

Acid News

NO.1, MARCH 2020

Cement could be greener, but will it?

Cement production is responsible for some 6–7 per cent of global CO₂ emissions, and is still growing

□ Page 6

Transition to 100 per cent renewable energy is cost efficient

Stanford researchers find that a completely renewable energy system will pay for itself in 7 years, while also solving major health and climate threats.

□ Page 8

Ten billion people can be fed

It may be viable to feed ten billion people without crossing the planetary boundaries for nitrogen flows, biodiversity loss, land system change, and freshwater use.

□ Page 17

The Andes Meltdown

The frozen areas covering the peaks and valleys of the Andes are melting at alarming rates, providing some of the most visible evidence that climate change is already here.

□ Page 20

Dutch health gains from reduced air pollution

Air pollution control policies implemented in Europe since 1980 have resulted in better air quality that has increased Dutch average life expectancy by six years.

□ Page 22

Air quality rules fit for purpose

The EU air quality limit values are enforceable and have been instrumental in driving a downward trend in air pollution exceedances and exposure.

□ Page 26



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Air pollution from fossil fuels costs USD 8 billion a day

Emissions from the burning of coal, oil and gas cause 4.5 million premature deaths a year globally, resulting in costs of health care and lives lost equivalent to 3.3 per cent of global GDP.

A new study by Greenpeace Southeast Asia and the Centre for Research on Energy and Clean Air shows that air pollution emitted from burning fossil fuels, primarily coal, oil and gas, causes approximately 4.5 million premature deaths worldwide every year.

The study focusses on particulate matter (PM_{2.5}), nitrogen dioxide (NO₂) and ozone (O₃), as elevated levels of these pollutants increase the incidence of chronic and acute illnesses and contribute to millions of hospital visits and billions of work days lost due to illness each year, resulting in

high costs to our economies, as well as to environmental damage.

Exposure to PM_{2.5} and ozone from fossil fuel emissions is responsible for about 7.7 million asthma-related trips to the emergency room each year, while exposure to fine PM_{2.5} alone from burning fossil fuels is estimated to cause 1.8 billion days of sick leave annually.

It is pointed out that air pollution is a major health threat to children, particularly in low-income countries. Globally, air pollution from fossil fuel-related PM_{2.5} is attributed to

Page 3 ►

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

The Air Pollution and Climate Secretariat

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

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

In furtherance of these aims, the Secretariat:

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

Editorial

A recent Eurobarometer survey asked over 27,000 people from across the EU several questions about air quality. When asked at what level they thought the issue of air pollution should be addressed, nearly three-quarters (72%) of EU citizens said at “international level”.

To deal with air pollution at the wider international level, countries from Europe and North America jointly set up the Air Convention, which last year celebrated its 40th anniversary.

The Convention's Gothenburg Protocol sets binding national caps for five air pollutants (SO₂, NO_x, NH₃, VOCs and PM), to be achieved by 2020. Using an effects-based scientific foundation, it is cleverly constructed to achieve commonly agreed interim environmental targets at least cost for Europe as a whole.

However, the emission reductions for 2020 were clearly inadequate to achieve the long-term objectives, and a process of review and revision in which emission caps were to be progressively lowered was therefore foreseen.

In December 2019 the convention's Executive Body decided to start the review process, and following this decision environmental groups – under the lead of the European Environmental Bureau (EEB) – presented their initial recommendations for the review of the Protocol, namely that a revised Gothenburg Protocol shall:

- Continue to be based on the multi-pollutant and multi-effect approach;
- Introduce a long-term vision of zero-pollution;
- Set a clear objective that emissions of air pollution – by 2030 at the latest – come down to levels that do not exceed the World Health Organization's guidelines for health protection and also do not exceed the critical loads and levels for environmental protection;
- Elaborate new national Emission Reduction Commitments (ERCs) for 2030 and future years with the help of

“Zero-pollution vision for air quality”

integrated assessment modelling that uses emission scenarios based on up-to-date projections of energy use and

activity levels that are compliant with the Paris Agreement, i.e. where emissions of greenhouse gases are reduced to levels that are needed to secure that global warming

stays below 1.5°C;

- Establish binding national ERCs for 2030, as well as indicative national ERCs for 2035 and 2040, that are needed to move towards the zero-pollution vision;
- Expand the number of air pollutants covered by binding ERCs from the current five to eight, by adding methane, black carbon and mercury;
- Include mandatory technical annexes that set binding minimum requirements (e.g. emission limit values and emission abatement measures) for the main source-sectors;
- Focus on achieving further significant reductions in agricultural emissions of ammonia and methane;
- Include a mechanism for review and revision, so that the indicative national ERCs for 2035 and 2040 are reviewed/ revised and made binding by 2030 and 2035 respectively at the latest;
- Remove the current adjustment procedure and the three-year averaging option.

Clearly there are close and important links between air pollution policies and climate policies. Reducing fossil fuel combustion through improvements in energy efficiency and increased use of less- or non-polluting renewable energy sources will result in significantly lower emissions of SO₂, NO_x and PM, as well as cutting emissions of the main greenhouse gas, CO₂.

Not only will the implementation of tough climate policies help to achieve air quality targets. The significant co-benefits from air pollution reductions also help to motivate a much higher level of ambition for climate policy, as well as a higher share of domestic GHG reductions.

Christer Ågren

From page 1 ►

the death of about 40,000 children before their fifth birthday and to approximately 2 million preterm births each year.

The analysis incorporates recent research that quantifies the contribution of fossil fuel-related emissions to global air pollution levels, and it uses global datasets on levels of PM_{2.5}, NO₂, and O₃ to perform health impact assessments and subsequent cost calculations for the year 2018.

Exposure to PM_{2.5} from fossil fuels was found to be responsible for the premature deaths of around 3 million people due to cardiovascular disease, respiratory disease and lung cancer. Moreover, approximately 1 million people die prematurely due to ozone pollution and 500,000 people due to NO₂.

The total economic costs of the health damage are estimated to amount to USD 2,900 billion in 2018, equivalent to USD

8 billion per day. The report has an appendix providing both cost and mortality data country-by-country. When looking at individual countries, China, the US and India bear the highest cost from fossil fuel pollution, at USD 900 bn, 600 bn and 150 bn respectively.

Across the EU, around 400,000 annual premature deaths are attributed to fossil-fuel-related air pollution. Of these, 295,000 are linked to PM_{2.5} exposure, 69,000 to NO₂ and 34,000 to ozone exposure. The overall economic costs for the EU are estimated at more than USD 500 billion. Country-by-country data for EU member states are shown in the table.

The authors of the study argue that the solution is to rapidly phase out the use of fossil fuels, which would simultaneously tackle both the air pollution crisis and the

climate emergency, and the report lists some good examples of action taken in the transport and energy sectors.

“This is a problem that we know how to solve,” said Minwoo Son, clean air campaigner at Greenpeace East Asia. “By transitioning to renewable energy sources, phasing out diesel and petrol cars, and building public transport. We need to take into account the real cost of fossil fuels, not just for our rapidly heating planet, but also for our health.”

Christer Ågren

The report “Toxic Air: The Price of Fossil Fuels” is available at:

<https://www.greenpeace.org/southeastasia/publication/3603/toxic-air-the-price-of-fossil-fuels-full-report/>

Table: Health impacts in the EU attributed to fossil-fuel-related air pollution in 2018.

| Country/Region | Estimated premature deaths (central value) | Estimated health costs in million USD (central value) |
|----------------|---|--|
| Austria | 7,900 | 15,000 |
| Belgium | 6,800 | 12,000 |
| Bulgaria | 9,000 | 3,900 |
| Croatia | 4,400 | 2,800 |
| Cyprus | 440 | 570 |
| Czech Republic | 11,000 | 11,000 |
| Denmark | 2,800 | 6,700 |
| Estonia | 630 | 650 |
| Finland | 2,100 | 4,300 |
| France | 37,000 | 54,000 |
| Germany | 81,000 | 140,000 |
| Greece | 8,400 | 6,100 |
| Hungary | 13,000 | 9,400 |
| Ireland | 1,200 | 3,800 |
| Italy | 56,000 | 61,000 |
| Latvia | 1,500 | 1,200 |
| Lithuania | 2,600 | 2,300 |
| Luxembourg | 350 | 1,500 |
| Malta | 170 | 200 |
| Netherlands | 9,900 | 21,000 |
| Poland | 39,000 | 29,000 |
| Portugal | 4,800 | 4,100 |
| Romania | 22,000 | 13,000 |
| Slovakia | 5,400 | 5,100 |
| Slovenia | 1,700 | 1,800 |
| Spain | 25,000 | 24,000 |
| Sweden | 4,000 | 7,800 |
| UK | 41,000 | 66,000 |
| EU | 398,000 | 508,000 |



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Smooth transition to global ship sulphur regulation

After having been adopted by the International Maritime Organization (IMO) in 2008, tighter limits on the sulphur content of shipping fuel finally came into force on 1 January 2020. From this date the maximum permitted sulphur content was lowered from 3.5 to 0.50 per cent, resulting in an estimated three-quarter drop in the emissions of harmful sulphur dioxide (SO₂), linked to acid rain and a range of pulmonary and cardiovascular diseases.

