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More than 90 per cent of Euro 6 diesel cars on sale don't meet the EU emission limits on the road but are still exempt from LEZ or diesel bans.

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Germany still constructs new coal power stations

Several countries in Europe, have recently built or are planning to build new coal power stations. Some examples of such plants are presented here.

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1.5°C still within reach

Scenarios show that the 1.5°C target can be reached through a massive expansion of renewable energy, improved energy efficiency and lifestyle changes.

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EU ship sulphur directive scrutinized

Sulphur emissions from ships in northern Europe have come down significantly, resulting in health and environmental improvements in coastal regions and port cities.

The maximum permitted sulphur content of maritime fuels is regulated in the EU's 2012 sulphur directive, which is largely harmonized with global standards set by the International Maritime Organization (IMO). By January 2020 the overall global limit is strengthened from 3.50 per cent to 0.50 per cent, but a limit of 0.10 per cent has been in force since 2015 in specially designated sulphur emissions

control areas (SECAs). For comparison, the sulphur content of fuels used by road vehicles (trucks or cars) and by ships on inland waterways in the EU must not exceed 0.001 per cent.

So far, only two European sea areas – the Baltic Sea and the North Sea (including the English Channel) – have been designated as SECAs, and new research has

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Acid News

A newsletter from the Air Pollution & Climate Secretariat, the primary aim of which is to provide information on air pollution and its effects on health and the environment.

Anyone interested in these matters is invited to contact the Secretariat. All requests for information or material will be dealt with to the best of our ability. Acid News is available free of charge.

In order to fulfil the purpose of Acid News, we need information from everywhere, so if you have read or heard about something that might be of general interest, please write or send a copy to:

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The Air Pollution and Climate Secretariat

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

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

In furtherance of these aims, the Secretariat:

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

Editorial

Evidence of the health hazards posed by air pollutants is clear and unambiguous. Air pollution particularly affects vulnerable groups such as infants, children, the elderly and those suffering from asthma, allergies and other respiratory diseases.

Despite action taken to cut air pollutant emissions, almost all city dwellers continue to be exposed to pollutants at levels deemed unsafe by the World Health Organization (WHO). In 2014, around nine out of ten urban citizens in the EU were exposed to levels of fine particles and ozone above the WHO guideline values.

While recent data shows that air quality in the EU is slowly getting better, excessive concentrations of air pollutants continue to have significant health impacts, with fine particles (PM), nitrogen dioxide (NO₂) and ground-level ozone (O₃) causing the greatest harm.

Last year, the European Environment Agency (EEA) attributed 399,000 annual premature deaths to PM_{2.5} exposure and 75,000 and 13,600 premature deaths to nitrogen dioxide and ozone exposure, respectively, for the year 2014.

On top of these scarily high numbers of premature deaths, air pollution is also the cause of allergies and respiratory and cardiovascular diseases, which result in extra medication and hospitalisations as well as millions of lost working days.

Moreover, excess fall-out of acidifying and eutrophying air pollutants damages nature and biodiversity. Agricultural crops, forest trees and even man-made materials, including monuments and buildings of high cultural value, are all suffering.

In 2008, the EU adopted a new directive on ambient air quality and cleaner air for Europe (2008/50/EC), including a set of limit values for a number of air pollutants (many of these limit values had actually been set earlier, in the preceding 1999 directive).

“the benefits of clean air far outweigh the costs of emission control”

So what is the result? According to the latest EEA air quality data, in 2016:

- 19 EU countries were breaching the annual limit value for nitrogen dioxide (NO₂);
- 7 EU countries were breaching the annual limit values for fine particles (for either PM₁₀ or for PM_{2.5} or for both these pollutants);
- 14 EU countries were breaching the daily limit value for PM₁₀ more than 35 times per year – which is the maximum allowed under EU law.

The statistics show that the air quality standards that are there

to protect people's health – most of which were agreed by EU countries nearly 20 years ago – are still frequently being exceeded. How can this be, when the EU clearly has the tools needed for strict enforcement?

As reported in the last issue of Acid News, the Commission is currently pursuing infringement actions for excessive levels of PM₁₀ against 16 member states and legal action has also been initiated on NO₂, so far involving 12 member states.

Unfortunately, the EU legal process in these matters is painstakingly slow. However, when the process eventually arrives at a judgement, significant financial penalties can be imposed.

Considering the serious and widespread damage to health and the environment caused by excessive air pollution, compliance with air quality legislation is essential. Strict and rapid enforcement action by the Commission must therefore be a top priority.

We all have the right to breathe clean air. And whichever way you look at this problem, the benefits of clean air far outweigh the costs of emission control.

Christer Ågren

EU ship sulphur directive scrutinized

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shown that since 2015 the atmospheric concentration of sulphur dioxide (SO₂) has more than halved along the North Sea and Baltic coasts of Denmark, Germany and Sweden.

The first report by the European Commission on compliance with the EU's sulphur directive has just been published. It reports that during the three years from January 2015 to December 2017, over 28,000 inspections were carried out by member states. This resulted in the identification of around 1,350 cases of fuel sulphur limits being breached, i.e. a non-compliance rate of around 5 per cent.

Looking specifically at the SECAs, where the stricter 0.10-per-cent sulphur limit applies, the non-compliance rate was somewhat higher, at 7 per cent.

According to the Commission, the directive has led to a significant increase in the number of fuel sulphur inspections, from previously checking 1 in every 1,000 ships calling on EU ports to the current inspection frequency of 1 in 10 ships. This increase in inspections follows the adoption in February 2015 of an Implementing Decision that lays down rules and procedures that member states must follow to check compliance with the sulphur directive (see AN 1/2015).

The Commission notes that this increase in monitoring and enforcement by member states has a significant deterrent effect. It also notes, however, that some member states do not yet comply with

the mandatory number of inspections and fuel sampling. In its conclusions, the Commission says that it will also look into the penalties member states have imposed on non-compliant operators and assess whether they have a truly dissuasive effect.

While member states are obliged by the directive to submit a report to the Commission on compliance by 30 June each year, the Commission must also report annually on the implementation of the directive. Moreover, the Commission "shall evaluate the need for further strengthening the relevant provisions" of the directive and "make any appropriate legislative proposals to that effect".

In its report, the Commission notes that additional reductions in ship air pollution are expected more widely across Europe from 2020 as a result of the blanket 0.50 per cent sulphur limit. But it also notes that exceedances of the air quality standards for NO₂ occur frequently and that there are no immediate reductions in ship emissions of nitrogen oxides (NO_x) envisaged.

Last year the Commission launched a study to identify the health benefits and associated costs of designating additional Emission Control Areas (both for SO_x and NO_x emissions) in European sea areas other than the Baltic and North Seas, and it also tasked the European Maritime Safety Agency (EMSA) to develop inventories of total ship emissions (SO₂,



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NO_x, PM) in all European waters based on ship activity data. Both tasks are to be finalized in 2018.

This new data on ship emissions will inform the Commission and member states on policies and measures that could further reduce the contribution from shipping to air pollution, including the feasibility of designating the Mediterranean Sea, or parts thereof, as an Emission Control Area.

Christer Ågren

European Commission press release and report, 16 April 2018. "Report from the Commission to the European Parliament and the Council on implementation and compliance with the sulphur standards for marine fuels set out in Directive (EU) 2016/802 relating to a reduction in the sulphur content of certain liquid fuels" Link: https://ec.europa.eu/info/news/concerted-eu-action-reduces-air-pollution-shipping-european-coastlines-and-ports-2018-apr-12_en

11 more court cases over Germany's dirty air

Following the victory in Germany's highest court in February, environmental organisations Deutsche Umwelthilfe (DUH) and ClientEarth are now taking legal action against authorities in an additional eleven German cities over illegal

air pollution. The number of German cities facing legal action by the organisations now stands at 28.

The two NGOs have targeted cities with levels of illegal pollution so high that they are unlikely to be brought below legal limits without restrictions on the most polluting diesel vehicles.

ClientEarth chief executive James Thornton said: "The Federal Administrative Court's ruling was unambiguous – German authorities have the power and the duty to restrict diesel to comply with air pollution law. Prolonging the inevitable is a

breach of authorities' legal duty to protect the people of Germany against harmful air pollution.

The new cases are being launched against: Backnang, Esslingen, Heilbronn, Ludwigsburg, Marbach, Reutlingen, Offenbach, Bochum, Dortmund, Düren and Paderborn.

Cases already launched are in: Berlin, Bonn, Darmstadt, Düsseldorf, Essen, Frankfurt, Gelsenkirchen, Halle, Hannover, Kiel, Köln, Limburg, Mainz, Munich, Stuttgart and Wiesbaden.

Source: ClientEarth News, 29 March 2018

A total of 28 German cities are facing legal action because of harmful levels of air pollution.





Wind and solar can be integrated into the grid

There are strategies to manage variability in electricity generation. A successful example is Denmark, which sometimes produces more than half of its electricity from wind and solar.

Wind and solar can be integrated into the grid much more effectively than at present. This is not just theory. Denmark got 53 per cent of its electricity from wind and solar in 2017. It is one of the real-world examples in a new study by the Energy Economics and Financial Analysis (IEEFA).

Solar and wind are growing fast and will continue to do so. The International Energy Agency has consistently underestimated renewables in its forecasts. But in its latest World Energy Outlook it says renewables will make up two-thirds of total global investment in new power plants.

Others believe wind and solar will grow even faster. But how can they be integrated. This question is examined in some detail in a new study from the IEEFA think-tank: *Power-Industry Transition, Here and Now. Wind and Solar Won't Break the Grid: Nine Case Studies*. It shows how nine countries or states have coped with a high percentage of variable renewable electricity (VRE). The countries or regions studied are: Denmark (52.8% VRE); South Australia (48.4%); Uruguay (32.2%); Germany (26%); Ireland (24.6%); Spain (23.2%); Texas (18%); California (15%); and the state of Tamil Nadu, India (14.3%).

It works.

The average annual duration of blackouts is generally lower in high-VRE countries than in comparable countries.

One way to manage variability is to “curtail” when VRE is too much for the grid or greater than demand. In Texas, the curtailment rate was unacceptable, at 17 per cent in 2009, but then dropped to below 2 per cent from 2013 on. Irish and German curtailment has also dropped

in recent years. In Denmark it simply doesn't happen.

The ways to balance VREs are many and varied.

Denmark is well connected to neighbouring countries, of which Sweden and Norway have a lot of hydro, which can swallow a lot of variation. So Denmark exports when winds are high, and imports when they are not.

A well-functioning electricity market has helped VRE integration in Denmark. It allows for “negative prices”. Denmark has a lot of district heating, where heat is normally co-generated with electricity, as in biomass plants. When winds are strong and electricity prices negative or low, turbines are turned off, and boilers are turned down. Wind is stored as heat, produced from cheap electricity. Fuel is saved for later use.

Improved weather forecasting has made it easier to match supply with demand.

South Australia has had other problems and found other solutions. A big blackout in 2016 was blamed on renewables, and showed too great a dependence on one interconnector. The government has since reduced vulnerability. Three gas power stations, seeing VRE undermining electricity prices, sold their gas elsewhere instead of producing power, but under some pressure they resumed power production. In order to preserve grid stability, frequency control and active power control have been mandated on wind turbines, so grid operators can modulate their output by altering the pitch of the turbine blades. A 5-minute market has been introduced. South Australia also has the biggest storage battery in the world, 100 MWh, alongside a 315 MW wind power plant,

with more to come.

1000 MW of demand reduction has been negotiated. A concentrated solar power station of 150 MW will be in place by 2020. Unlike PV, this can deliver dispatchable power, with 8–10 hours of storage.

More interconnection to other states is under construction or planned.

In Uruguay, VRE grew from 1.3% of electricity in 2013 to 32% in 2017, which mainly replaced oil power. Hydro power provides more than half of electricity, so Uruguayan electricity is now more than 90% renewable, and the country exports electricity to its neighbours. Hydro, and exports, are perfect for balancing VRE. The grid needs to be modernized to reduce the blackouts, however.

Germany has only modest hydro resources, though it can export/import some of its flexibility from the north and south. Bio-power, which is dispatchable, helps to stabilize and enjoys a flexibility premium. Germany, which started its road to renewables some 20 years ago, has fine-tuned a large number of policies to go even further.

