovenia	1,938	97
Slovakia	6,300	243
United Kingdom	39,450	634
Andorra	51	4
Bosnia & Herzegovina	3,412	154
Switzerland	4,394	256
Iceland	54	2
Liechtenstein	16	1
Monaco	29	2
Montenegro	482	31
Former Yugoslav Rep. of Macedonia	1763	108
Norway	1,473	74
Serbia	13,063	495
San Marino	25	-
All	458,065	17,407
EU-28	431,261	16,160

Christer Ågren, AirClim staff member for more than 30 years, has been awarded EEB's prize "Twelve Stars for the Environment". The award is given to "outstanding individuals who in different ways have made an exceptional contribution to the cause of environmental sustainability in Europe".

"Christer's enthusiasm and commitment continues unabated", says EEB President Mikael Karlsson. "His fight today for further extending EU laws against air pollution, the Clean Air Package, is as important as his fight in the 1980s for laws against acid rain. Christer is a champion among champions in the environmental movement."

The awards were presented on the occasion of the EEB's 40th anniversary celebrations on 1 December 2014 at the BIP House of the Capital Region, Brussels.



Christer Ågren

The other recipients were nature conservation activist Corinna Cwiela from Germany, former environment commissioner Janez Potočnik from Slovenia and Marc Pallemmaerts from Belgium, who received the award posthumously for his work to strengthen environmental law.

The winners have been selected by the EEB Board following an open nomination process and recommendations for nominees from the EEB Twelve Star Award Committee consisting of the EEB President, Vice-Presidents and Secretary General.

Read the entire rationale here: <http://www.eebconference.eu/wp-content/uploads/2014/11/Rationale-Christer-%C3%85gren.pdf>

Read more about the award and the other winners here: <http://www.eebconference.eu/12-stars-award/>

Commission takes legal action against UK non-compliance with the LCP Directive

The European Commission issued a reasoned opinion in September 2014 due to a failure to comply with EU requirements on industrial emissions, stemming from the Directive 2001/80/EC on Large Combustion Plants (LCP). The infringement concerns coal-fired Aberthaw power station in Wales, which is exceeding the emission limits for nitrogen oxides (NOx). NOx is a pollutant that has serious consequences for human health and the environment, causing respiratory illnesses, acidifying soil and surface water, and damaging vegetation. In line with LCP Directive member states were required to reduce emissions by 1 January 2008 either individually, by

complying with the emission limits set out in the Directive, or by including these plants in national plans for the reduction of emissions. Having met neither of these requirements, Aberthaw power plant currently operates on the basis of a NOx emission limit of 1200 mg/Nm³, as opposed to the legally applicable 500 mg/Nm³. In case of failure to take effective measures to comply with emission limits for NOx, the case may be referred to the EU Court of Justice.

Source: http://europa.eu/rapid/press-release_MEMO-14-589_en.htm

Aberthaw power station



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Recent publications from the Secretariat

Reports can be downloaded in PDF format from www.airclim.org



Gasping for air

Air pollution is one of Europe's gravest environmental threats. Every year 400,000 people die prematurely because of poor air quality, but the European Parliament has the power to change that. Members of the European Parliament are now starting to work on a number of EU laws, including the National Emissions Ceilings and Medium Combustion Plants Directives, which could substantially improve the air we breathe.

Twelve factsheets reveal how air pollution affects us, from our health to our economy, and explain what the main sources of pollution are. Crucially, they contain policy recommendations to MEPs that will help clean up our air. Everywhere.

The 1.5°C long-term global limit

Scientific assessments have shown that impacts are projected to worsen significantly above a global warming of 1.5, or 2°C from pre-industrial levels. Such assessments have contributed to the adoption of 2°C as a global goal. In Cancun in 2010 Climate Convention Parties agreed to review the global goal with the perspective of strengthening this to 1.5°C.

This report is an attempt to answer the questions: Does a long-term global goal actually help to streamline global efforts to reduce greenhouse-gas emissions and inspire local initiatives? Is the level adequately low to prevent dangerous interference with the climate system? Is the goal feasible, given socio-economic and technical constraints?

The 10 best climate measures in Northern Europe

A number of national environmental NGOs were asked to describe and rank their ten best climate measures.

There is a great diversity among these measures. Hardly any country seems to have noticed what their neighbours are doing. So all climate policymakers should take a look, not only at the ten winners, but at the full smorgasbord of measures in neighbouring nations.

Coming events

UNFCCC Conference of the Parties (COP) 20.

Lima, Peru, 1 - 12 December 2014. Information: <http://unfccc.int/>

CLRTAP Executive Body.

Geneva, Switzerland, 8 - 12 December 2014. Information: www.unep.org/env/lrtap/

Air Quality in Europe – New Challenges.

London, UK, 9 - 10 December 2014. Information: <http://aamg-rsc.org/meetings/monitoring-ambient-air-2014/>

EU Environment Council.

17 December 2014. Information: <http://europa.eu/newsroom/calendar/>

International Conference on Air Pollution and Control (ICAPC).

Paris, France, 23 - 24 February 2015. Information: www.waset.org/conference/2015/02/paris/ICAPC

Fifth International Conference on Plants & Environmental Pollution (ICPEP-5).

Lucknow, India, 24 - 27 February 2015. Information: <http://isebindia.com>

Green Ship Technology Conference.

Copenhagen, Denmark, 11 - 13 March 2015. Information: www.informamaritimeevents.com/event/green-ship-technology/

Fifth Symposium on Ultrafine Particles (UFP-5).

Brussels, Belgium, 4 - 5 May 2015. Information: <http://ufp.efca.net>

36th International Vienna Motor Symposium.

Vienna, Austria, 7 - 8 May 2015. Information: www.ovk.at/index_en.htm

IMO Marine Environmental Protection Committee (MEPC).

London, UK, 11 - 15 May 2015. Information: www.imo.org

23rd European Biomass Conference and Exhibition.

Vienna, Austria, 1 - 4 June 2015. Information: <http://conference-biomass.com/>

UNFCCC meeting of subsidiary bodies.

Bonn, Germany, 3 - 14 June 2015. Information: <http://unfccc.int/>

European Photovoltaic Conference and Exhibition (EUPVSEC 2015).

Hamburg, Germany, 14 - 18 September 2015. Information: www.photovoltaic-conference.com

UNFCCC Conference of the Parties (COP) 21.

Paris, France, 21 November - 11 December 2015. Information: <http://unfccc.int/>

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