The transition to the new sulphur regulation has so far happened without major problems, the IMO reported in late January. The next step is a carriage ban on non-compliant fuel oil (except for ships with exhaust gas cleaning systems installed) that enters into force on 1 March 2020, helping to support implementation of the global sulphur limit.

Source: IMO press release, 21 January 2020.



Sales of petrol cars rise in the EU

16 EU countries reported a higher petrol share in new registrations of passenger cars in 2017.

Eurostat reported last year on the trends in passenger car stocks and new registrations in the European Union (EU). In 2017, Luxembourg had the highest number of cars per inhabitant in the EU, with 670 cars per 1000 inhabitants. Despite an increase over previous years, cars powered by alternative fuels, including hybrid cars, only made up a small share of the fleet of passenger cars in the EU in 2017. This is reflected by the share of cars powered by alternative fuels being low among newly registered cars.

Overall, the passenger car fleet in almost all EU member states has grown over the last five years. The highest number of cars per inhabitant was recorded in Luxembourg, followed by Italy (2016 data), Finland and Malta. In 2017, Poland had by far the highest share of passenger cars older than 20 years, followed by Estonia and Finland.

Preferences for petrol or diesel passenger cars vary across the EU member states. Among the member states for which recent data are available, cars with petrol engines make up the majority of registered cars in most countries; diesel cars dominate in only ten member states. When looking at petrol and diesel engines together, medium-sized engines

dominated the car fleet in most EU member states; however, in Hungary and Malta the smallest engines dominated.

Preferences for whether a new passenger car should be powered by a petrol or diesel engine vary across the member states. For the 21 member states for which detailed data are available, 16 registered a higher petrol share; this is a change from the past, when a majority of member states recorded a higher diesel share.

In 2017, the highest shares of petrol cars among the new registrations were noted in the Netherlands (80.0%), Estonia (74.8%), Finland (68.7%), Denmark (64.4%), Malta (62.8%), Germany (57.7%), the United Kingdom (57.6%), Cyprus (56.9%), Latvia (55.6%), Hungary (54.3%), Poland (53.8%), Slovenia (52.7%), Belgium (52.1%) and France (51.6%). In contrast, the highest shares of diesel cars among new passenger cars were recorded in Croatia (76.1%), Lithuania (68.5%), Romania (67.3%), Ireland (65.6%), Portugal (62.1%) and Spain (50.7%).

EEA reported as well that for the first year since 2009, in 2017 more petrol cars (53% of the new fleet) were sold than diesel ones (45%). The share of diesel cars decreased by 5 percentage points compared to 2016 and the share of petrol

cars increased accordingly. As diesel cars are generally more fuel-efficient than petrol cars, the observed shift negatively affects the average emissions. In addition, the engine power of passenger cars has been increasing since 2011 (by 18% for petrol cars and 12.5% for diesel cars). More powerful vehicles tend to have higher CO₂ emissions.

Furthermore, [autvistagroup.com](https://www.autvistagroup.com) reported last year that petrol expanded its market share from 56.7% to 59.5% in the second quarter of 2019 across the entire continent. By contrast, the number of diesel cars registered across the EU decreased by 16.4% to 1.3 million units, with diesel's market share falling from 36.3% in the second quarter of 2018 to 31.3% in 2019.

In May 2020, Eurostat plans to update statistical trends in passenger car stocks over the last two years.

Compiled by Reinhold Pape

Sources: https://ec.europa.eu/eurostat/statisticsexplained/index.php/Passenger_cars_in_the_EU#Overview

https://ec.europa.eu/clima/news/slight-increase-average-co2-emissions-new-cars-sold-europe-2017-while-co2-emissions-new-vans_en

Scrubbers not allowed in California

The California Air Resources Board (CARB) has announced that the Californian regulation for ocean-going ships, which was adopted in 2008 and still is in effect, requires the use of low-sulphur (max 0.1%) distillate fuels by vessel main engines, auxiliary engines and auxiliary boilers within 24 nautical miles of the California coastline, and thus does not allow compliance through the use of scrubbers.

Source: Safety4sea.com, 27 January 2020.

More bans on open-loop scrubbers

Ships fitted with open-loop scrubbers will be banned from discharging effluent from the emissions-cleaning systems while travelling through the Suez Canal, according to an announcement by the Suez Canal Authority in January.

Also in January, Pakistan's Ministry of Maritime Affairs announced that the discharge of wash-water from open-loop scrubbers was prohibited in the Pakistani Port of Karachi.

Sources: Ship & Bunker, 15 January; Reuters 22 January 2020.

Iceland creates 0.1% SECA

Iceland has enacted a strict sulphur emissions control area (SECA) whereby ships calling at the island from next year will only be allowed to burn 0.1 per cent sulphur content fuel in Icelandic territorial waters.

While the Iceland Nature and Conservation Association and the Clean Arctic Alliance welcomed the new sulphur restrictions, they were critical that the decision has a "loophole" given that some vessels using scrubbers will continue burning high-sulphur heavy fuel oils. Therefore, they urge the Government of Iceland to ban all vessels that burn or carry heavy fuel oil from entering Icelandic waters.

Source: Splash247, 10 December 2019.

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Ecolabelled biofuels in Sweden

Ecolabelled biofuels make it easier for consumers to choose fuels that have less impact on the environment, says the Swedish Society for Nature Conservation (SSNC). Bra Miljöval is the ecolabel of SSNC. It is referred to as "Good Environmental Choice" in English. SSNC started ecolabelling in 1988, initially for laundry detergents and paper. Today, the ecolabel covers 11 categories of products.

SSNC began ecolabelling electricity supply contracts at the start of 1996. Both the availability of and demand for

ecolabelled services are expanding rapidly in scope and coverage. The same criteria are being used in Norway and Denmark in cooperation with SSNC. In 2007, SSNC launched criteria for district heating and got their first licensee in March 2008. The labelling of electricity and district heating is part of the overall energy project of SSNC. The ecolabel is one of SSNC's tools for pushing development towards a more sustainable energy system.

The SSNC criteria include reduced climate emissions, more sustainable forestry, less harmful chemicals and less heavy metals left in residual ash. Biofuel is a

relatively new product category within Good Environmental Choice. Purchasing ecolabelled biofuel raises the demand for sustainably produced biofuels and challenges manufacturers to adapt their production. The criteria for ecolabelled biofuels can be found at the following links:

https://www.naturskyddsforeningen.se/sites/default/files/dokument-media/criteria_biofuel_2016.pdf

<https://www.naturskyddsforeningen.se/biofuels>

<https://www.naturskyddsforeningen.se/node/12484>

Cement could be greener, but will it?

Cement production is responsible for some 6–7 per cent of global CO₂ emissions, and is still growing. There are many technical options to cut emissions, but few incentives. The EU cement industry pays zero for its emissions, and does little to improve its act.

Between 1,500 and 1,600 million tons of CO₂ was emitted from the cement process in 2018, equal to Russia's total CO₂ emissions. Another 1,000 million tons may be emitted from fuels.

Concrete is a widely used construction material that consists of sand and pebbles glued together with cement.

That cement is made from limestone. The lime is heated to around 1450°C, driving the CO₂ out of the stone and transforming carbonate into oxide. This cement is called Portland Cement, after the Portland quarry in Dorset on the Jurassic Coast in England from which it was first produced in 1824. Since then, the remains of ichthyosaurs have been used to build houses and roads. It is usually heated with coal, another fossil, derived mainly from plants that grew in the Devonian era.

Fossil, fossil.

Concrete is a versatile material, inexpensive and predictable. It does not catch fire or mould. If reinforced, it is very strong, and provides some insulation.

But there are alternatives.

The fuel used for heating can be switched from coal to gas, waste, biomass or to electric heating.

Whichever fuel is chosen, the roasting of lime still produces CO₂.

But concrete is not the only construction material. President Macron has ordered that new public buildings financed by the French state must contain 50 per cent wood or other organic material (such as hemp or straw) by 2022.