Texas may not have a very green image, but it is the #1 state for wind power in the US, with 62 TWh in 2017, providing 18 per cent of its electricity. Solar came late, but is now growing fast. The Texas grid is essentially an island, so import/export is no option. Reinforcement of power lines within Texas from west to east in 2014 reduced curtailment dramatically. More reinforcement will be needed, as much of the best resources for more wind and solar are in West Texas.

Fredrik Lundberg

Renewables are rolling out rapidly

Between 2005 and 2015 wind power grew fourfold and solar by a factor of 72 in the EU. But this growth is very unevenly spread in the EU and in wider Europe.

An average Dane got 2,496 kWh of electricity from wind power in 2015. A Russian only got 1 kWh. Differences in solar are just as striking: Germany produced 469 kWh per inhabitant, Switzerland only 13, and Russia and Ireland zero, zilch and nada.

Both the fast growth and the uneven distribution can be seen in the tables in the factsheet “Development of renewable energy in Europe 1990–2015”.

Renewable energy includes hydro power, geothermal power and heat, wave energy, solar heating and biopower/heat. Hydro is big, but was mostly built a long time ago. Biomass is also important and a growing source of energy, for heat, power and vehicle fuel, ranging from mixed waste incineration (bad) to bark and wood shavings (good), so system boundaries are confusing and aggregated data are hard to understand and evaluate. Geopower and solar heating are not big in Europe and not moving fast.

Wind and solar are the result of a climate-

driven, and anti-nuclear, energy policy and a good indicator of the seriousness of climate policy.

Solar was absolutely insignificant as a source of electricity in 2005, but by 2015 it produced 108 TWh. This is about five times as much as Germany’s biggest fossil power plant, Jämschwalde, used to produce, so clearly solar can replace a lot of fossil power, and is doing so.

Wind is still much bigger and produced 302 TWh in Europe in 2015, equivalent to about 40 nuclear power reactors.

Renewables are no longer seen as alternative. They are the new default power source, eating away at fossils and nuclear.

Fredrik Lundberg

Link to factsheet: <http://airclim.org/publications/development-renewable-energy-europe-1990%E2%80%932015>

Table Renewables: Consumption in Terawatt-hours


	1990	2005	2014	2015	diff 05/90	diff 15/05
Austria	1.1	3.7	8.9	10.2	2.6	6.4
Belarus	^	0.0	0.1	0.2	0.0	0.2
Belgium	0.3	1.8	11.9	14.1	1.5	12.3
Bulgaria	^	0.0	2.8	3.1	0.0	3.1
Czech Rep.	^	0.7	7.3	7.6	0.7	7.0
Denmark	0.8	9.8	18.0	18.9	9.0	9.2
Finland	4.7	9.6	12.8	13.7	5.0	4.0
France	1.9	4.8	28.8	35.0	2.9	30.1
Germany	1.5	42.9	141.8	168.4	41.4	125.5
Greece	0.0	1.4	7.7	8.8	1.4	7.4
Hungary	^	1.6	2.8	3.0	1.6	1.4
Ireland	^	1.2	5.7	7.1	1.2	5.8
Italy	3.4	13.9	62.1	63.4	10.4	49.5
Lithuania	^	0.0	1.1	1.3	0.0	1.3
Netherlands	0.7	7.4	11.6	13.6	6.7	6.2
Norway	0.2	0.8	2.5	2.7	0.6	1.9
Poland	0.1	1.6	17.7	20.9	1.5	19.2
Portugal	0.7	3.5	16.0	15.7	2.8	12.2
Romania	0.0	0.0	6.5	9.6	0.0	9.6
Russian Fed.	0.1	0.5	0.6	0.7	0.4	0.2
Slovakia	^	0.0	2.0	2.2	0.0	2.1
Spain	0.7	24.8	71.1	69.1	24.1	44.3
Sweden	1.9	8.4	22.0	27.1	6.5	18.7
Switzerland	0.4	1.1	2.7	2.9	0.7	1.8
Turkey	0.1	0.3	12.3	17.0	0.2	16.8
Ukraine	^	0.0	1.7	1.7	0.0	1.7
UK	0.6	12.0	58.7	77.3	11.4	65.2
EU	18.6	149.8	521.6	594.8	131.2	445.1

Source: BP Statistical Review of World Energy 2017.
diff05/90=difference 2005 to 1990. diff15/05=difference 2015 to 2005

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Solar was absolutely insignificant as a source of electricity in 2005, but by 2015 it produced 108 TWh.





The price per megawatt-hour for generating from wind farms built onshore fell 18 per cent in the first half of 2018.

Wind and solar cheaper than coal

The economics of generating electricity from fossil fuels are deteriorating rapidly as renewable energy technology plunges in costs according to a new Bloomberg New Energy Finance report. In most places, wind and solar will work out cheaper than coal by 2023. One new factor is that lithium-ion batteries have enjoyed a 79 per cent drop in costs since 2010, making the idea of storing energy a possibility the coming years. The price per megawatt-hour for generating from wind farms built onshore fell 18 per cent in the first half of 2018 to \$55, while photovoltaics dropped 18 per cent to \$70. Calculations for energy costs in China compare generating costs for combined-cycle gas turbines (CCGT), coal,

wind farms and photovoltaics, suggesting that coal will fall behind the main forms of renewables early in the next decade. The cheapest solar and wind costs can now be found in China and India, which are also among the worst polluters. Bloomberg concludes that the tumbling costs will continue until at least until 2040 for both renewable energy sources worldwide, and they will become cheaper than coal and gas within five years, the report showed. <https://www.bloomberg.com/news/articles/2018-03-28/fossil-fuels-squeezed-by-plunge-in-cost-of-renewables-bnef-says>

Mongolian air pollution causing health crisis

Smog in Mongolia's capital Ulaanbaatar is causing a public health crisis, especially among children, according to a new study by the United Nations Children's Fund (UNICEF) and Mongolia's National Center for Public Health.

Pollution levels in Ulaanbaatar had become worse than that in cities such as Beijing and New Delhi. Concentrations of breathable airborne particles known as PM_{2.5} were as high as 3,320 micrograms

per cubic metre at one monitoring station on 30 January, they said.

The government has offered subsidies for more efficient wood- and coal-burning stoves and it is also providing free electricity at night in some districts. But smog levels spike in the bitterly cold winters, especially in poor "ger" neighbourhoods, named after the felt tents in which many migrants live. Many ger households burn coal or even trash to keep warm and the

smog they produce has led to a surge in respiratory and heart disease, and stoked anger and protests.

"Air pollution has become a child health crisis in Ulaanbaatar, putting every child and pregnancy at risk. The risks include stillbirth, preterm birth, lower birth weight, pneumonia, bronchitis, asthma, inhibited brain development and death," UNICEF Mongolia Representative Alex Heikens said.

Source: Reuters, 23 February 2018

Smog over Ulaanbaatar.



WHO: 9 out of 10 people breathing polluted air

Air pollution levels remain dangerously high in many parts of the world. Nine out of ten people globally are breathing polluted air, the World Health Organization (WHO) reports, as new analysis showed improvements in Europe and wealthier cities, but a worsening situation in poorer regions.

WHO estimates that around 7 million people die every year from exposure to fine particles (PM) in polluted air that penetrate deep into the lungs and cardiovascular system, causing diseases that include stroke, heart disease, lung cancer, chronic obstructive pulmonary diseases and respiratory infections, including pneumonia.

Although conditions in the world's megacities and poor countries remain dangerous, the WHO said there was some "positive progress" as governments take measures to tackle the problem. Concentrations of ambient air pollution are generally lowest in the wealthiest countries, with declining levels in parts of Europe and the Americas.

The WHO air quality database collected mean concentrations of particulate matter PM₁₀ and PM_{2.5} from more than 4,300 cities in 108 countries between 2010 and 2016. The WHO recommends countries reduce their air pollution levels to below annual mean values of 20µg/m³ for PM₁₀ and 10µg/m³ PM_{2.5}. EU air quality standards



Around 7 million people die every year from exposure to fine particles. FLICKR.COM / IAN SANE CC BY-NC-ND

are set much higher – at 40µg/m³ for PM₁₀ and 25µg/m³ for PM_{2.5}.

Later this year the WHO will convene the first Global Conference on Air Pollution and Health (30 October – 1 November 2018) to bring governments and partners together in a global effort to improve air quality and combat climate change (see: <http://www.who.int/airpollution/events/conference/en/>).

Source: Ends Europe Daily and WHO press release, 2 May 2018

WHO information: <http://www.who.int/news-room/detail/02-05-2018-9-out-of-10-people-worldwide-breathe-polluted-air-but-more-countries-are-taking-action>

Renewable alternative to jet fuel in the US


The International Air Transport Association predicts that 7.2 billion passengers will fly in 2035, nearly doubling the 3.8 billion in 2016. Instead of petroleum, researchers have now developed new processes to ramp up production of bio-based fuel made from corn cobs and wood chips. World air travel contributed 815 million tons of CO₂ emissions in 2016 – two per cent of the global anthropogenic total, according to the International Air Transport Association. Other US companies make renewable jet fuel from materials such as triglycerides

extracted from used oil and grease, or from a combination of carbon monoxide and hydrogen called syngas. One company uses algae as its source material and even has an underground pipeline to Los Angeles Airport (LAX), where a percentage gets mixed with conventional jet fuel.

<https://www.sciencedaily.com/releases/2017/10/171030154446.htm>

Algae-based biofuels are mixed with conventional fossil fuels.





Limits to achieving “4 per 1000” target

Increasing carbon stocks in agricultural soils is promoted as a climate mitigation practice. Scientists show that the potential in Europe might be overestimated.

The “4 per 1000” initiative (see article in AN4/16) was launched by France in December 2015 at COP21. It aims at an annual growth rate of 0.4 per cent in the soil carbon stocks in agricultural soils, as a way to remove carbon dioxide from the atmosphere and contribute to climate mitigation. This would also lead to other benefits that come with increased soil carbon, such as soil fertility, water infiltration and ease of tillage.

However, there are some flies in the ointment that have attracted increased attention from the research community. One article published in *Global Change Biology* reviews the results from 16 long-term experiments in the south-east UK, including 114 different treatments over a period of 7–157 years.

They conclude that in the majority (65 per cent) of the treatments it was possible to increase the soil organic carbon by more than 0.4 per cent over the first few decades. In some of the treatments the increase also continued for 40–60 years, before reaching a new equilibrium.

Some of the most successful treatments include high loads of farmyard manure, much more than is used in common practice. However, some basic calculations will

show that there is not enough manure to treat all fields in this way. Most manure is already applied directly on agricultural land; some 8 per cent in the EU is used for biogas production and there is also a smaller fraction of poultry litter that is incinerated. If you are going to put more manure on one field you will have to put less on another one. And the only way to get more manure will be to increase the number of livestock, which obviously will have other climate implications.

The study also shows that the greatest increase in carbon stock will appear in soils that have a very low initial concentration of carbon. From that observation it would make sense to target soils with the lowest carbon stocks and apply most manure there. This may sound simple. But current reality is that farming has moved towards more and more specialisation, with arable crops grown in some regions that are spatially separated from the areas where most animals are bred. There are several practical problems with transporting manure even over relatively short distances. A shift towards more integrated farming systems would, according to the scientists, also “require changes in policy structure and financial incentives and presupposes

that there is consumer demand for the animal products derived from grass”. They also add that from a climate perspective, the numbers of grain-fed animals would need to decrease at least in equal numbers.

Similar limitations also apply to the relatively successful treatments of including more ley in crop rotations. In the areas where it would make the greatest difference it doesn’t make economic sense to do so under the current regime.

The article also covers some treatments that involve removing agricultural land from production and converting it to forest. When it comes to increasing carbon stocks this is the best thing we can do. These were the only treatments where soil carbon stocks had not reached a new equilibrium after 100 years, and this does not even include the carbon stock in the biomass above ground. The limitation of this strategy is reduced food security. However, the authors believe that this could make sense on land with low productivity or areas exposed to severe soil erosion.

Another concern is that a measure that increases carbon stocks could also lead to increased emissions of nitrous oxide that



would offset some or all of the climate mitigation gains. This is scrutinised in another scientific article recently published in *Nature Climate Change*. In this study, researchers from the European Commission's Joint Research Centre have modelled 8,000 soil sampling locations from arable fields all over the European Union. They modelled two different treatments. In the first, which they call integrated crop residue retention and lower soil disturbance (IRS), a maximum of 10 per cent of the crop residues was removed. To simulate reduced tillage the decomposition rate was decreased by 20 per cent. In the second treatment, commonly known as green manure, a nitrogen-fixing cover crop (CC), clover, was grown and incorporated into the soil before the main crop was grown. Nitrogen mineral fertilisation was also reduced by 75 per cent compared to baseline.