Wood can be used for load-bearing joists and for exterior walls, even on tall buildings. An 18-storey timber building was completed in 2019, north of Oslo.

When biomass is used for vehicle fuel or heating fuel, the carbon goes back into the air. When wood is used for construction, the carbon is stored for as long as the building stands.

The construction industry could in principle require other building materials or at least lower-carbon cement. But they usually don't, as the CO₂ from cement is not included in the environmental reports of the construction companies. Skanska, the fifth biggest construction company in the world, does not even mention cement under <https://group.skanska.com/sustainability/green/priority-areas/carbon/>.

Concrete is used in the foundations of buildings, where its function is to be heavy, to keep the building in place. Part of the foundation can be stone, such as granite. Wind power foundations can substitute concrete for rock, or be anchored directly to the rock.

Foam glass can provide insulation and is at least as moisture resistant as concrete.

Concrete reinforced with steel bars uses another property of Portland cement, its high alkalinity, which protects the iron from corrosion. If the iron is allowed to oxidise it will expand and create cracks in the concrete, and then widen those cracks.

If other materials are used as reinforcement, such as glass fibre, carbon fibre, plastic fibre, stainless steel or even cellulose, there is no need for an alkaline environment.

Bridges can be built of steel which – unlike concrete – is easily recyclable. They can sometimes be made of composites, i.e. plastics, which are much lighter than concrete.

Even if concrete is preferred, its carbon footprint can vary widely.

The Pantheon in Rome was constructed 1900 years ago using low-carbon concrete made from volcanic ash. (It was naturally not reinforced, so it did not rust and crack.)

Volcanic ash can be used as an additive to Portland cement, up to 50 per cent according to MIT¹. Slag from steel production and fly-ash from coal power have long been used as “supplementary cementitious materials” blended into Portland cement.

But there is much more slag and much more ash available. There are more sources:

aluminium dross, waste incineration slag, rice hull ash, silica fume, all of which have high alkalinity and can be reinforced with steel.

Why is this largely unquantified source of low-carbon cement not used?

The construction industry is not very innovative by nature. It is much less dynamic than the engineering industry, where productivity and product development have been much faster. (Just look at cars.)

It is difficult to build a house; many things can go wrong, and every change means taking risks. The risk of delays, the risk of later collapse or slow deterioration, risks to health at work, as well as subsequent health risks for the users of the building.

Logistics is complicated, so it is easier to use few, well-defined and well-known materials. Ash from industrial by-products may contain hazardous metals.

Sweden used large quantities of “blue concrete” gypsum boards for several decades. They were effectively a by-product from uranium mining, and emit radon, which caused thousands of deaths due to lung cancer, and will cause many more. This was a risk that should have been foreseen.

But a building material that is unfit in one place may be perfectly acceptable somewhere else. Living-room walls, bridges, rail sleepers, parking lots, harbours, airstrips ... they all have different requirements regarding toxicity, strength, resistance to rain and salty winds etc.

With more detailed specifications for each use, the CO₂ footprint can be reduced by using more substitutes for Portland cement, which often require less cement per ton of concrete.

Why has this not happened? The answer is simple: it is cheap because the price does not include its environmental costs.

In the EU, the cement industry is part of the °C trading system. Sort of. It gets free allocations, i.e. it is paid back for all its emissions. In 2018, the cement industry received 114 million tons of free allocations

and emitted 111 Mt. Some plants actually pay for some of their emissions, but over-allocation is normal. The allocation is (in theory) benchmarked in line with the 10 per cent best performers, but this obviously does not work in practice. It is justified on the grounds of carbon leakage, i.e. the threat that if Europe and cement producers had to pay for their emissions, they would be at a disadvantage to outside competition.

The evidence for such a threat is slim². Cement is a cheap, voluminous product which is normally not transported very far. A Sandbag report summed it up “For cement, free allocation is a solution to a problem that does not exist since the sector has experienced no carbon leakage.”³

Sandbag has noted that the industry’s carbon intensity rose between 2005 and 2014 and that the present system “offers inadequate short- and long-term incentives to reduce carbon emissions. It ... makes investment in low-carbon cement unattractive.”

The cement industry – Cembureau and individual companies – has lobbied hard in Brussels and elsewhere, with great success. They lobby hard because they need to. Cement factories are usually built close to quarries. They use big mining, big kilns, big harbours and big ships. They can’t move. They can’t do anything else. So they will use all their market power and political influence to keep things as they are as long as possible. As things stand, they will keep free allocations through 2030.

As the climate debate increasingly focuses on 1.5 degrees C, the cement industry has to find some context where Portland cement can appear Paris-compatible.

How could that be done?

The International Energy Agency relies on CCS for 83 per cent of cumulative emissions reductions in the cement sector in its Energy Technology Perspectives 2017.

CCS features high on Cembureau’s low carbon web page⁴. This is in fact the only way they address the core problem, i.e. the CO₂ from lime. The rest are either things that may happen in the future (improved energy efficiency, less carbon-intensive fuels) or are up to somebody else (product efficiency and “downstream”).

Cement plants can produce a large and

relatively pure stream of CO₂, so there are few places better for CCS. But nobody believes CCS will pay for itself, at least not Heidelberg Cement, which lobbies for billions of euro in government support in Norway and Sweden. A typical estimate says CCS would increase costs by over 50 per cent⁵.

A Chatham House report⁶ enumerates six alternatives to Portland cement with a potential to mitigate CO₂ by 50–100%.

They are:

- Low-clinker Portland (ash, slag etc.)
- Geopolymers (clay)
- Low-carbonate clinker with calcium silicates
- Belite clinkers
- Calcium silicate clinkers
- Magnesium-based cements

Several are now produced on an industrial scale. Costs vary with location, but are thought to be about the same as now. That would mean that much of the problem could probably be solved surer, cheaper and faster than with CCS.

There are still more options.

Another way to cut the use of cement and its emissions is to use less of it in concrete, with more fine-tuned design of buildings and concrete mixes. Some of the clinker can also be replaced with lime powder, which is mined in the same way but does not go through the kiln.

Nature, and man, have developed many ways to glue sand and pebbles together to make a strong and durable mass. Even living bacteria can be used for this purpose. The cohesion of naturally occurring materials can be quite impressive; 1900 million-year-old Scandinavian granite is still in good shape.

1. <http://news.mit.edu/2018/cities-future-built-locally-available-volcanic-ash-0206>

2. Healy et al <https://www.mdpi.com/1996-1073/11/5/1231>

3. <https://sandbag.org.uk/project/cement-industry-future/>

4. <https://lowcarboneyconomy.cembureau.eu/>

5. <http://www.energy-transitions.org/better-energy-greater-prosperity>

6. <https://reader.chathamhouse.org/making-concrete-change-innovation-low-carbon-cement-and-concrete#>

Greek lignite plant cancelled in major NGO court win

A major Greek court ruling has put the final nail in the coffin for planned power plant Meliti II and left its sister plant Meliti I operating without legal permission. The decision follows a legal challenge brought jointly by ClientEarth, WWF Greece and Greenpeace Greece.

Greece’s Supreme Administrative Court, the Greek Council of State, annulled the environmental permits for the two lignite-fired power plants, both property of state power company PPC. The decision means that the construction of Meliti II will no longer go ahead, while Meliti I will need to apply for a new environmental permit if it is to continue operating.

“These recent developments mean the end of the lignite era in Greece,” said Eleni Diamantopoulou, an energy lawyer for ClientEarth, in response to the ruling.

Source: ClientEarth press release, 13 January 2020.



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Transition to 100 percent renewable energy is cost efficient

Stanford researchers find that a completely renewable energy system will pay for itself in 7 years, while also solving major health and climate threats.

Global warming, air pollution and social instability are all challenges that the new roadmaps to a renewable energy system address. A new report from Stanford university¹ presents different scenarios in which 143 countries transition to 100 percent renewable energy by 2050.

Such a transition would reduce energy demand by 57 percent and decrease social costs by 91 percent compared to a business-as-usual scenario (BAU). The 143 nations included represent more than 99.7 percent of the world's fossil fuel emissions. This transition would make it possible to stay below 1.5 degree of global warming and reduce the air pollution that causes approximately 7 million premature deaths every year.

The calculations conclude that such a development would cost \$6.8 trillion/year compared to \$17.7 trillion/year for business-as-usual energy systems. These figures account for electricity, heating, cooling, hydrogen generation and storage, and transmission and distribution using annual private market costs. Thus, the transition costs 61 percent less than the BAU energy scenario.

However, the aggregate social cost (private together with health and climate expenses) of BAU energy is \$76.1 trillion/year. The net present value of the capital costs of transitioning to renewable energy worldwide is \$72.8 trillion for the entire transition period, from now until 2050.

These expenses will be covered by electricity sales and increased job opportunities. The presented Wind-Water-Solar scenario (WWS) creates 28.6 million more full-time jobs than the BAU scenario.

Besides the argument of expense, others argue that the material resources it will take to produce the WWS energy equipment could be a liability in their own right. However, the calculations show that the equipment will only consume 1 percent of the world's annually produced steel and 0.4 percent of

the concrete. The net carbon dioxide emissions from producing the materials needed would be approximately 0.014 percent of the annual current carbon dioxide emissions.

The technology that is needed for a 100 percent renewable energy transition already exist. According to the authors, the transition would be economically and technically feasible by 2030². However due to political, institutional and cultural obstacles 2050 is a more realistic target.

The calculations for how to reach 100 percent renewables by 2050 are made based on the US democratic party's proposal, The Green New Deal. This plan calls for a launch of a "10-year mobilization" to reduce carbon emissions, by sourcing 100 percent of the country's electricity from renewable and zero-emissions power, upgrading to more energy-

efficient buildings, investing in electric vehicles and high-speed rails etc.

The first step in the study was to project 2016 end-use BAU energy in multiple energy sectors in 143 countries to 2050. The end-use energy of BAU 2050 was then electrified using renewable energy sources. When the 143 countries move from BAU to WWS energy, the 2050 annual average demand for end-use power decreases by 57.1 percent. This reduction is due to: efficiency gains from using WWS electricity over combustion (38.3 percent), eliminating energy in the mining, transporting and refining of fossil fuels (12.1 percent), and improvements in end-use energy efficiency and reduced energy use beyond those in the BAU case (6.6 percent).

Compared



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to previous studies on strategies and scenarios this study adds important factors and new perspectives. The main differences are the following:

First, socioeconomic costs include external costs not accounted for in market costs or prices. In this case the social costs can be air pollution mortality, morbidity and global warming damage. When it comes to political applicability a social cost analysis is of greater value than a private cost analysis alone as it presents a comprehensive view of the impacts of policies.

Second, other studies use the cost per unit energy rather than the aggregate energy cost per year. This has an important effect as a renewable energy system uses much less end-use energy than a business-as-usual system.

Two main issues that are often brought up in technical discussions on the transition to 100 percent renewable energy are storage and transmission. Regarding energy storage the report finds that the problems have already been solved. As a result of the decrease in energy demand by switching to renewable energy sources (see Figure 1) and developing the technologies already in play,

storage will not be a limiting factor.

When it comes to grid congestion and new transmission, the study concludes that both the risk of congestion and the need for additional transmission are lower than previously thought. Even when the most conservative WWS scenario model is used together with the highest costs, the BAU scenario still has the highest expense. However, continent-scale grids will not be a solution for isolated nations such as Japan and South Korea. The study found that even when sticking to grid isolation, the costs of a renewable grid are lower than BAU.

Comprehensive road maps of this type naturally involve some uncertainties and sensitivities. Assuming perfect energy transmission, inconsistencies between load and resource datasets and projecting future energy use are some examples of the uncertainties. By modelling several scenarios with different levels of costs and climate damage several of the uncertainties are addressed. When it comes to accounting for extreme weather events the model includes these by measuring the variability of weather worldwide at a 30-second time resolution.

One of the authors explains³ that the aim

of the study is to illustrate that there is no downside to making this transition, and to allay some of the fears that the transition would be too expensive. The evidence shows that the technology, resources and knowledge needed for the 100 percent renewable transition already exist.

Additionally, the study shows that the transition is by far the cheapest option. The risk is rather that these types of transitions will not be implemented quickly enough. They should inspire policymakers, according to the one of the authors, Marc Jacobson: "I hope people will take these plans to their policymakers in their country to help solve these problems."

Emilia Samuelsson

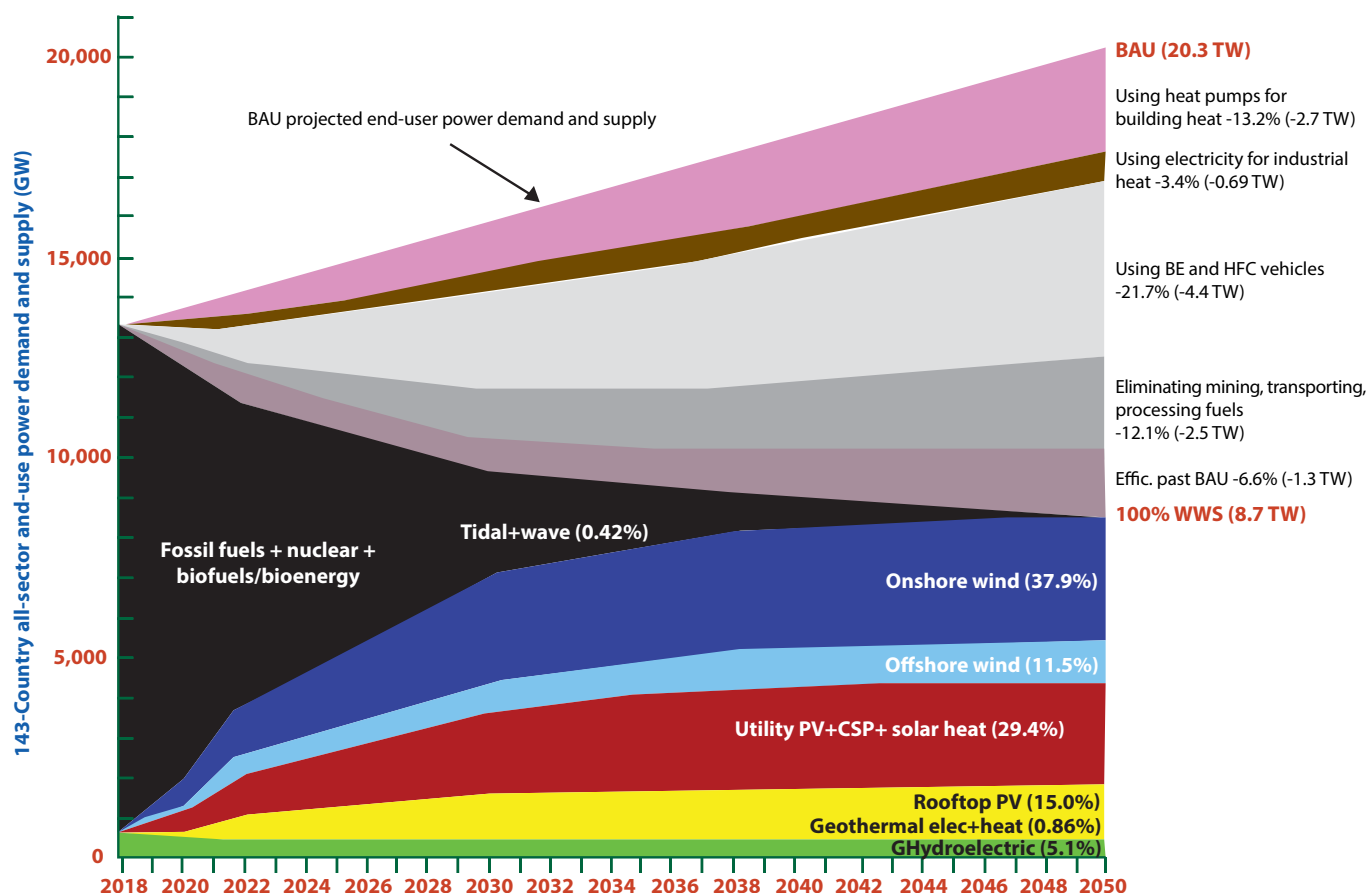
The article is based on the report:

"Impacts of Green New Deal Energy Plans on Grid Stability, Costs, Jobs, Health, and Climate in 143 Countries" is available at:

<https://www.sciencedirect.com/science/article/pii/S2590332219302258>

1. Jacobson, M.Z., and Delucchi, M.A. (2009). A path to sustainable energy by 2030. *Scientific American*, November 2009 <https://www.scientificamerican.com/article/a-path-to-sustainable-energy-by-2030/>

Figure 1. Timeline for 143 countries, representing more than 99.7 percent of world fossil-fuel CO₂ emissions, to transition from conventional fuels (BAU) to 100 percent wind-water-solar (WWS) in all energy sectors. Also shown are the annually averaged end-use power demand reductions that occur along the way.