When modelled, the IRS treatment indicated lower potential for carbon storage than the cover crop treatment. But when nitrous oxide emissions were included it was shown that in most sites the cover crop treatment would result in net emissions after only 40 years. In comparison, the IRS treatment meant that most sites

would still be net sinks after 100 years. The cover crop treatment also showed a greater spatial variation, and some areas with already high nitrogen loads, such as the Po valley and the border between the Netherlands and Germany, had the highest net emissions.

What can be learned from both these studies is that a more holistic approach is needed before assessing the potential and climate mitigation benefits of carbon storage in agricultural soils. And that these both factors may have been overvalued by those who have promoted the "4 per 1000" initiative. Instead the first article suggests that the many other well-known benefits of increased soil carbon for soil quality should continuously be promoted.

Kajsa Pira

Poulton P, Johnston J, Macdonald A, White R, Powlson D. Major limitations to achieving "4 per 1000" increases in soil organic carbon stock in temperate regions: Evidence from long-term experiments at Rothamsted Research, United Kingdom. *Glob Change Biol*. 2018;00:1–22. <https://doi.org/10.1111/gcb.14066>

Lugato E, Leip A, Jones A. Mitigation potential of soil carbon management overestimated by neglecting N₂O emissions. *Nature Climate Change*. 2018;08:219–223 <https://doi.org/10.1038/s41558-018-0087-z>

EU subsidises most-polluting farms

Over half of Europe's most-polluting livestock farms receive CAP payments, as revealed in a new study from Greenpeace.

They investigated all farms in Belgium, Denmark, France, Germany, Italy, Poland and the Netherlands listed in the European Pollutant Release and Transfer Register (E-PRTR). Agricultural installations are required to submit data to the E-PRTR if they emit more than 10,000 kg of ammonia per year, and to the Industrial Emission Directive register if they have space for over 40,000 poultry, 2,000 pigs or 750 sows.

Of the 2,374 livestock farms from these countries qualifying for the register, 1,209 received CAP payments totalling at least €104 million per year.

The report "Investigation: How the CAP promotes pollution": <http://www.greenpeace.org/eu-unit/en/Publications/2018/investigation-CAP-promotes-pollution/>

Nitrogen still pollutes European waters

Nitrogen overload continues to be a problem in European water bodies and aquifers, according to a new report from the EU commission with the aim of evaluating the implementation of the Nitrates directive. It is stated that "groundwater quality has only slightly improved" since 2008 and several countries are still recording excessive levels. In 2012–2015 13.2 per cent of the monitoring stations exceeded levels of 50mg/l, compared to 14.4 per cent in the previous reporting period.

The main source of nitrogen emissions is agriculture. Between the reporting periods 2008–2011 and 2012–2015 the average nitrogen discharge decreased by only 3 per cent. In the period 2012–2014, all member states, except Romania, had a surplus of nitrogen. The highest nitrogen surpluses (> 50 kg/ha) were found in Belgium, Cyprus, Czech Republic, Denmark, Luxemburg, the Netherlands and the United Kingdom.

Source: ENDS Daily 4 May 2018

The report: http://ec.europa.eu/environment/water/water-nitrates/pdf/nitrates_directive_implementation_report.pdf

Savings threat to a more sustainable agriculture

Less funding for environmental measures and increased flexibility for member states are bleak, but likely expectations of a post-2020 Common Agricultural Policy (CAP).

The EU Common Agricultural Policy (CAP) is under review. The Commission published a communication back in November in which they outlined some of their ambitions (see AN4/2017). A leaked document and the publishing of the proposed EU budget now puts some flesh on the bones to help anticipate what the post-2020 CAP proposal will look like. A document is expected to be published at the end of May.

On 2 May the European Commission presented a proposal for a Multiannual Financial Framework (MFF) 2021–2027. It sets out most of the economic prerequisites for the CAP. As a result of Brexit, cuts in CAP funding, which in the past has accounted for almost 40 per cent of the overall budget, were expected. The Commission communicated a 5 per cent decrease in the CAP budget. Agricultural Commissioner Phil Hogan described it as “a very fair outcome for our farmers, given the very challenging circumstances in which the budget has been framed”.

Alan Matthews, Professor Emeritus of European Agricultural Policy, has scruti-

nised the MFF figures in a blog post and gives a quite different picture. He shows that the Commission’s figure is correct if the whole budget periods are compared and nominal figures are used. But he argues that to show the general trend it is better to compare the final years of each budget period, 2020 and 2027, and to take into account an assumed inflation rate of 2 per cent. When this is done, the cuts come closer to 15 per cent. Direct payments will be maintained in nominal terms, but rural development payments, which include all targeted environmental funding, will fall by one-quarter.

The proposed MFF includes a suggested percentage of 25 per cent for climate mainstreaming across the whole budget – a figure that has been raised by 5 percentage points since the last MFF period. This is considered insufficient by environmental organisations such as WWF and the EEB. WWF is calling for a spending target of 50 per cent for climate and nature, and EEB suggests that all EU spending should be oriented towards meeting the Sustainable Development Goals.

However, a seemingly ambitious degree of environmental mainstreaming may mean little or no real-world change. The very much criticised greening mechanism, in which 30 per cent of direct payments are conditional on certain environmental practices, is a good example. Greening has failed to deliver (see AN/2018), mainly because the required practices were set at such a low ambition level that they made very little difference compared to business as usual and only added more bureaucracy to the system.

Instead of improving the greening mechanism, the Commission has decided to abolish it all together. This was stated in the communication back in November and has now been confirmed in the newly leaked document that reveals some of the policy architecture in more detail.

Direct payments have been divided in two categories: “the Basic Income Support for Sustainability (BISS)” and “the Complementary Redistributive Income Support for Sustainability (CRISS)”. The rationale of the Commission seems to be: since these income supports are subject



to conditions, they are per se sustainable. The promise of enhanced environmental conditionality is not visible in the leaked document. Actually the only common ground across member states is the old structure of cross-compliance.

The leaked document also shows that the Commission wants to give more flexibility to member states in the design of the CAP. They have proposed nine objectives:

- Support viable farm income and resilience across the EU territory (to support food security);
- Increase competitiveness and enhance market orientation;
- Improve the farmers' position in the value chain;
- Contribute to climate change mitigation and adaptation;
- Foster sustainable development and efficient management of natural resources;
- Preserve nature and landscapes;
- Attract new farmers and facilitate their business development;
- Promote employment, growth, social inclusion and local development in rural areas (including bio-economy);
- Address societal expectations on food and health.

Based on these objectives, member states will have to propose to the Commission their respective CAP plans. The plans can include fewer than the nine objectives if this can be justified by a SWOT analysis. This leaves an open door for member states to exclude one or more environmental objectives from their plans. Member

states will be free to decide which type of interventions (decoupled payments, coupled payments, investment etc.) they want to use to reach their chosen objectives. Under the current proposal only the new voluntary eco-scheme could deliver for the environment, nevertheless its voluntary nature makes it unlikely to be used by member states.

Environmental organisations have previously warned about increased subsidiarity and flexibility for member states in the CAP. History has shown that member states tend to aim for lower environmental ambition levels when given the opportunity, especially when put under pressure by national agriculture lobby groups. Bérénice Dupeux, EEB Policy Officer for Agriculture, said:

“Taxpayers can't keep funding billion-euro farm budgets with no accountability. The only way to ensure that the new farm policy steers farming in Europe away from an environmentally-destructive model is to ring-fence off at least half of the next farm budget for environment and climate protection.”

However, there is one slightly positive development in the CAP. Today the largest 20 per cent of farms receive 80 per cent of the direct payments. The Commission now wants to introduce a capping system. When taxes and labour costs are subtracted from the direct payments the total should not exceed €60,000, and the excess will instead be put into a redistribution fund.

Kajsa Pira

Sources:

The leaked proposal published by Politico, 25 April 2018: <https://www.politico.eu/wp-content/uploads/2018/04/SPOLITICO20-18042519010.pdf?utm>

CAP reform EU “Commission assaults rural development spending to protect direct payments” by Alan Matthews: <http://capreform.eu/commission-assaults-rural-development-spending-to-protect-direct-payments/>



Chance to let the EU Commission know what you feel about the 7th Environmental Action Programme and Ambient Air Quality Directives.

Consultation on 7th EAP

The European Commission announced in early May an open public consultation as part of its evaluation of the EU's 7th Environment Action Programme (EAP). The programme will be assessed regarding its effectiveness, efficiency, relevance, coherence and added value. All citizens and organisations are welcome to contribute to this consultation, and the consultation period is from 3 May to 26 July 2018.

More information: https://ec.europa.eu/info/consultations/public-consultation-evaluation-7th-environment-action-programme_en

Consultation on Ambient Air Quality Directives

A public consultation announced in early May aims to collect views from stakeholders on the level of awareness of air quality challenges in general and the provisions of the Ambient Air Quality Directives in particular; how these directives have contributed to improved air quality in Europe; whether their provisions continue to be relevant, effective, efficient and coherent with other EU and national policies; and what value they add to the EU. All individuals and organisations are welcome to contribute to this consultation, and the consultation period started on 8 May and will end on 31 July 2018.

More information: https://ec.europa.eu/info/consultations/public-consultation-support-fitness-check-eu-ambient-air-quality-directives_en



Eating healthily and sustainably

Reducing meat and calories is a win-win for health and the environment. An optimised Low Lands diet is a Dutch concept to make the transition more culturally acceptable.

The fact that there is a positive relationship between sustainable diets and healthy diets has been highlighted by several studies.

In his doctoral thesis “Simultaneous optimisation of the nutritional quality and environmental sustainability of diets”, Corné van Dooren examines this relationship and tries to find constructive ways to benefit from it, killing two birds with one stone, so to say.

He notes that within the Dutch population the action that has the greatest potential to make our diets healthier and more environmentally friendly is to reduce meat consumption. Second comes eliminating over-consumption of food and eating less calories. Though this is often emphasised from a health perspective, over-eating is less commonly seen as an environmental concern.

In one of the papers he presents an “optimised Low Lands diet”, which was designed with the help of linear modelling and is based on the diet that was commonplace in the Netherlands in 1900–1940, a so-called “traditional Low Lands diet”. The idea is that a food regime that has historical roots in the region is more culturally acceptable than a diet that is not. At least in the case of the Netherlands the diet of the early 20th century was both healthier and more sustainable than the current diet. Tweaking this traditional diet by exchanging as few food items as possible for the greatest environmental and health gains shows where we need to put in the effort for dietary change.

In short, the optimised Low Lands diet would mean a massive increase in vegetables (+85%), fruit (+218%), legumes (+1600%) and potatoes (+227%),

combined with a reduction in meat consumption (–58%) and extras (–69%). Cheese is also eliminated from the diet. Fish consumption is also tripled, which may be questionable from a sustainability point of view, but is allowable based on the parameters used: land use and greenhouse gas emissions. Unlike many similar attempts to design diets, extras such as cake, jam etc., were not totally excluded, but kept at the same level as the traditional diet, 30 g a day. Beer was treated similarly, allowing 300 ml a day, which is actually higher than the current consumption.

The resulting optimised Low Lands diet is also compared to two previous concepts for regional diets: the Mediterranean diet and the New Nordic Diet. Based on the chosen parameters the optimised Low Lands diet was assessed to be as healthy as the Mediterranean diet and a little less healthy than the New Nordic diet, but performed better in reducing greenhouse gas emissions and land use.

The reason why the optimised Low Lands diet performs better can be found in the so-called “vegetable paradox”. The paradox is that increasing the amount of vegetables and fruit in the diet makes it healthier, but not necessary more sustainable. In short, if vegetables and fruit replace meat and cheese in the diet they result in lower greenhouse gas emissions, but when they replace potatoes and grains they most often lead to higher greenhouse gas emissions. Both the Mediterranean and the New Nordic diets have a very high share of vegetables

and fruit but are rather low in potatoes and grains compared to the optimised Low Lands diet.

The study also dismisses the notion that eating sustainably and healthily is out of the reach of poor people. A sustainable diet is not necessarily more expensive. With the help of modelling, van Dooren manages to design a healthy weekly shopping basket, with low greenhouse gas emissions and land use, for a two-person household for less than €40 per week. However, it is also noted that food prices in the Netherlands are among the lowest in Europe. And there is also no analysis of other barriers than price that might prevent less-affluent citizens having access to healthy and sustainable food.