Climate tipping points in the boreal forest region

In the southern part of the boreal forest zone, climate change may cause closed forest to be replaced by open woodland or scrubland

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The forest of Interior Alaska is changing, rapidly and thoroughly. Over the course of a few decades, an ecosystem shift, from coniferous to deciduous forests, is taking place over an area the size of Spain. The driving force is global warming, and the transformation will most likely contribute to further warming.

The development in Alaska is highlighted in an IPCC report on the Cryosphere (the cold areas in the northern hemisphere) published last September¹. The report, and the new scientific findings underlying it, shows that climate-driven shifts in northern ecosystems not only may happen faster and at much lower levels of warming than was previously expected. In fact, they are already happening.

It's an understatement to claim that much is at stake. Permafrost areas in Northern America and Eurasia, mostly Arctic tundra, represent a frozen carbon store of about 1,500 Gt (Gigatonnes). The coniferous forest belt of the northern hemisphere – the boreal forest – holds another 500 or 600 Gt of carbon, for the most part in the soil. Since much boreal

forest grows on permafrost the figures are partly overlapping, but a reasonable estimation is that these two biomes together contain more than twice the amount of carbon of the entire atmosphere.

To halt global warming at 1.5°C, future emissions of carbon dioxide must not exceed 500 Gt globally. Thawing permafrost may, even by conservative estimates, claim 20 per cent of that space. Climate-driven wildfires, pest outbreaks and vegetation changes in the boreal forest could add another 100 Gt, meaning that less than half of the global carbon budget would remain for anthropogenic emissions².

The present development in Alaska's forests suggests that this is where we are heading.

The annual mean temperature in Interior Alaska has increased by 1.4°C over the last century, while precipitation has decreased by 11 per cent. Warmer and drier summer climate has created more favourable conditions for wildfires in coniferous forest, where flammable debris has accumulated on the forest floor for centuries. Thus, fire frequency has increased dramatically. As

a consequence, around 1990 the forest ecosystem switched from being a carbon sink to a net carbon source.

Two-thirds of all forest stands in Interior Alaska used to be black or white spruce. Twenty years from now, when the transformation phase is completed, the landscape will be dominated to the same extent by deciduous forests, mostly aspen – a normal succession stage after fire disturbances in boreal forest. These forests are far less likely to burn than old-growth coniferous forests, which means that fire frequency will decrease. However, this does not mean that the forests of Alaska will return to their former state of a net carbon sink. On the contrary, the change may have a positive feedback effect on global warming. One reason for this is higher soil temperatures, speeding up the decomposition of organic matter.

There are studies indicating that the transformation now seen in Alaska is also underway in other parts of the boreal region, for example in Russia³ and north-eastern China. Obviously, climate is changing in a similar manner all over the

Boreal forest and tundra – close to tipping?

Permafrost areas and boreal forest are two of the so-called tipping points identified by the IPCC. Tipping points are “climate bombs” with the potential to reinforce global warming through powerful positive-feedback loops. Crossing one or several tipping points may cause uncontrollable further warming.

When the concept of tipping points was introduced twenty years ago general understanding was that the risk of crossing critical thresholds would occur at around 5°C of warming. New facts summarized in the IPCC’s Special Reports on Global Warming of +1.5°C (part of which is presented in this article) now suggest that tipping points could be exceeded even between 1 and 2°C of warming.

expansion of boreal forest into tundra in the north.

The rapid and profound transition of boreal forests outlined in the IPCC report and underlying scientific papers will of course not only affect future climate. It will have severe consequences for a number of vital ecosystem services; it will jeopardize the survival of many indigenous and local communities and it will pose a great threat to biodiversity, not only in the Arctic.

Roger Olsson

region, and so is the frequency and extent of wildfires. Across the North American boreal region the total burned area grew by a factor of 2.5 between the 1960s⁴ and 1990s. In fact, there are studies indicating that fire frequency in the boreal region is higher now than anytime over the last 10,000 years. The IPCC estimates that wildfire is projected to increase for the rest of this century across most tundra and boreal regions. As a result of this and other changes, the boreal forest may have started transitioning from a carbon sink to a source on a global scale. Some regions such as western Canada and Siberia may already be emitting more carbon than they capture⁵.

Changes in fire frequency and other disturbances are not the only cause of large-scale shifts in northern forest and tundra biomes. Climate change also affects ecosystems directly, since temperature and precipitation are important environmental factors for trees and other vegetation. Drought-induced mortality has already been reported in several boreal regions, and is predicted to increase regionally⁶.

Furthermore, winter snow cover is of crucial importance to boreal ecosystems, and it has changed dramatically. Since 1981 the area covered by snow in June has decreased by more than 10 per cent per decade in the Arctic region (north of 60° N).

One may think that boreal forests as well as other ecosystems would simply migrate northwards as temperatures rise, but numerous model studies show that the reactions will be more complex, and far more threatening from a human perspective. An obvious reason is that climate zones are shifting northwards an

order of magnitude faster than the ability of trees to migrate⁷.

The boreal forest will expand at its northern edge, but is not projected to colonize present tundra on a larger scale, at least not during this century. Nevertheless, far-reaching changes are underway. Woody shrubs are already projected to expand to cover 24–52 per cent of arctic tundra by 2050, resulting in an overall positive feedback effect on climate, likely to cause greater warming than has previously been predicted. While denser vegetation may decrease carbon emissions from permafrost thaw, this may be counteracted by changes in albedo (heat reflection) and increasing amounts of water vapour in the atmosphere. In addition, denser vegetation and a warmer climate will facilitate the expansion of fire into tundra, causing large reductions in soil carbon stock.

In the southern part of the boreal forest zone, climate change may cause closed forest to be replaced by open woodland or scrubland. It is documented that such changes can happen rapidly in response to changes in climate. Since the new vegetation types have lower biomass than those they replace, large amounts of carbon will be released into the atmosphere during such a transition. At the same time the total boreal forest area, and thus its capacity as a carbon sink, will be reduced. This carbon loss is likely to offset any carbon gains from projected

1. The Ocean and Cryosphere in a Changing Climate. IPCC 2019

2. Lenton, T M et al 2019: Climate tipping points – too risky to bet against. *Nature* 575:592-595

3. Shuman, J. K. et al., 2015: Forest forecasting with vegetation models across Russia. *Canadian Journal of Forest Research*, 45 (2), 175-184, doi:10.1139/cjfr-2014-0138.

4. Boreal Forest and Climate Change p 17-

5. Gauthier et al., 2015

6. Gauthier et al., 2015

7. Gauthier et al., 2015

Sources

The article is based on the IPCC report “The Ocean and Cryosphere in a Changing Climate” (2019) and scientific papers cited therein. Other sources are

Lenton, T. M. et al., 2019: Climate tipping points – too risky to bet against. *Nature* 575:592-59

Olsson 2009: Boreal Forest and Climate Change. AirClim report 2009



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IMO failed to adopt speed reduction measures

Lowered ship speed means reduced fuel burn, resulting in less emissions of greenhouse gases and traditional air pollutants, as well as benefits for marine life.

It is well known that reducing the speed of ships cuts fuel use and thus emissions of the main greenhouse gas carbon dioxide (CO₂). What has been less well understood are the benefits for the marine environment and human health. A new report, entitled "The multi-issue mitigation potential of reducing ship speeds", shows that a 20 per cent lowering in speeds would reduce underwater noise pollution by 66 per cent, and the chance of a fatal collision between a ship and a whale by a massive 78 per cent – as well as reducing CO₂ emissions by 24 per cent.

Regarding air pollutants, the report estimated that emissions of nitrogen oxides (NO_x), sulphur dioxide (SO₂) and black carbon (BC) would come down more or less in line with the reduced fuel consumption, which means that a 20 per cent speed reduction would cut all three air pollutants by approximately one quarter.

Commissioned by Seas at Risk and Transport & Environment, the report was launched in time for November's discussions within the International Maritime Organization (IMO) on reducing shipping's climate impact, i.e. the Sixth Meeting of Intersessional

Working Group on Reduction of GHG Emissions from Ships.

Despite the multiple benefits of ship speed reductions, the IMO meeting did little more than review options already on the table and give more time for technical measures. However, there was widespread acceptance by IMO member states and the shipping industry that ship speed is one of the most important factors affecting emissions.

Commenting on the outcome of the meeting, John Maggs at Seas at Risk said: "The importance of speed reduction in cutting ship GHG emissions in the short-term is woven into the fabric of many of the proposed measures. The challenge as we go forward is to ensure that this most straight-forward of approaches is taken up and implemented in such a way that all ships contribute speed-related emissions savings."