Somewhat related to this is an attempt to find patterns of eating habits among different population subgroups. However, the normal divisions by age, gender, income and education prove to be a poor tool for this type of analysis. Although women, older and well-educated people tended to eat healthier, and women, the unemployed and non-European immigrants had diets with lower greenhouse gas emissions compared to the average, there was great variation within those groups.

Another approach was to look at groups classified by their social status (low, middle and high) and values (traditional, modern and postmodern), using a method called social milieus or mentality milieus.

Van Dooren presents an idea for using specific strategies to improve the diet from a sustainability



and health perspective. The strategies he suggests are:

1. Replacing snacks with fruit, especially between meals
2. Replacing cheese with vegetables
3. Partly replacing meat with fish
4. Drink less alcoholic beverages
5. Halving the daily portion of meat.

For example, “New conservatives” – people with high status and traditional values – tend to eat more meat and snacks than average and should be targeted with messages 1) and 3). Looking at crude consumption figures also shows that lifestyles and attitudes that seem to favour sustainability are not always enough. One example is the group “Cosmopolitans” – people with high status and modern values. They tend to have progressive attitudes towards different innovative sustainability concept, such as local foods, artisanal production and urban farming. But they eat more cheese than average, which also leads to higher greenhouse gas emissions than the average Dutch population, and van Dooren suggests that they should be targeted with message 2).

Vegetarianism varied significantly among the groups. It was most common in the group of “Post-materialists”, people with postmodern values and low to medium status, of which 10 per cent were vegetarian compared to 3 per cent in the population as a whole.

The general conclusion from this study is that changing diets can reduce greenhouse gas emissions from food substantially. However, changing people’s eating habits is a complex issue and a combination of practical approaches needs to be tested and investigated.

Kajsa Pira

“Simultaneous optimisation of the nutritional quality and environmental sustainability of diets” by Corné van Dooren, <https://research.vu.nl/en/publications/simultaneous-optimisation-of-nutritional-quality-and-environment>

Increased emissions from German farms

German greenhouse gas emissions from agriculture reached a low in 2007, at 62 million tonnes CO₂e, and have since then increased to 65.5 million tonnes, according to a report from the German Federal Environment Agency (UBA) published earlier this year.

They state that technical measures will not be enough reduce these emissions, but that reductions in numbers of livestock are also needed. It is also noted that this must be accompanied with dietary changes, otherwise emissions will just leak abroad.

The report also shows that ammonia emissions are on the rise, the reported figure of 759,000 tonnes in 2015 shows an increase of 12 per cent since 2005. Without efforts to break this trend Germany will have problems meeting its NEC directive commitment in 2020 at 644,000 tonnes.

Source: ENDS Europe Daily 27 February 2018

Umwelt und Landwirtschaft 2018 https://www.umweltbundesamt.de/sites/default/files/medien/421/publikationen/20180125_uba_fl_umwelt_und_landwirtschaft_bf_final.pdf

Concern over ammonia in Northern Ireland

Ammonia has received some newly awakened attention in Northern Ireland, after a report “Making Ammonia Visible” was published in December by a working group commissioned by Northern Ireland’s Department of Agriculture. Ammonia emissions peaked 20 years ago, and reached their lowest levels in 2010, but since then they have increased by 9 per cent.

The report recommendations include well-known and not very far reaching measures such as a proposal to ban splashplate slurry spreading by 2025 and banning the sale of new splashplate spreaders by 2020; planting forest around livestock units; maintaining a cleaner farmyard; extending the grazing season; covering slurry lagoons; and applying slurry earlier in the season.

This new focus on ammonia has also stalled the approval of planning applications for new agricultural projects, framed in the media as the “ammonia deadlock”. This is due to their impact on ammonia emissions being examined more carefully now.

Because of the increased concern over ammonia emissions Northern Ireland’s



Ammonia levels has increased by 9 per cent since 2010.

Department of Agriculture, Environment and Rural Affairs has commissioned a new scientific research programme. It will provide information on how best to address ammonia emissions – including the gathering of data from 20–30 new air quality monitoring sites.

The report “Making ammonia visible” <https://www.daera-ni.gov.uk/sites/default/files/publications/daera/Ammonia%20Annex-%20Expert%20Working%20Group%20%28final%29.pdf>

Agriland, 8 May 2018 <https://www.agriland.ie/farming-news/daera-outlines-progress-in-tackling-ammonia/>



IMO adopts greenhouse gas strategy for shipping

While the EU pushed for emission cuts of 70–100 per cent by 2050, the final global agreement settled for a target of “at least 50 per cent”.

After two weeks of negotiations, countries meeting at the United Nations International Maritime Organization (IMO) in London agreed on 13 April an initial strategy for reducing greenhouse gas emissions from ships. The deal was supported by an overwhelming majority of countries – only Saudi Arabia, Brazil and the USA raised specific objections.

The stated levels of ambition are that greenhouse gas emissions from international shipping should peak as soon as possible and to reduce emissions by at least 50 per cent by 2050 compared to 2008, while, at the same time, pursuing efforts towards phasing them out entirely.

The strategy includes a specific reference to “a pathway of CO₂ emissions reduction consistent with the Paris Agreement temperature goals”.

Climate Action Network concluded that “while the agreement falls short of the 70 to 100 per cent reductions by 2050 that the Pacific Islands, the EU and others were calling for ahead of the meeting, it keeps a window open to meet the Paris climate goals and is undeniably a game changer for the shipping sector”.

On top of the “at least 50-per-cent” reduction target, the strategy says that the carbon intensity of shipping shall decline through implementation of further phases of the energy efficiency design

index (EEDI) for new ships. Also, that the carbon intensity of international shipping shall decline by reducing CO₂ emissions per transport work, as an average across international shipping, by at least 40 per cent by 2030, pursuing efforts towards 70 per cent by 2050, compared to 2008 levels.

According to the IMO, this initial strategy sets out a future vision for international shipping, the levels of ambition to reduce greenhouse gas emissions and guiding principles. It includes a list of so-called candidate measures to be taken in the short-, mid- and long-term. Short-term measures include, for example, speed reductions. In line with the roadmap approved by IMO member states in 2016, the initial strategy is due to be revised by 2023.

International shipping currently accounts for 2–3 per cent of global CO₂ emissions. Under the below 2°C Paris temperature goal, the strategy’s target of at least halving emissions by 2050 means that shipping’s share of CO₂ emissions is likely to grow to around 10 per cent by mid-century.

Veronica Frank, international political advisor at Greenpeace, said: “The plan is far from perfect, but the direction is now clear – a phase-out of carbon emissions. This decarbonisation must start now and targets improved along the way, because

without concrete, urgent measures to cut emissions from shipping now the Paris ambition to limit warming to 1.5 degrees will become swiftly out of reach.

Dr Tristan Smith, a shipping expert at University College of London’s Energy Institute, said: “It is likely this target will tighten further, but even with the lowest level of ambition, the shipping industry will require rapid technological changes to produce zero-emission ships, moving from fossil fuels to a combination of electricity (batteries), renewable fuels derived from hydrogen, and potentially bioenergy.”

The next step of the strategy work will be to hold a fourth meeting of the IMO’s “Intersessional Working Group on Reduction of GHG emissions from ships” later this year. The working group shall develop a programme of follow-up actions to the initial strategy and report progress to the next session of the IMO’s Marine Environment Protection Committee (MEPC), which is scheduled to meet on 22–26 October 2018.

Christer Ågren

Sources:

IMO briefing, 13 April 2018: <http://www.imo.org/en/MediaCentre/PressBriefings/Pages/06GHGInitialStrategy.aspx>

CAN press release, 13 April 2018: <http://www.climateactionnetwork.org/press-release/imo-shipping-sector-gets-board-tackle-climate-change-faster-near-term-action-needed>

Diesels in low-emission zones?

More than 90 per cent of Euro 6 diesel cars on sale today don't meet the EU emission limits on the road but are still exempt from low-emission zones or diesel bans.

Green transport organisation Transport & Environment (T&E) has analysed low-emission zones and congestion charges in eleven EU cities and found large differences in the systems implemented so far. While some policies exclude high-polluting vehicles permanently and are intended to promote cleaner transportation options, others are more short-term responses to hazardous air pollution episodes.

Although the vast majority of new Euro 6 diesel cars don't meet the EU emission limits for nitrogen oxides (NOx) in real-world driving conditions, they still manage to escape low-emission zones or diesel bans. According to the T&E study, around 90 per cent of the Euro 6 diesel cars still exceed the NOx limit by a factor of 4–5. Some models even have emissions that are up to 10 times higher, notably from carmakers such as Renault, Fiat and Opel (see AN 3/17, pp. 8–9). Moreover, there are Euro 6 diesel cars that emit more NOx on the road than much older Euro 4 and Euro 5 cars that are banned.

Julia Poliscanova, clean vehicles manager at T&E, said: "One of the key weaknesses of the low-emission zones and car restrictions in cities is the blanket exemption of mostly dirty Euro 6 diesels. Unless carmakers properly fix these dirty diesels, cities are left with no other option but keep them out of city centres. To be effective, the inclusion/exclusion criteria of these measures should be based on vehicles' real-world emissions that are now widely available. More importantly, diesel bans should be accompanied by high-quality public transport and infrastructure for shared and zero-emission vehicles."

On 27 February, a ruling by Germany's highest federal administrative court confirmed that German cities can introduce diesel restrictions with immediate effect and clarified that the

right of citizens to breathe clean air takes precedence over the right of private car owners to drive polluting vehicles. However, in some other EU countries national legislation is still preventing cities from taking action, and the T&E says that the German court ruling should be a precedent EU-wide.

As more and more cities introduce restrictions for dirty diesel cars, the air pollution problem may shift to Central and Eastern European countries, due to second-hand cars imported from Western Europe.

"The European Commission should consider what measures can be put in place to ensure all second-hand imported cars have had their exhaust treatment systems fixed or upgraded. All Europeans have an equal right to clean air and a joint EU solution is needed," said Poliscanova.

In order to ensure that low-emission zones and diesel bans are fully effective, T&E recommends:

- To avoid blanket exemptions of Euro 6 diesels and instead only allow vehicles that are clean in real-world driving, including those that have been fixed.
- That the vehicles with emissions above



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the EU limits should either be adequately fixed, at the expense and responsibility of the car manufacturer, or not allowed in city centres. Unaltered performance and fuel consumption should be guaranteed to drivers.

- The use of remote sensing linked to number plate recognition to police compliance as well as to identify individual grossly polluting models and ensure these are repaired or cannot enter the city.
- Cities to be given powers to put in place permanent vehicle restriction policies to help them achieve air quality standards.
- Investments in public transport, incentives to reduce vehicle ownership as well as infrastructure for zero-emission vehicles, shared and active mobility (e.g. cycling lanes) to help secure public acceptance and local buy-in.
- Consistency between all policy levels (EU, national and local) to help reduce pollution and make cities clean and liveable. At EU level, emission limits should not favour diesel but instead follow the principles of technology and fuel neutrality. At national level, vehicle taxation should include an air quality increment to avoid skewing the market in favour of diesels.

In September last year, a study by the international research institute IIASA concluded that excess emissions from diesel vehicles that exceed certification limits were associated with at least 5,000 premature deaths annually in the EU.

Christer Ågren

T&E press release and report "How to get rid of dirty diesels on city roads", 14 March 2018. See: <https://www.transportenvironment.org>

Low emission zones (LEZ) for cars in the European Union.



CO₂ makes up 81 per cent of US greenhouse gases

The website of the US EPA presents an inventory of GHG emissions for 1990 to 2016, but web pages containing detailed climate analysis were removed one year ago.

The Environmental Protection Agency (EPA) has prepared an inventory of US Greenhouse Gas Emissions and Sinks since the early 1990s. The 2016 annual report provides a comprehensive account of total greenhouse gas emissions from all man-made sources in the United States. The gases covered by the inventory include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, and nitrogen trifluoride. The inventory also calculates carbon dioxide emissions that are removed from the atmosphere by “sinks,” e.g., through the uptake of carbon and storage in forests, vegetation, and soils.

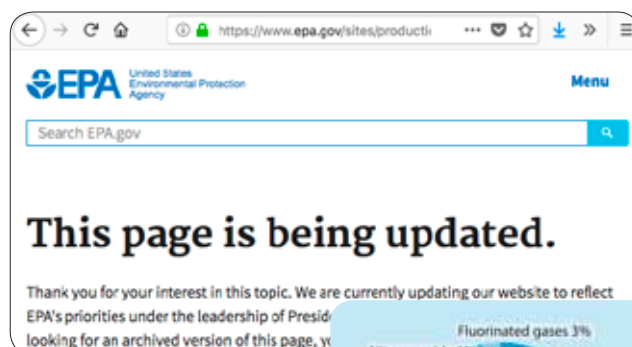
Key findings from the 1990–2016 US Inventory include:

- In 2016, US greenhouse gas emissions totalled 6,511 million metric tons of carbon dioxide equivalents, or 5,795 million metric tons of carbon dioxide equivalents after accounting for sequestration from the land sector.
- Emissions decreased from 2015 to 2016 by 2.5 per cent (after accounting for sequestration from the land sector). This decrease was largely driven by a decrease in emissions from fossil fuel combustion, which was a result of multiple factors

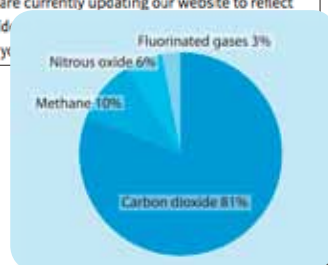
including substitution from coal to natural gas consumption in the electric power sector, and warmer winter conditions that reduced demand for heating fuel in the residential and commercial sectors.

- Greenhouse gas emissions in 2016 (after accounting for sequestration from the land sector) were 12 per cent below 2005 levels.

This information can still be found on the EPA website. But in April 2017 the EPA removed web pages providing information about climate change that had existed in some form for nearly two decades and under three presidents, the Washington Post reports. The pages explained the science of climate change and its effects, and described actions that individuals could take and that the agency itself was taking to work on the issue. Today, one year later, the agency’s climate pages are still down, and would-be visitors



Right: Overview of US greenhouse gas emissions in 2016. Source: US Environmental Protection Agency (2018). Inventory of US greenhouse gas emissions and sinks: 1990–2016.



are redirected to a notice saying that “this page is being updated.” The reason for this is that the present US government does not regard global warming as man-made.

The Washington Post concludes that inside and outside the agency, scepticism is rising that the agency’s main climate web pages will ever go back online.

Compiled by Reinhold Pape

<https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2016>
https://www.washingtonpost.com/news/energy-environment/?p=51650&utm_term=.463d815537fe



People's Climate Solidarity
March Minnesota, US.

FlickR.COM / FIBONACCI BLUE CC BY

Revolving doors threat to climate policy

On 2 May the Greens/EFA Group in the European Parliament launched a report that examines the relationships between governments and the fossil fuel industry. The study covers 13 European countries and has found 88 cases of so called “revolving doors”, where individuals from high positions in public office have moved to jobs in private companies engaged in fossil energy or vice-versa.

It is noted that Belgium, the Czech Republic, France, Germany, Italy, Norway, Poland, Spain and the UK regulate the issue to varying degrees, while only Austria, Denmark, Hungary and Sweden have no specific legislation. Though as the results show “legislation to regulate the revolving door does not always effectively address the problem, either because there are no enforcement mechanisms or if there are, they are not always used, or because the rules are easily circumvented or there are gaps in the legislation for certain public officials”.

Of the cases identified 28 involve ministers, prime ministers, deputy prime ministers or secretaries of state. One striking example is that of former German chancellor Gerhard Schröder, who left office in 2005 and went on to chair the advisory board of Nord Stream AG, a Gazprom-led joint venture to build a new gas pipeline from Russia to Germany.

The report recommends countries to introduce regulation that ensures a minimum “cooling-off period” of three years for officials and managers moving between the public and private sectors.



High-ranking public officials frequently move to jobs in the private energy sector and vice versa, without any cooling-off periods.

Revolving doors and the fossil fuel industry <https://www.greens-efa.eu/files/doc/docs/3d2ec57d6d6aa101bab92f4396c12198.pdf>

Secrecy over plans to tackle dirty air

Proposals from a handful of national governments to stave off legal action over breaches of air pollution limits are inadequate, while four out of nine countries facing referral to Europe’s highest court have refused to reveal their plans.

The European Environmental Bureau (EEB) and other campaign groups made freedom of information requests to the governments of Italy, Spain, the UK, Romania, Hungary, the Czech Republic and Slovakia to reveal the plans they submitted to the European Commission in a bid to avert a court case and potentially severe fines.

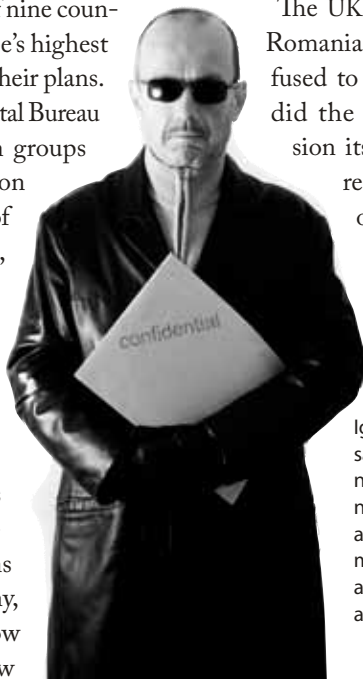
While some governments shared their proposals, others want to keep their plans secret to avoid public scrutiny, the EEB concluded. “It’s now essential that the public know

why further legal action will or won’t be taken,” said EEB policy officer Margherita Tolotto.

The UK, Spanish, Czech and Romanian governments all refused to share information, as did the European Commission itself. Hungary did not respond to the freedom of information request.

The Department for Environment, Food and Rural Affairs in London cited a

Ignorance? Is a bliss they say. Our statistics show that not revealing our plans of not doing anything about air pollution will prevent as many heart attacks as actually doing something about air pollution. Do you follow?



“strong public interest in withholding the information because its disclosure would undermine the UK Government’s position in discussions with the European Commission”. Romania dismissed the request saying the request information comprised “working documents for ... internal use”.

However, the Italian and Slovak governments did release their proposals and the French and German measures were already in the public domain.

Legally binding air pollution limits are currently being broken in 130 cities in 23 of the 28 member states, and air quality data shows that the nine countries now facing legal action are among the worst offenders.

Sources: Ends Europe Daily and EEB, 28 March 2018

Germany still constructing new coal power stations

Several countries in Europe, among them Germany, have recently built or are planning to build new coal power stations. Some examples of such plants are presented here.

Hard coal power plant, Datteln

Completion of the E.ON (now Uniper) coal power station at Datteln has been delayed repeatedly since 2007 by court injunctions due to non-compliance with zoning and environmental regulations. The construction site was determined by Friends of the Earth (BUND) to lie five kilometres distant from the original application location.

Following licence revisions, the plant will now be entering service in 2018 with 1,052 MW total electrical capacity. As much as 413 MW can be electronically converted to 16.7 Hz 110 kV traction power for the state railway system, Deutsche Bahn, superseding the 507 MW Steag coal power plant simultaneously being retired at Lünen.

The Datteln power station will have an electrical efficiency of 45 per cent, with an additional 380 MW of heating energy raising the total fuel utilization to over 59 per cent. The elimination of outlays for domestic furnaces, space heaters, and maintenance enhances customer acceptance of the district heating services.

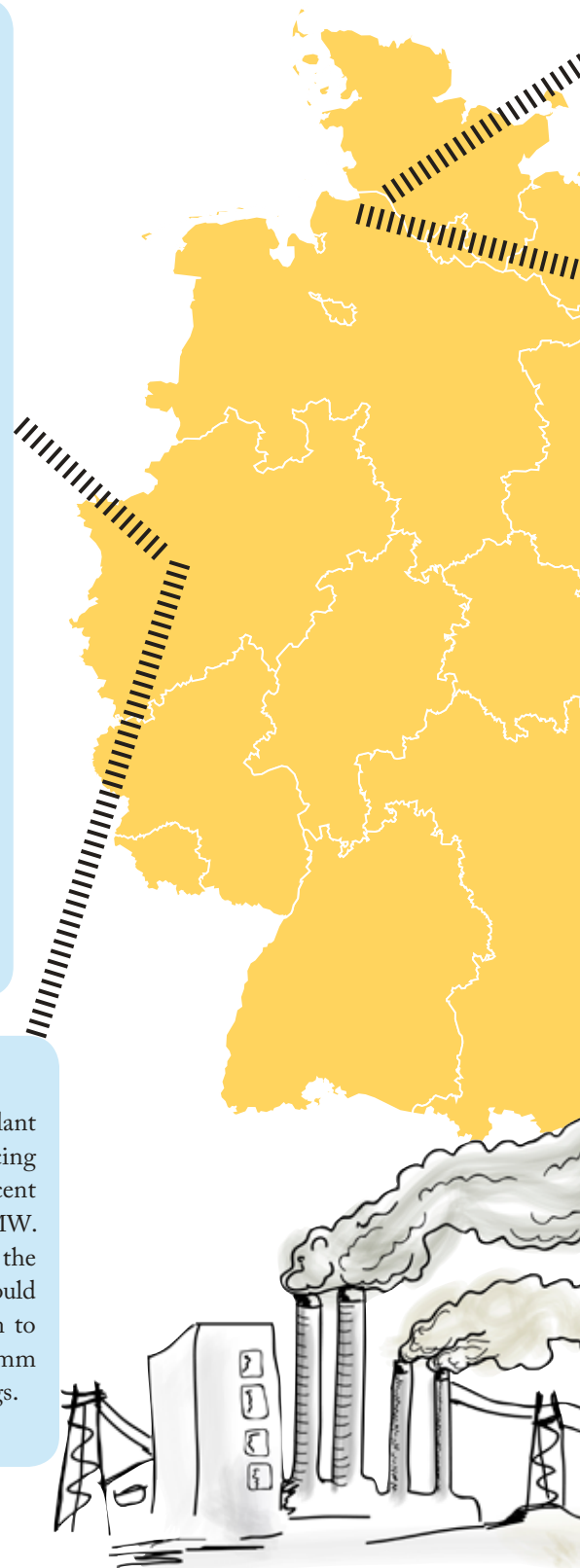
Nevertheless, the Datteln power station may be incapable of complying with future air quality regulations. Effective from 19 January 2017, the environmental ministry of North Rhine-Westphalia had ordered the mercury emissions limit of 0.004 mg/m^3 requested by Uniper to be halved to 0.002 mg/m^3 . Uniper later obtained a revocation of this directive from the district administration of Münster irrespective of impending court decisions. Coal power plants remain responsible for the greatest amounts of stratospheric mercury deposited worldwide from manmade sources.

Studies by the University of Stuttgart have also shown that cumulative mortality risks from the Datteln power station are increased by secondary aerosols from the chemical reactions of smokestack effluents with atmospheric ammonia. Low-emission energy technologies therefore remain essential for reducing airborne contaminants.

Hard coal power plant, Lünen

The coal power station at Lünen North Rhine-Westphalia was completed in 2013 at a cost of €1.4 billion by Trianel GmbH. The original configuration with an electrical capacity of 750 MW had achieved an efficiency of 45.95 per cent. Up to 160 MW of excess heat is fed through a 617 metre pipeline into the 44 km Stadtwerke Lünen district heating network, increasing the ef-

fective utilization of the power plant to around 50 per cent but reducing the power efficiency to 44.96 per cent and the electrical capacity to 736 MW. Owing to advanced effluent filters, the company claims that 8,000 years would be required for the power station to deposit a dust layer of just 0.1 mm thickness on surrounding buildings.



Moorburg hard coal power station, Hamburg

The 2 x 774 MW Vattenfall power station in the Hamburg harbour district of Moorburg can deliver 11 billion kilowatt-hours of electricity per year, which is nearly sufficient for the city's 1.9 million inhabitants. With a net generating efficiency of up to 48.3 per cent, the electrical output can be reduced as low as 26 per cent of maximum capacity whenever warranted by grid conditions.

The plant had incurred major revisions before entering service behind schedule in 2015. Thermal stresses had required one-tenth of the T24 boiler steel to be replaced after initial trial runs. In the original design, a water volume of 64 m³/s would have been diverted from the Elbe River through the cooling circuit, greatly endangering aquatic ecosystems. Closed-cycle evaporation cooling towers

were therefore retrofitted that diminished the net plant capacity by only about one per cent. The hybrid (wet and dry) design with a low structural height of 85 metres significantly reduces cooling steam clouds above the Elbe shoreline.