T&E's shipping officer Faig Abbasov added: "The IMO spent yet another week talking the talk without deciding anything except to kick the can further down the road by giving far too much time to technical measures that will deliver too little too late. Everything is slow at the IMO, except for polluting ships, and this needs to change. That's why the EU needs to move on and

start regulating this unchecked sector and include shipping in the bloc's carbon market."

Since the Kyoto Protocol was signed in 1997, responsibility for tackling international greenhouse gas emissions from shipping has been delegated to the IMO, so far with very little progress.

Discussions on short-term GHG measures for international shipping will continue at the Seventh Meeting of the Intersessional Working Group on Reduction of GHG Emissions from Ships, to be held at the IMO in London, 23–27 March 2020.

Christer Ågren

Source: T&E News, 15 November and 16 December 2019

The report:
<https://seas-at-risk.org/24-publications/988-multi-issue-speed-report.html>

A Clean Shipping Coalition infographic on these issues can be found here:
https://seas-at-risk.org/images/Images/Shipping_Arctic/Infographic_8_1-pager_links.pdf

Note: Previous articles on the benefits of ship slow steaming can be found in Acid News No. 4/2017; 3/2017; 3/2015; 3/2012; and 2/2010: <https://www.airclim.org/acid-news-archive>

Clean air action linked to EU Green Deal

In January 2020, a group of eight leading environmental organisations working on clean air from the health, environmental, climate and transport angles wrote to the European Commission expressing their support for the EU Green Deal's commitments to the zero emission and zero pollution ambition, and urging for immediate steps to be taken to tackle air pollution.

The letter specifically calls for the Commission to adopt legislation this year to strengthen air quality plans and improve air quality monitoring, to enforce existing legislation through infringement procedures and to set a clear roadmap to align EU air quality limit values with the upcoming revised World Health Organization guidelines.



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The letter: www.env-health.org/wp-content/uploads/2020/01/joint-clean-air-letter-2020-EC-WP.pdf.

Threat to shut 14 coal-fired power plants in India

India's federal pollution regulator has warned 14 coal-fired power plants that they could be shut down and penalized for failing to comply with environmental standards. Nine of the plants are around India's polluted capital, New Delhi, and five are in south Indian states. The move comes as New Delhi and other Indian cities have been struggling with some of the worst global air pollution levels.

Indian utilities had already won an extension on a December 2017 deadline for coal plants to meet emissions standards, after extensive lobbying by the industry. Only one out of 11 plants around New Delhi – which had an end-of-2019 deadline – is complying with the emission standards for health-damaging sulphur dioxide (SO₂). More than half of India's coal-fired power plants that were ordered to retrofit equipment to curb SO₂ emissions are set to miss deadlines.

Source: Reuters, 5 February 2020.

South Korea shuts a quarter of its coal plants over winter

In late November, South Korea decided to temporarily shut down up to a quarter of its coal-fired power plants over winter in an attempt to combat dangerously high levels of fine dust pollution.

The country's energy ministry said 14 plants would be idled between December and February, and as many as 27 in March. The country has some 60 coal-fired power plants in total. The coal plant suspensions are expected to cut fine dust emissions by 44 per cent over the three months from December compared to last year.

Source: The Guardian, 28 November 2019.



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Beyond coal campaign retires 300th US coal plant

The decision in January to close Dolet Hills Power Station in Arkansas symbolises an important milestone for the Sierra Club's Beyond Coal campaign, as it marked the 300th coal plant proposed to retire since 2010. In just the three years since Donald Trump became President, the campaign and its allies have been able to secure the retirement of 62 coal plants.

The closure of coal plants since 2010 can now be credited with the annual prevention of about 8,000 premature deaths, 12,500 heart attacks, 131,700 asthma attacks, and USD3.8 billion in healthcare costs.

Mary Anne Hitt from the Sierra Club said: "230 coal plants are still out there polluting our air, water, and climate – putting thousands of lives at risk. And there are still programmes that must be developed and implemented to help former coal miners and their families transition out of the fossil fuel industry."

Source: Sierra Club press release, 8 January 2020

South Korea opts for ship speed reduction and ECA

South Korea's Ministry of Oceans and Fisheries began a "Vessel Speed Reduction Programme" in December 2019, in an effort to reduce fine dust from ships and protect the marine environment. The programme requires that ships will have their port fees lowered when they enter ports at a speed below 10 or 12 knots, depending on ship type. The speed reduction will apply from a distance of about 20 nautical miles from the ports.

In addition, the Ministry has announced that a new mandatory regional Emission Control Area (ECA) will be established around the following ports along the Korean coast with an effective date of 1 September 2020: Incheon; Pyeongtaek & Daejeon; Yeosu & Gwangyang; Busan; and Ulsan. All ships anchored or at a berth in these locations must use fuel oil with a sulphur content of max 0.10 per cent, or use approved equivalent arrangements. The ECA regulation is likely to be expanded on 1 January 2022, to cover all vessels when operating in designated zones around the aforementioned ports.

Source: Safety4sea.com, 24 and 27 January 2020.

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LNG could worsen shipping's climate impact

Ships fuelled by LNG do not deliver the emissions reductions required by the IMO's greenhouse gas strategy, says new study.

A recent analysis by the International Council on Clean Transportation (ICCT) has compared the life-cycle greenhouse gas emissions of liquefied natural gas (LNG), with those from traditional marine fuel oils.

LNG has become increasingly popular as a ship fuel as it significantly reduces emissions of air pollutants, such as sulphur dioxide, nitrogen oxides and particles. Moreover, LNG is cheaper than marine gas oil (MGO), and is – over the longer term – expected to be less expensive than both heavy fuel oil (HVO) and the

blended 0.5-per-cent very low sulphur fuel oil (VLSFO).

In 2019, there were more than 750 LNG-powered ships, most of them in the offshore and ferry segments, but new tankers, container ships and cruise ships are also being built with LNG engines.

Two years ago, in April 2018, the IMO adopted an initial strategy with the stated levels of ambition 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.

Achieving these objectives will inevitably require a transition to zero-carbon fuels or propulsion systems. While LNG contains less carbon per unit of energy than conventional marine fuels, which means that burning it emits less carbon dioxide (CO₂), there are also other GHGs to consider.

LNG consists mainly of methane, which over a 100-year time period traps 36

"Using LNG as ship fuel might actually worsen shipping's climate impacts."



times more heat than the same amount of CO₂, i.e. its global warming potential (GWP100) is 36. If we look instead at a 20-year time period (GWP20), methane traps 86 times more heat.

The study compared the life-cycle greenhouse gas emissions of LNG, marine gas oil (MGO), very low sulphur fuel oil (VLSFO), and heavy fuel oil (HFO) when used in engines suitable for international shipping, including cruise ships. The analysis included upstream emissions, combustion emissions, and unburned methane (methane slip), and evaluates the climate impacts using 100-year and 20-year global warming potentials.

It was found that over a 100-year time frame, the maximum life-cycle GHG benefit of LNG is a 15 per cent reduction compared with MGO, and this is only if ships use a high-pressure injection dual fuel (HPDF) engine and upstream methane emissions are well controlled.

The authors point out, however, that the

European shipping's climate record

Using data reported under the monitoring, reporting and verification (MRV) regulation of EU maritime emissions, environmental group Transport & Environment found that container shipping operator, Mediterranean Shipping Company (MSC), joined coal power plants in the EU's top 10 emitters list in 2018. MSC was responsible for about 11 Mt of CO₂ from operations falling under the scope of the EU MRV.

The data also shows that ships sailing to and from Europe emitted more than 139 million tonnes of CO₂ in 2018. If shipping were a country it would be the EU's eighth biggest emitter after the Netherlands. Despite this, shipping is the only sector with no binding measures to reduce its greenhouse gas emissions in the bloc and still does not pay for its pollution. The sector is exempt under EU law from paying tax on its fuel, an effective subsidy worth €24 billion a year, according to T&E.

latter might prove difficult as more LNG production shifts to shale gas, and given recent evidence that upstream methane leakage could be higher than previously expected. Additionally, only 90 of the more than 750 LNG-fuelled ships in service or on order use HPDF engines.

The most popular LNG engine technology is low-pressure dual fuel, four-stroke, medium-speed, which is used on at least 300 ships and is especially popular with LNG-fuelled cruise ships. Using GWP100, this technology emitted 8 per cent more lifecycle GHGs when it used LNG instead of MGO and 16 per cent more than using MGO in a comparable medium-speed diesel engine.