Moorburg now releases up to 8.7 Mt of greenhouse gases annually in conventional operation.

Industrial mixed firing power plant, Stade

A coal power plant designed by DowDuPont for its existing chemical manufacturing facility in Stade near Hamburg will include a newly built gas and steam turbine generator. The main dual industrial boiler concept is configured for hard coal firing with up to 10 per cent each of biomass and hydrogen released by the electrolytic production of chlorine.

The 45 per cent electrical efficiency of the central 1,000 MW generator in combination with 300 MW steam for the factory results in an overall fuel efficiency approaching 60 per cent. Employing a hybrid cooling tower precludes the need for drawing cooling water from the Elbe River.

A completion date for the plant has not

been announced, however. According to Reinhard Elfring, city council member of the Green Party, DowDuPont does not intend to operate the plant itself, since it is not a utility company. A partner corporation has not yet been identified. The estimated facility cost of up to €2 billion would require half a century of continuous production to be justified.

The American headquarter corporation DowDuPont Inc. has already confirmed "strong leading indicators of broad-based growth across developed economies including the United States, Germany and France" that will be favourable to future business. Any losses incurred by CO₂ regulations on coal power generation could likely be compensated by increased revenues from chemical manufacturing.

Multipurpose lignite power station, Schkopau

Schkopau, near the eastern German city of Halle, has been a centre of the chemical synthesis industry for over a century. A new dual-block lignite power station with 900 MW electrical capacity was dedicated in 1995/96 to complement overall site modernization. The facility owners are Uniper Kraftwerke GmbH, Düsseldorf (58.1%) and the EPH subsidiary Saale Energie GmbH in Schkopau (41.9%).

The combined plant configuration includes a 110 MW 16 2/3 Hz generator for traction power on the German railway system, two 400 MW class generators for 50 Hz grid electricity, and low- and high-pressure steam production employed by the adjacent DowDuPont chemical plant and local heating services. In 2016, electrical

power of about 5 TWh was generated from 4.7 million metric tons (Mt) of lignite delivered by rail from the 40 km distant MIBRAG Profen mine, which is likewise owned by EPH.

Since the present MIBRAG delivery contract expires in 2021, a corresponding near-term opportunity could arise to eliminate lignite usage altogether. DowDuPont is already converting some of its manufacturing plants in the United States to renewable energies. Solid-state frequency converters at Schkopau would allow substitute railway power to be drawn from the local high-voltage transmission grid to supersede the existing 110 MW generator, with 100 per cent renewable electrical energy predicted for the region by 2030.

Jeffrey Michael

The article and list of plants will be continued in the next issue of Acid News with the following plant projects:

- RWE BoA lignite power plants, Germany;
- Expanded and modernized lignite power generation in Turów and Bełchatów, Poland;
- New coal generation for energy security at Koźienice, Poland;
- Hard coal capacity expansion in Opole, Poland;
- Delayed advanced lignite power plant at Ledvice, Czech Republic;
- Lignite plants in the Balkan region.

Average CO₂ level exceeds 410 ppm for first time

Since 1990, there has been a 40 per cent increase in total radiative forcing – the warming effect on our climate – due to long-lived greenhouse gases.

The University of California reports that the average concentration of carbon dioxide in the atmosphere was 410.31 parts per million (ppm) for the month of April 2018, according to the Keeling Curve measurement series made at the Mauna Loa Observatory in Hawaii. This marks the first time in the history of the Mauna Loa record that a monthly average has exceeded 410 parts per million. It also represents a 30 per cent increase in carbon dioxide concentration in the global atmosphere since the Keeling Curve began in 1958. In March, Scripps Institution of Oceanography at the University of California San Diego observed the 60th anniversary of the data series, the first measurements of which were 315 ppm.

Last autumn the World Meteorological Organization (WMO) reported that concentrations of carbon dioxide in the atmosphere surged at record-breaking speed in 2016 to the highest level in 800,000 years. The abrupt changes in the atmosphere witnessed in the past 70 years are without precedent. Globally averaged concentrations of carbon dioxide reached

403.3 parts per million in 2016, up from 400.00 ppm in 2015 due to a combination of human activities and a strong El Niño event. Concentrations of carbon dioxide are now 145 per cent of pre-industrial (before 1750) levels, according to WMO.

Rapidly increasing atmospheric levels of carbon dioxide and other greenhouse gases have the potential to initiate unprecedented changes in climate systems, leading to “severe ecological and economic disruptions,” said WMO.

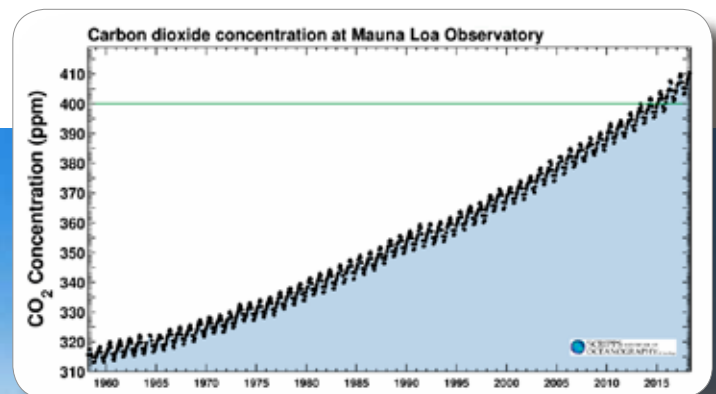
Since 1990, there has been a 40 per cent increase in total radiative forcing – the warming effect on our climate – due to all long-lived greenhouse gases, and a 2.5 per cent increase from 2015 to 2016 alone, according to figures from the US National Oceanic and Atmospheric Administration quoted by WMO.

“Without rapid cuts in carbon dioxide and other greenhouse gas emissions, we will be heading for dangerous temperature increases by the end of this century, well above the target set by the Paris climate change agreement,” said WMO

Secretary-General Petteri Taalas. “Future generations will inherit a much more inhospitable planet,” he said. “Carbon dioxide remains in the atmosphere for hundreds of years and in the oceans for even longer. The laws of physics mean that we face a much hotter, more extreme climate in the future. The last time the Earth experienced a comparable concentration of carbon dioxide was 3–5 million years ago, the temperature was 2–3°C warmer and sea level was 10–20 meters higher than now.”

Carbon dioxide is by far the most important anthropogenic long-lived greenhouse gas. Globally averaged concentrations for carbon dioxide reached 403.3 parts per million in 2016, up from 400.00 ppm in 2015. This record annual increase of 3.3 ppm was partly due to the strong 2015/2016 El Niño, which triggered droughts in tropical regions and reduced the capacity of “sinks” like forests, vegetation and the

Carbon dioxide concentrations have been measured at the Mauna Loa Observatory since 1958.



oceans to absorb carbon dioxide. Concentrations of carbon dioxide are now 145 per cent of pre-industrial (before 1750) levels. The rate of increase of atmospheric carbon dioxide over the past 70 years is nearly 100 times larger than that at the end of the last ice age. As far as direct and proxy observations can tell, such abrupt changes in the atmospheric levels of carbon dioxide have never before been seen.



"Without rapid cuts in carbon dioxide and other greenhouse gas emissions, we will be heading for dangerous temperature increases by the end of this century", said WMO Secretary-General Petteri Taalas.

Over the last 800,000 years, pre-industrial atmospheric carbon dioxide content remained below 280 ppm, but it has now risen to the 2016 global average of 403.3 ppm. From the most-recent high-resolution reconstructions from ice cores, it is possible to observe that changes in CO₂ have never been as fast as in the past 150 years. The natural ice-age changes in CO₂ have always preceded corresponding temperature changes. Geological records show that the current levels of CO₂ correspond to an "equilibrium" climate last observed in the mid-Pliocene (3–5 million years ago), a climate that was 2–3°C warmer, where the Greenland and West Antarctic ice sheets melted and even some of the East Antarctic ice was lost, leading to sea levels that were 10–20 m higher than those today.

Methane (CH₄) is the second most important long-lived greenhouse gas and contributes about 17 per cent of radiative forcing. Approximately 40 per cent of methane is emitted into the atmosphere by natural sources (e.g., wetlands and termites), and about 60 per cent comes from human activities like cattle breeding, rice agriculture, fossil fuel exploitation, landfills and biomass burning. Atmospheric methane reached a new high of about 1,853 parts per billion (ppb) in 2016 and is now 257 per cent of the pre-industrial level.

Nitrous oxide (N₂O) is emitted into the atmosphere from both natural (about 60%) and anthropogenic sources (approximately 40%), including oceans,

soil, biomass burning, fertilizer use, and various industrial processes. Its atmospheric concentration in 2016 was 328.9 parts per billion. This is 122 per cent of pre-industrial levels. It also plays an important role in the destruction of the stratospheric ozone layer which protects us from the harmful ultraviolet rays of the sun. It accounts for about 6 per cent of radiative forcing by long-lived greenhouse gases.

The Washington Post reports that planetary carbon dioxide levels have been this high or even higher in the planet's history – but not for a long time. Scientists are also concerned that the rate of change now is far faster than what Earth has previously been used to. In the mid-Pliocene warm period more than 3 million years ago, CO₂ levels were also around 400 parts per million – but Earth's sea level is known to have been 20 metres or more higher, and the planet was still warmer than now. As a recent federal climate science report noted, the 400 parts per million carbon dioxide level in the Pliocene "was sustained over long periods of time, whereas today the global CO₂ concentration is increasing rapidly". In other words, Earth's movement toward Pliocene-like conditions may play out in the decades and centuries ahead of us. Even farther back, in the Miocene era between 14 million and 23 million years ago, carbon dioxide concentrations in the atmosphere are believed to have reached 500 parts per million. Antarctica lost tens of metres of ice then, probably corresponding to a sea level rise once again on the scale of that seen in the Pliocene.

Compiled by Reinhold Pape

Sources:

<https://scripps.ucsd.edu/programs/keelingcurve/>

<https://public.wmo.int/en/media/press-release/greenhouse-gas-concentrations-surge-new-record>

https://www.washingtonpost.com/news/energy-environment/wp/2018/05/03/earths-atmosphere-just-crossed-another-troubling-climate-change-threshold/?noredirect=on&utm_term=.ada6ee9c7445

New British record of 13.9 GW set in March this year.

Wind power in the UK set a new record

On 17 March this year wind power generated 14 gigawatts for the first time – nearly 37 per cent of the country's electricity. The National Grid control room confirmed that 13.9 gigawatts was the highest ever metered wind output. The previous record was 13.6 GW in January this year. Wind farms produced a record 15 per cent of Britain's electricity in 2017, up from 10 per cent in 2016. Several large offshore farms came online and onshore wind had a record year for deployment.

Source: The Independent 17 March 2018

<https://www.independent.co.uk/news/uk/home-news/wind-power-record-electricity-gigawatt-output-national-grid-a8260836.html>

Subsidy-free offshore wind farm

The Netherlands has mapped a 7 GW expansion of its offshore wind sector. Total sector capacity will rise from the currently planned 4.5 GW by 2023 to 11.5 GW. Transmission company TenneT is planning a hub, potentially on an artificial island, to connect the far offshore cluster of projects. The latter could also serve as a step towards a so-called Wind Connector grid link with the UK. Vattenfall won the rights to build the country's first subsidy-free offshore wind farm, the 750 MW Hollandse Kust Zuid 1 & 2, earlier this year. Subsequent rounds are expected to move forwards on a concession basis via auctions.

<http://renews.biz/110618/dutch-map-7gw-offshore-increase/>

1.5°C target still within reach

Scenarios show that the 1.5°C target can be reached without BECCS, through a massive expansion of renewable energy, improved energy efficiency and lifestyle changes.

In 2015 in Paris it was agreed that global temperatures should not increase by more than 1.5°C, or well below 2 degrees. Hundreds of scenarios have been developed over the last three years to show how the target could be reached.

The International Renewable Energy Agency (IRENA), an intergovernmental body, says that increasing the adoption of renewable forms of energy by at least a factor of six is the answer for the Paris target. The global economy would grow by one per cent by 2050, IRENA says, and global welfare, including gains not measured by GDP, for example health benefits from reduced air pollution and lower climate impacts, would improve by 15 per cent, compared with the current trajectory. This could create over 11 million additional energy sector jobs, completely offsetting job losses in fossil fuels.

“Renewable energy and energy efficiency together form the cornerstone of the world’s solution to energy-related CO₂ emissions, and can provide over 90% of the energy-related CO₂ emission reductions required to keep global temperature rise to two degrees Celsius,” said IRENA.

“If we are to decarbonise global energy fast enough to avoid the most severe impacts of climate change, renewables must account for at least two-thirds of total energy by 2050. Transformation will not only support climate objectives, it will support positive social and economic outcomes all over the world, lifting millions out of energy poverty, increasing energy independence and stimulating sustainable job growth. An opportunity exists to ramp up investment in low-carbon technologies, and shift the global development paradigm from one of scarcity, inequality and competition to one of shared prosperity – in our lifetimes.”

The roadmap analysis outlines an energy system in which clean renewables account for up two-thirds of total final energy consumption and 85 per cent of power

generation by 2050 – up from 18 per cent and 25 per cent respectively today. IRENA says solar and wind capacity should lead the energy transformation.

Several other studies present pathways without the use of carbon capture and storage (CCS), bioenergy with carbon capture and storage (BECCS) or negative emissions from land use. These technologies and methods have been criticised by many for being unsafe and harmful to nature and human societies.

One of the scenarios was published recently in *Nature Climate Change*. Carbon Brief summarized the study as follows: The research says that it is possible to limit warming to 1.5°C above pre-industrial temperatures without using negative emissions from BECCS. This is controversial, because BECCS is largely untested, might not become available at the levels anticipated and could require land equivalent to the area of Australia, for growing bioenergy crops.

The paper instead explores alternatives including lifestyle changes, agricultural intensification and lab-grown meat, as well as an even more rapid adoption of renewables and energy efficiency. Some of these have tended to be

excluded from the conversation, because they are hard for scientists to model. Deployment of each mitigation option is designed to be “ambitious but not unrealistic”, the paper says. These alternatives include:

- Renewable electrification. All energy end-use sectors are rapidly electrified, including heat. The technical constraints to integrating variable renewables on the grid are overcome. Some fossil-fuelled power stations retire early and, by 2030, all new cars are electric.
- High efficiency. The best available technologies are quickly adopted for all energy and material uses, including cement and steel. From 2025 onwards, only highly efficient new cars and aeroplanes are sold and only the most efficient home appliances allowed.
- Lifestyle change. The majority of the world population adopts sustainable lifestyles, including, by 2050, 100% adoption of healthy diets with lower levels of meat consumption. There is less private car use and more walking or cycling, while air travel is reduced.



Advice given on on the
March for Science, Ham-
burg, Germany, April 2017.

FLICKR.COM / FRERK MEYER CC BY-SA

We don't just need electric cars, we need fewer cars says Greenpeace

Each of the mitigation alternatives cuts emissions, with the electrification and efficiency scenarios mostly affecting CO₂ and the others having a greater impact on other greenhouse gases. This, in turn, cuts the need for BECCS and for agricultural land. Combining all of the mitigation options together effectively eliminates the need for BECCS to stay within a 1.5°C limit. This frees up significant areas of agricultural land in the model, some of which is reforested, resulting in “natural” CO₂ removal.”

In May 2018, at the start of the Talanoa Dialogue in the UN, representatives of the Climate Vulnerable Forum (CVF) urged countries to step up and revise their national climate plans without further delay. “Growing climate risks, economic and technological developments in low-carbon technology, as well as increased action by sub-national actors, make the national climate plans submitted by governments in 2015 outdated and requiring review. 1.5°C is completely feasible, but it requires bold political will. All countries must internalise the urgency and start the process of revising their current national targets no later than January 2019 to secure survival and prosperity for all of us. The current commitments made by countries in 2015 lead to dangerous warming that can reach 3 or 4 degrees Celsius. The gap is wide with the 1.5°C target set in Paris. We must act fast otherwise we will lose out in every sector and every country. Therefore, it is imperative that the Talanoa Dialogue should deliver a political outcome in COP24 that triggers a process for revision of national targets before 2020.”

Compiled by Reinhold Pape

Sources: Carbon Brief and IRENA

<https://thecvf.org/vulnerable-countries-urge-all-to-step-up-climate-targets-for-1-5c/>

Ever since the first production car rolled off the assembly line more than 100 years ago, our love affair with automobiles has grown and grown. In countries like the UK, France, Italy and Germany there are now around 5 vehicles for every 10 people. In the USA, Australia and New Zealand, the number is higher still. With the cost of electric vehicles set to plummet over the next decade, many car firms now admit that the future is an



One car less.

electric one. But will this be enough? Shouldn't we also be asking ourselves if we need so many cars in the first place?

Our vision: Though the rise of electric cars should be celebrated, a truly sustainable transport system isn't just about ditching fossil fuel vehicles. It's about building more cycle lanes, and supporting schemes to get people on bikes in the first place. It's about constructing roads which encourage a more diverse range of travel – cycling, electric scooters and cargo bikes – instead of so heavily favouring cars. It's about mass transport that runs on clean energy and is affordable and easy for everyone to use. And it's about all of us – citizens, politicians, and businesses – playing a part in making it happen.

<https://www.greenpeace.org/international/story/13968/we-dont-just-need-electric-cars-we-need-fewer-cars/>

Electrified roads for charging vehicles

The world's first electrified road that recharges the batteries of cars and trucks while they drive along it has been opened in Sweden. About 2 kilometres (1.2 miles) of electric rail has been embedded in a public road near Stockholm, but the government's roads agency has already drafted a national map for future expansion. Sweden's target of achieving independence from fossil fuel by 2030 requires a 70 per cent reduction in the transport sector. The technology behind the electrification of the road linking Stockholm Arlanda airport to a logistics site outside the capital city aims to solve the thorny problems of keeping electric vehicles charged, and making the manufacture of their batteries affordable. Energy is transferred from two tracks of rail in the road via a movable



Truck on the test track outside Stockholm.

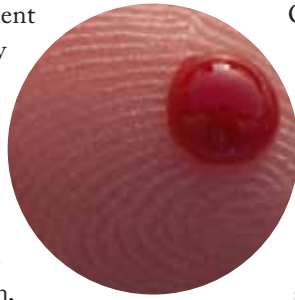
arm attached to the bottom of a vehicle. The design is not dissimilar to that of a Scalextric track, although should the vehicle overtake, the arm is automatically disconnected.

<https://www.theguardian.com/environment/2018/apr/12/worlds-first-electrified-road-for-charging-vehicles-opens-in-sweden>

Serious health impacts from NO₂

A study by the German Environment Agency (UBA) estimates that roughly 6,000 premature deaths in 2014 were due to cardiovascular diseases linked to background concentrations of NO₂ in both rural and urban areas.

The study also shows that NO₂ pollution is associated with diseases such as diabetes mellitus, hypertension, stroke, chronic obstructive pulmonary disease (COPD) and asthma. For example, eight per cent of the existing cases of diabetes mellitus in Germany in 2014 – about 437,000 cases – were linked to NO₂ exposure in outdoor air. For asthma, the percentage of cases which can be traced to NO₂ pollution is even higher – around 14 per cent, or about 439,000 cases.



FLICKR.COM / ALDEN CHADWICK CC BY
Eight per cent of diabetes mellitus can be attributed to NO₂ pollution.

is undoubtedly diesel cars – also on roads with lighter traffic,” said UBA President Maria Krautzberger.

Source: Umweltbundesamt press release, 9 March 2018. Link: <https://www.umweltbundesamt.de/en/press/pressinformation/nitrogen-dioxide-has-serious-impact-on-health>

Overall nitrogen dioxide pollution in Germany has been decreasing for a number of years, but data for 2017 corroborates that many locations still exceed threshold levels. “One significant cause of harmful nitrous oxides in respiratory air

World’s biggest insurer moves away from coal

Allianz, the world’s biggest insurance company by assets, announced on 3 May 2018 that it will no longer provide stand-alone insurance coverage for coal power plants or coal mines. The German insurer also announced that it will ban all companies planning to build more than 500 MW of new coal capacity from its investment portfolio. This bold step reinforces the shift of the insurance industry away from coal and increases the pressure on industry laggards to adopt coal exit policies as well.

<https://unfriendcoal.com/2018/05/03/allianz-moves-away-from-coal/>

New low-emission zones in Sweden

On 4 April, the Swedish government announced that from 1 January 2020 municipalities will be able to introduce three different kinds of low-emission zones. It will be up to cities themselves to decide whether and where low-emission zones should be applied.

“Children’s right to breathe clean air takes priority over the right to drive all kinds of cars on every single street. We are now giving the municipalities the powerful tool they have long been requesting so that they can tackle hazardous air pollution,” said Minister for the Environment Karolina Skog.

The first type of low-emission zone (LEZ) regulates heavy-duty vehicles (lorries and buses), and this type of LEZ already exists in eight cities.

The second type of LEZ sets standards for cars. Initially, diesel cars that meet the Euro 5 and 6 emission standards may drive here. But on 1 July 2022, the standards will be made stricter, allowing only Euro 6 diesel cars. The same applies to hybrid electric vehicles and plug-in hybrids with diesel engines. Petrol-driven cars will have access if they meet Euro 5, or better. This also applies to hybrid electric vehicles, plug-in hybrids, natural

gas vehicles and E85 vehicles. Cars with better environmental performance, such as electric cars and fuel-cell vehicles, may also drive here.

The third type of LEZ sets the highest standard. This zone only allows purely electric cars, fuel-cell cars and gas-driven cars that meet Euro 6. Similarly strict standards also apply for heavy vehicles.

Information: <http://www.government.se/press-releases/2018/04/government-makes-announcement-on-low-emission-zones>



“Children’s right to breathe clean air takes priority over the right to drive all kinds of cars on every single street”, said Swedish Minister for the Environment Karolina Skog.

Myths about carbon storage – the Sleipner case

The risk of leaks that are difficult to detect and the thorough investigations required to find suitable sites are factors that limit the potential to scale up ongoing CO₂ storage projects.

The Sleipner gas field in the North Sea has been used over the years as an example of safe storage of carbon dioxide, but there is a crack ten metres wide and three kilometres long not far from the present extent of stored carbon dioxide. This was shown by an investigation conducted on behalf of the EU several years after the start of the carbon storage project. The crack was located just 25 kilometres from the northern edge of the carbon storage site. A later study confirmed this and stated that the crack and other fissures need to be investigated prior to large-scale carbon dioxide deposition in the Utsira formation.¹ If it had been located above the storage area, a major leak could have developed. This shows that the storage site was not subject to a thorough investigation before pumping started.²

Carbon dioxide that is separated from the natural gas from the Sleipner field has been pumped down into the Utsira rock formations under the sea bed for about 22 years, since 1996. The deposition rate has been around one million tons per year. Carbon storage at the Sleipner field is quite cheap, because the carbon dioxide has to be separated anyway before it is sent to consumers. The only costs are for compressing and pumping the gas and monitoring the storage site. The price of carbon dioxide is currently too low to make the commercial storage of carbon dioxide economically viable. The carbon dioxide price must be at least 50 USD/ton, while at present the price is just 6 USD/ton CO₂, according to Statoil.

To put these figures in perspective, annual global emissions of carbon dioxide are around 33 gigatons. This is 33,000 times more than the deposition rate in the Sleipner storage facility. You would therefore need 33,000 storage sites the size of the Sleipner facility to handle global carbon dioxide emissions.

Finding a safe storage site with the

necessary integrity is a costly and lengthy undertaking. Investigating just one site might cost several million euros, and could take anywhere from three to ten years at the most. Even after such efforts there are no guarantees of a positive result. Finding a large number of storage sites the same size as Sleipner or larger is therefore a very demanding task. A long-term storage site must have practically zero leakage.

Even very low leakage rates, as low as 0.1 percent (per year), could undermine the potential climatic benefits of geological storage on a time scale of a few centuries. The success of Sleipner's carbon storage therefore depends on a low leakage rate. The problem is that it is impossible to detect carbon dioxide leakages in such small volumes. The fact that no leaks of carbon dioxide have been detected so far has been equated to no leaks. To say that no leaks have been detected is not untrue, but this does not mean that there have not been any leaks. We simply don't know!