Using GWP20 instead, low-pressure dual fuel, four-stroke, medium-speed technology emitted 70 per cent more lifecycle GHGs when it used LNG instead of MGO and 82 per cent more than using MGO in a comparable medium-speed diesel engine.

Dr. Elizabeth Lindstad, Chief Scientist at SINTEF Ocean, Maritime Transport, commented that: "The report shows the need for adopting policies that can reduce the broader GHG emissions of shipping



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Launched on 11 December, the European Commission's Green Deal commits to bringing shipping emissions under the bloc's emissions trading system (ETS) to help make the EU carbon neutral. T&E said this was an essential first step to rein in the sector's climate impact. But additional measures, including a CO₂ standard for how much ships can emit while in operation, will also be needed to accelerate energy efficiency technologies and zero-carbon fuels/energy.

Source: T&E News, 9 and 16 December 2019.

The report: <https://www.transportenvironment.org/publications/european-shippings-climate-record?overlay-context=publications>

instead of CO₂ only, including the well-to-tank emissions of ship fuels. If we fail to include all GHGs and focus only on CO₂, we might end up with a large number of ships fulfilling all efficiency requirements, but where the GHG savings are on paper only."

The ICCT concludes that the results show that LNG does not deliver the GHG emissions reductions demanded by the IMO's initial GHG strategy and that using it might actually worsen shipping's climate impacts. Given this, it is fair to question continued investments in LNG infrastructure on ships and on shore, as these could make it harder to transition to low- and zero-carbon fuels. Investing instead in energy-saving technologies, wind-assisted propulsion, zero-emission fuels, batteries, and fuel cells would deliver both air quality and climate benefits.

Christer Ågren

The study "The climate implications of using LNG as a marine fuel" is available at: https://theicct.org/sites/default/files/publications/Climate_implications_LNG_marinefuel_01282020.pdf



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Too little focus on diets and population growth

In recent decades, research on how to nourish the global population sustainably has had a strong and growing focus on improving productivity through technology, but has largely ignored aspects of dietary patterns and population growth. This was what a recent Swedish study concluded after analysing decades of scientific articles on how to feed the world. Studies that investigate how a shift in consumption patterns, e.g. shifting from a meat-heavy diet to less resource-intensive diets, would affect the global food supply have been

constantly underrepresented in the research, while the effects of population growth have shifted from being the dominant focus in 1969 to being the least common focus today. The authors suggest that this is in line with prevailing ideas in politics, which spills over into scientific research. One example is that the fear of being accused of paternalism been identified as a barrier to targeting people's individual behaviour, such as dietary patterns.

It is true that a growing global population taken together with the shift to resource-

intensive diets leads to a need for higher productivity in agriculture, but the authors stress that a focus on productivity alone is not enough to arrive at sustainable solutions on how to feed the world. There is a need for a more holistic approach to solve future challenges of global food security.

Source: Tamburino, Lucia., Bravo, Giangiacomo., Clough, Yann., Nicholas, Kimberly A. (2020). From population to production: 50 years of scientific literature on how to feed the world. *Global Food Security*, vol 24. DOI: <https://doi.org/10.1016/j.gfs.2019.100346>



A call to introduce meat taxes in EU

A sharp reduction in meat and milk consumption is essential to tackle climate change. Meat taxes are a well-debated solution to this issue. A recent report that quantified the cost of greenhouse gas emissions, as well as other air and water pollution and biodiversity loss associated with meat production, proposes that this cost should be added as a levy on meat prices in Europe. The levy would vary between different kinds of meat – for beef as an example it implies an extra cost of €0.47 per 100g. The report suggests that this levy, which would raise the price of a steak by about 25 percent, should be integrated in the Farm to Fork strategy, which is part of the European Green Deal. This would potentially lead to a reduction in greenhouse gas emissions of 120 million tons per year. Additionally, this levy would yield an extra €32 billion, of which half should be used to support farmers who want to shift their production away from meat, according to the authors. Further, they suggest that the other half should be used to subsidize plant-based foods, support poor families and help developing countries to take measures to counter climate change.

Source: <https://www.theguardian.com/environment/2020/feb/04/eu-meat-tax-climate-emergency>

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Post-Brexit agricultural plan in UK revealed

A new agricultural bill to replace the EU Common Agricultural Policy (CAP) support scheme was presented by the UK government in January. At the core of the bill is a shift from CAP subsidies, in which the farmer is paid for the amount of land farmed, to a support scheme that instead gives payments for the “public goods” produced by the farmer, such as clean air and water, fertile soils and animal welfare. The bill has been criticized for not including trade regulations to protect domestic farmers from imports of food produced under lower standards of health, environmental protection and animal welfare.

Source:

<https://www.theguardian.com/uk-news/2020/jan/16/food-security-brexit-biggest-shake-uk-farming-40-years-agriculture-bill>



Ten billion people can be fed within planetary boundaries

A newly published study shows that it may be viable to feed ten billion people without crossing the planetary boundaries for nitrogen flows, biodiversity loss, land system change, and freshwater use. Planetary boundaries are a concept established by a group of researchers that refer to the safe operating space for nine processes in the Earth system. Human activities must be kept within these boundaries to avoid irreversible changes in the Earth system that put the welfare of future generations at risk.

The study quantifies the extent to which the current food system is dependent on crossing the four planetary boundaries above, and found that almost half of the food produced today relies on exceeding these boundaries. If food production were adjusted using the measures needed to keep within

all these four boundaries, the potential food supply would only provide a balanced diet for 3.4 billion people. However, when other measures are included, such as improved water and nutrient management, change of diets and a reduction in food waste, the amount of calories available increased to a level sufficient to supply around 10.2 billion people, while strictly respecting the planetary boundaries for nitrogen flows, biodiversity loss, land system change and freshwater use.

Respecting the safe operating space for nitrogen flow alone would decrease the global production in kilocalories by 25.1 percent, which is mainly due to a necessary reduction in heavy fertilizer use in Europe, India, China and the eastern United States. The study suggests that some regions in the world cannot be

self-sufficient in food within the planetary boundaries, even when all measures are applied. These regions (e.g. the Middle East, the Indus Basin, Indonesia and parts of Europe) will probably have to rely on international trade or future innovations to feed their inhabitants a balanced diet.

The planetary boundaries for climate change are not fully integrated in the study, but it is indirectly assumed that climate change is primarily mitigated through decarbonization and by reducing emissions connected with decreased land use change simulated in the study.

Source: Gerten, D., Heck, V., Jägermeyr, J. et al. (2020) Feeding ten billion people is possible within four terrestrial planetary boundaries. *Nature Sustainability*. <https://doi.org/10.1038/s41893-019-0465-1>

What milk should we drink?

Supermarket shelves are filled with a wide variety of plant milks today, but which sort is the best choice in terms of environmental impact? A recent ranking reveals a considerable difference in environmental performance between different sorts of plant milk.

Coconut milk is ranked as the worst alternative, causing destruction of rainforest and exploitation of workers, accompanied by almond milk,

since the production of almonds in the US causes water stress and negative impact on pollinators. The unanimous winner in the ranking is oat milk, which is considered to be the most sustainable choice of plant milk, and in second place comes soy milk. However, whichever plant milk you choose is a better choice than dairy, regarding environmental impact including climate change.

Source: <https://www.theguardian.com/environment/2020/jan/28/what-plant-milk-should-i-drink-almond-killing-bees-aoe>

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Demonstrations against agricultural policy in Germany

Massive demonstrations took place in conjunction with International Green Week, an annual food and agriculture fair in Berlin. Tens of thousands of people took to the streets in Berlin to urge for a radically changed agricultural policy that promotes organic farming, animal welfare and strengthened environmental protection. The day before, a conflicting demonstration took place when 500 farmers entered Berlin in tractors to protest against the policy guidelines aimed at protecting the climate and animal welfare, which they perceive as too strict and constraining their working conditions. Similar protests have been arranged by farmers in Germany over recent months.

Sources:

<https://www.euractiv.com/section/agriculture-food/news/germans-protest-in-berlin-demanding-radical-change-of-agricultural-sector/>

<https://www.dw.com/en/germany-thousands-of-farmers-protest-in-berlin/a-52039202>

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NOx from ships in western Baltic Sea quantified

Atmospheric deposition of nitrogen contributes significantly to eutrophication, and accounts for about a third of the total input of nitrogen in the western Baltic Sea.

A recent study estimates that emissions of nitrogen oxides (NOx) from the shipping sector contribute up to 5 per cent of the total concentration of nitrogen in the sea, but with considerable geographic variation. The absolute contribution was found to be highest along the shoreline. However, the relative contribution was highest in offshore areas, which are less affected by riverine input of nutrients. For instance,

in the centre of the Arkona Basin the share of dissolved inorganic nitrogen related to shipping could be as high as 10 to 15 per cent. The authors conclude that these offshore regions could also benefit most from reducing NOx pollution from ships.