Then you have the problem of the safety of the storage site against major leaks. The North Sea bed is subject to earth tremors on a regular basis. Oil and gas exploitation may exacerbate this natural tendency. The layer of rock that keeps the oil and gas in place is called the cap layer. The cap rock also keeps the carbon dioxide from leaking from the storage site to the atmosphere. As stated initially, a big crack located 25 kilometres north of the storage site could



Small leaks are difficult to detect, but matter over centuries.

have been located right above the site, and it could have led to a major leak. Smaller leaks of hydrocarbons have already been located in the area above the storage site.³

One may therefore conclude that the Sleipner carbon storage facility cannot be used as an example of a successful storage site. The lack of technology to detect the very small leakage rates that will undermine the potential climate benefits of carbon storage is just one factor. The geological hazard of undetected cracks in the cap rock layer is another problem. The general problem of scaling up the location and evaluation of storage sites in their thousands make the use of underground storage of carbon dioxide highly doubtful. This in turn will make the widespread use of CCS technology for removing carbon dioxide either from the combustion of carbon fuels or from industrial processes highly unrealistic.

Tore Braend

¹<http://adsabs.harvard.edu/abs/2013AGUFMOS13A1683L>

²Peter M. Haugan, professor of Geophysics, University of Bergen, Norway.

³Greenpeace briefing 2008.

Norwegian CCS hype moves from power to industrial processes

The government is unlikely to foot the bill. There are faster, cheaper ways to cut such emissions.

It could create 30–40,000 jobs in CCS in Norway by 2030, and 80–90,000 jobs by 2050, according to Norwegian research institute Sintef in a report¹ in April 2018. Including indirect jobs it amounts to 160–200,000 jobs.

Norway is the world leader in CCS, and Prime Minister Jens Stoltenberg famously claimed CCS as “our moon landing” in a 2007 speech.

The moon is not yet quite within reach, though. The actual CCS projects are still only Sleipner, which started in 1996, and Snöhvit in 2008, both from the processing of natural gas. The carbon dioxide has to be separated from the gas anyway, so the separation of 1.7 Mton of carbon dioxide per year this way does not prove much about viability for CCS in other fields.

The big application for CCS was thought to be fossil power. Norway, which gets all its electricity from hydro, and which has very good wind resources, nevertheless built one “CCS-ready” gas power station, Kårstø in 2007. But it was only used intermittently, got no CCS, and began to be decommissioned in 2017. Another gas power “CCS-ready” plant at Mongstad is now also being scrapped, which will save 300,000 tons of carbon dioxide per year².

But belief in CCS runs deep in Norwegian society, and hope is pinned on a project called “Full-Chain CCS”, which instead aims to capture carbon dioxide from three industries.

1) A waste incineration plant for district heating and power in Oslo. It burns imported mixed waste with fuel of both biogenic and fossil origin (plastics). It is supposed to store 400,000 tons of carbon dioxide per year, and thus become a negative emitter.

The operator of the Oslo plant, Fortum, also runs a new CHP plant in Stockholm, which is fuelled by biomass alone, and by definition does not emit any carbon dioxide at all. The Stockholm plant will cut emissions soon, as it will reduce operation of a coal-powered plant and help to eliminate it by 2022.

Incineration of large amounts of mixed waste is a systemic failure. Plastic packaging should be reduced, reused and recycled to a much larger extent, but the simple solution of just burning it is an obstacle to a responsible solution. Importing waste from the UK means that the UK does not have to face the problem.

2) Yara, a fertiliser producer outside Oslo, wants to produce hydrogen from fossil gas and then store the carbon dioxide.

Hydrogen can also be produced from the electrolysis of water. Yara’s predecessor, Norsk Hydro, did this for some 80 years. This is actually well-known all over the world. The factory also produced heavy water as a by-product, and was subject to the most famous act of sabotage during the Second World War.

The Swedish steel and mining industry has a strategic plan (see AN 4 2016) to replace coal and coke with electrolytic hydrogen, so it does not see the future cost of electricity as an impediment.

3) Norcem, part of Heidelberg Cement, also outside Oslo, wants to store 400,000 tons of carbon dioxide, about half of its emissions.

The cement industry wants to use CCS, though there are several other options for them to cut CO₂ emissions.

To find alternatives to Portland cement, one has to look no further than to another page at Sintef, on the development of kaolinite clays, an essentially CO₂-free cement³. It is a geopolymer, which emits no carbon dioxide from the process, and is baked at 600–800°C instead of the 1450°C for ordinary cement.

Another way to cut the amount of concrete, and thus cement, is to build lighter bridges with plastic reinforcement instead of iron rebars, as Sintef is also exploring⁴.

There are other ways. The Gothenburg-based multinational company Thomas Concrete Group used 34 per cent of alternative binders (mainly fly-ash and slag) in 2017. It aims to use 50 per cent by 2020, meaning a 50-per-cent cut in carbon dioxide emissions.

The Norcem project is also of interest for sister Heidelberg company, Cementa, in Sweden. They have published plans for CCS at their factory on the Baltic island of Gotland, despite admitting that the geology is not good. So the plan is to ship the carbon dioxide to Norway⁵.

Heidelberg has not elaborated on who is supposed to pay for the investment and operation.

In Norway, the cost per ton of carbon dioxide for “full-chain CCS” is calculated at \$174, 13 times the May 2018 price in ETS trading. This would generate a deficit of about \$2.5 bn, which would have to be paid by the government. Which it looks very unlikely to do.

Fredrik Lundberg

¹ www.sintef.no/siste-nytt/industrielle-muligheter-og-arbeidsplasser-ved-storskala-co2-handtering-i-norge/

² <https://www.statoil.com/en/news/phasing-out-combined-heat-power-plant-mongstad.html>

³ www.sintef.no/siste-nytt/lager-miljoennlig-sement-av-norsk-leire

⁴ www.sintef.no/siste-nytt/armert-plast-kan-gi-billigere-broer/

⁵ www.svd.se/koldioxid-kan-bli-norges-nya-olja



IMO agrees global high-sulphur fuel ban

A ban on carrying high-sulphur fuel on board vessels was approved by the IMO's Marine Environment Protection Committee in April. This means that ships will be barred from carrying fuel with a sulphur content exceeding 0.5 per cent unless they have an exhaust gas cleaning system (scrubber) installed, and is seen as an important step in the right direction toward efficient enforcement of both the global fuel sulphur cap that takes effect in 2020 and the EU's sulphur directive. The proposal must now be formally adopted at the next MEPC meeting in October.

Source: ShippingWatch, 16 April 2018



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Stena Line considers using battery power in its fleet

Stena Line has signed a contract with Callenberg Technology Group for batteries with a capacity of 1 MWh to be installed on Stena Jutlandica, which operates between Gothenburg and Frederikshavn. The vessel will start using battery power in port before summer.

The battery project is planned to be completed in stages. In the first stage, battery power will be used for bow thrusters and manoeuvring when berth-

ing in port. In stage two, battery power will also be used to drive the propellers, giving the Stena Jutlandica a range of around 10 nautical miles on electricity. In stage three, battery capacity will be expanded and the vessel will be able to cover about 50 nautical miles – the distance between Gothenburg and Frederikshavn – on electricity.

Source: safety4sea, 2 March 2018

Decarbonisation of maritime shipping possible by 2035

A new report published by the OECD says that maximum deployment of currently known technologies could make it possible to achieve almost complete decarbonisation of maritime shipping by 2035. The report includes the following assessment:

“The four potential decarbonisation pathways for shipping identified in the report would result in a CO₂ emission reduction between 82 and 95 per cent of the currently projected 2035 level. This reduction equals the annual emissions of approximately 185 coal-fired power plants. Remaining CO₂ emissions would be between 44 and 156 million tonnes in 2035.

This compares to a business-as-usual scenario in which carbon emissions

from international shipping are projected to increase 23 per cent to 1,090 million tonnes by 2035 compared to the 2015 level. An adjusted baseline projects carbon emissions from maritime shipping of 850 million tonnes by 2035 – equivalent to the annual emissions of 210 coal-fired power plants. The adjusted baseline scenario assumes a substantial reduction in the transport of fossil fuels and a higher share of intra-regional trade.

Alternative fuels and renewable energy can deliver much of required reductions.

Advanced biofuels are already available in limited quantities. Gradually, they should be complemented by other natural or synthetic fuels such as methanol, ammonia and hydrogen. Wind assistance could reap additional reductions.

The first electric ships provide transport for short-distance routes. Technological measures to improve energy efficiency of ships could yield a substantial part of the needed emission reductions. Market-mature options include, among others, hull design improvements, air lubrication and bulbous bows. Finally, operational measures such as ship speed reductions, smoother ship-port interfaces and increased ship size could achieve further important emission reductions.”

Source: <https://www.itf-oecd.org/sites/default/files/docs/decarbonising-maritime-transport.pdf>



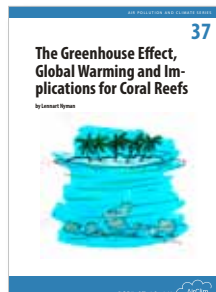
FLICKR.COM / YODA NAVARRETE CC BY

CO₂ emission from shipping could be cut by more than 80 per cent by 2035, according to new OECD report.

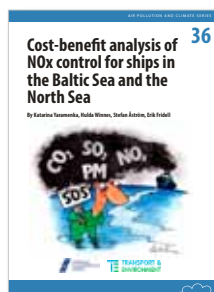
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The Greenhouse Effect, Global warming and Implications for Coral Reefs (March 2018). By Lennart Nyman. Tropical coral reefs harbor some 25 per cent of all marine species.



Cost-benefit analysis of NOx control for ships in the Baltic Sea and the North Sea (April 2017). By Katarina Yaramenka, Niklas Winne, Stefan Åström, Erik Fridell.



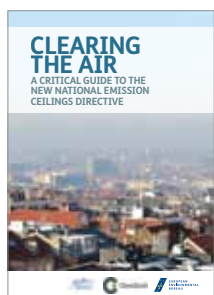
A vision for zero emissions in the Nordic-Baltic region by about 2030 (March 2018). By Fredrik Lundberg. A scenario for the electricity, heat and industrial sectors.



Paths to a sustainable agricultural system (Dec 2017). By Johan Karlsson et al. Exploring ways for sustainably feeding the Nordics.



What will it take to phase out greenhouse gas emissions from road traffic in the Nordic-Baltic region by 2030-2035? (March 2018). By Mats-Ola Larsson. A conceivable scenario.



Clearing the air (Feb 2017). A critical guide to the new National Emissions Ceilings directive.



Ecological effects of ocean acidification (March 2018). By Lennart Nyman. By absorbing CO₂ the ocean is becoming more acidic, and this happens at a rate faster than any period in the past 300 million years.



Effects of climate change on some anadromous salmonids in the northern hemisphere (March 2018). By Lennart Nyman. Some direct impacts on salmonids can be predicted.

Coming events

Air Pollution 2018: 26th International conference on modelling, monitoring and management of air pollution. Naples, Italy, 19 - 21 June 2018. Information: <http://www.wessex.ac.uk/conferences/2018/air-pollution-2018>

EU Environment Council. Luxembourg, 25 June 2018. Information: www.consilium.europa.eu/en/press/calendar/

CLRATP EMEP Steering Body and the Working Group on Effects. Geneva, Switzerland, 10 - 14 September 2018. Information: www.unece.org/env/lrtap/welcome.html

Global Climate Action Summit. San Francisco, USA, 12 - 14 September 2018. Information: <https://globalclimateactionsummit.org>

IMO Intersessional Working Group on Reduction of GHG emissions from ships. London, UK, 15 - 19 October 2018. Information: www.imo.org

IMO MEPC 73 (Marine Environment Protection Committee). London, UK, 22 - 26 October 2018. Information: www.imo.org

WHO First global conference on air pollution and health. Geneva, Switzerland, 30 October - 1 November 2018. Information: <http://www.who.int/airpollution/events/conference/en/>

10th Better Air Quality Conference. Kuching, Malaysia, 14 - 16 November 2018. Information: <http://baqconference.org>

UNFCCC Second sessional period in 2018; COP 24. Katowice, Poland, 3 - 14 December 2018. Information: <http://unfccc.int/>

CLRATP Executive Body. Geneva, Switzerland, 10 - 13 December 2018. Information: www.unece.org/env/lrtap/welcome.html

Information about GDPR

On May 25, 2018, the European general data protection regulation (GDPR) took effect. In conjunction with this, AirClim wants to ensure that you, as a subscriber to our publication Acid News, feel safe with how we handle your personal data. We take your privacy very seriously and

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