Because the Baltic Sea was recently designated a Nitrogen oxides Emission Control Area (NECA) from 2021 onwards, new ships will have to fulfill stricter NOx emission standards. However, the overall effect is expected to be counteracted by increased shipping and the long lifetime of existing ships.

Apart from

conclusions on nitrogen deposition related to shipping, the authors also conclude that future studies should focus on the relative role of other individual sectors as sources of atmospheric nitrogen.

The article: <https://www.ocean-sci.net/16/115/2020/>



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Cleaner air quickly brings big health benefits

Reductions in air pollution yield fast and dramatic improvements in health, as well as decreases in all-cause morbidity according to the research paper “Health Benefits of Air Pollution Reduction”, and the corresponding report “Clean Air Now”. The research also shows that reducing air pollution is cost-effective.

The paper shows that health benefits were seen from both national and locally-based interventions, tackling ambient or indoor air pollution, and in countries where GDP is high or low, without reducing economic growth.

“We knew there were benefits from pollution control, but the magnitude and relatively short time duration to accomplish them were impressive. It’s critical that governments adopt and enforce WHO guidelines for air pollution immediately,” said lead author of the report Dr Dean Schraufnagel.

The scientific article: <https://www.atsjournals.org/doi/10.1513/AnnalsATS.201907-538CME>

The report: <https://ncdalliance.org/resources/clean-air-now>



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The Andes Meltdown

The frozen areas covering the peaks and valleys of the Andes are melting at alarming rates, providing some of the most visible evidence that climate change is already here and putting communities and natural ecosystems at risk.

With the collaboration and support of AirClim, the Environment and Natural Resources Organization (FARN, Argentina) has recently published a comprehensive brief report summarizing the main findings on the impacts of climate change in the Andean cryosphere and the subsequent consequences for societies and ecosystems.

As 2019 marks the close of the hottest decade ever recorded and global emissions from fossil fuels hit yet another record high, climate change is affecting mountain regions at a faster rate than

other terrestrial habitats. Worldwide, mountains are losing their ice and snow and the Andes are far from being the exception, representing one of the areas where this is happening at one of the most terrifying rates.

The cryosphere – the frozen-water portion of the Earth system – provides a plethora of services for humanity and our planet's natural ecosystems. Ice and snow play a crucial role in feedback and regulation of the Earth's weather and climate while storing and supplying freshwater

essential for people's survival, healthy ecosystems, agriculture, hydropower, and economic activities.

With an estimated number of 18,800 glaciers¹, the Andes contain the largest glacierized area in the Southern hemisphere outside of Antarctica. Glacier runoff and seasonal snowmelt play a key role in freshwater supply for more than 85 million people living in the region, representing a critical contribution to Andean communities' socioeconomic activities and their sustainability. Moreover, glacier melt



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acts as an important buffer during periods of drought, providing water to an extensive portion of the Tropical and Dry Andes.

Sadly, the future of the cryosphere in these mountains is at stake: Climate change has positioned Andean glaciers among the fastest-retreating and largest contributors to sea level rise on Earth.

Over recent decades, Andean glaciers have shrunk by up to 50 percent, a trend that is expected to accelerate. According to recent studies, between 2000 and 2018

the average ice mass loss rate in the Andes was 22.9 Gt per year², which translates to an average loss of water equivalent to a four-storey building in 18 years.

Low-altitude glaciers in the Tropical Andes are particularly sensitive to warming because of their small size, and many will likely disappear in the coming decades, affecting the water supply of millions of people.

The Andean communities are already experiencing changes in hydrological regimes and water scarcity. Combined with a growing population, the climate emergency is putting unprecedented pressure on the existing water supply in metropolitan and rural areas of the Andes. Melting snow and glaciers are also increasingly exposing mountain communities to hazardous events such as glacial lake outburst floods (GLOFs) and landslides.

Biodiversity will also be affected as glacier retreat could seriously affect unique Andean ecosystems such as the northern tropical páramos and high-altitude wetlands, where meltwater depletion is likely to cause them to shrink.

The report stresses that the more heat-trapping gases we keep releasing into the atmosphere, the more severe the impacts from a melting cryosphere will become. Very few tropical glaciers will survive today's 1.1°C of warming, and a great deal

of the Southern Andes glaciers could resist 1.5°C. But most of them would disappear almost completely at 2°C.

As the IPCC points out, every fraction of a degree matters and all choices we make now are critical for the future of the cryosphere. Therefore, it becomes a human imperative to deeply cut greenhouse gas (GHG) emissions in the next few years if we want to preserve the vital services ice and snow provide in high-mountain areas and downstream.

Unfortunately – due to the GHGs that are already present in the atmosphere – the Andes are locked into increased warming. Andean countries thus face a serious need for more effective adaptation strategies, which should be planned and implemented incorporating both scientific and indigenous knowledge while engaging local communities.

Catalina Gonda

1. Pfeffer, W. T. et al. The Randolph Glacier Inventory: a globally complete inventory of glaciers. *J. Glaciol.* 60, 537–552 (2014)

2. Dussailant, I. et al. Two decades of glacier mass loss along the Andes. *Nature Geoscience* (2019). doi:10.1038/s41561-019-0432-5

The full report is available both in Spanish and English at: <https://farm.org.ar/archives/27148>



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Dutch health gains from reduced air pollution

Air pollution control policies implemented in Europe since 1980 have resulted in better air quality that has increased Dutch average life expectancy by six years.



A recent scientific study by researchers from the National Institute for Public Health and the Environment (RIVM) has investigated how much the air quality and associated health effects have improved in the Netherlands since 1980.

It also estimated how much of this change can be attributed to reductions in emissions in the Netherlands itself, and how much to emissions reductions in other countries, as well as which source sectors, domestic and foreign, and which policy measures contributed most to the improvements in air quality.

International air pollution control policies include those under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) as well as measures resulting from EU legislation. Additional emission reductions have also resulted from specific national and local initiatives.

Quantification was done by computer model calculations with high spatial resolution for concentrations of nitrogen dioxide (NO_2), particulate matter (PM_{10} , $\text{PM}_{2.5}$), and elemental carbon (EC) in the Netherlands from 1980 to 2015, using two emission scenarios.

The first scenario follows the officially reported emissions of the relevant air pollutants in all European countries. It serves as a reference for the second scenario, in which it was assumed that no air quality policies had been adopted from 1980 onwards and that the emissions of air pollutants had continued to grow, largely in line with the growth in economic activity. Emission changes resulting from other effects, such as changes in the economic structure or improvements in energy efficiency, are said to be taken into account using activity data.

Benefits from emission reductions were

quantified in terms of fewer exceedances of air quality limit values in the Netherlands, and lowered exposure of the Dutch population to high concentrations of air pollutants, including related reductions in health damage.

According to the study, the largest health effects of air pollution are associated with exposure to $\text{PM}_{2.5}$ (about 85%), with a smaller contribution from exposure to NO_2 (about 15%).

In the scenario without policies, the average $\text{PM}_{2.5}$ concentration in the Netherlands increased from $59 \mu\text{g}/\text{m}^3$ in 1980 to $102 \mu\text{g}/\text{m}^3$ in 2015. In reality, however, the concentrations decreased to about $12 \mu\text{g}/\text{m}^3$.

Similarly, the average NO_2 concentration increased from about $30 \mu\text{g}/\text{m}^3$ in 1980 to $45 \mu\text{g}/\text{m}^3$ in 2015 in the no-policy scenario, while the real development shows a reduction to about $15 \mu\text{g}/\text{m}^3$.

Ocean acidification associated with damage on shark skin

Recently, the effects of ocean acidification conditions were investigated on the puffadder shyshark (*Haploblepharus edwardsii*) over different periods of time. The study included chronic exposure of the sharks to elevated CO₂ conditions corresponding to lower pH for several weeks. One of the parameters studied was the effect on denticles – the small scales that cover the skin of sharks.

The results showed corrosion of the denticles under ocean acidification conditions. The authors attributed this effect to chemical dissolution. The observed damage could increase the turnover of these structures, and negatively affect the hydrodynamics and skin protection of sharks. As denticles and shark teeth are constructed in a similar manner, it can also be expected that the teeth will be affected, which would compromise feeding.

The puffadder shyshark is a small, endemic species in South African shallow waters. In these waters, CO₂ levels fluctuate naturally due to upwellings. Nevertheless,

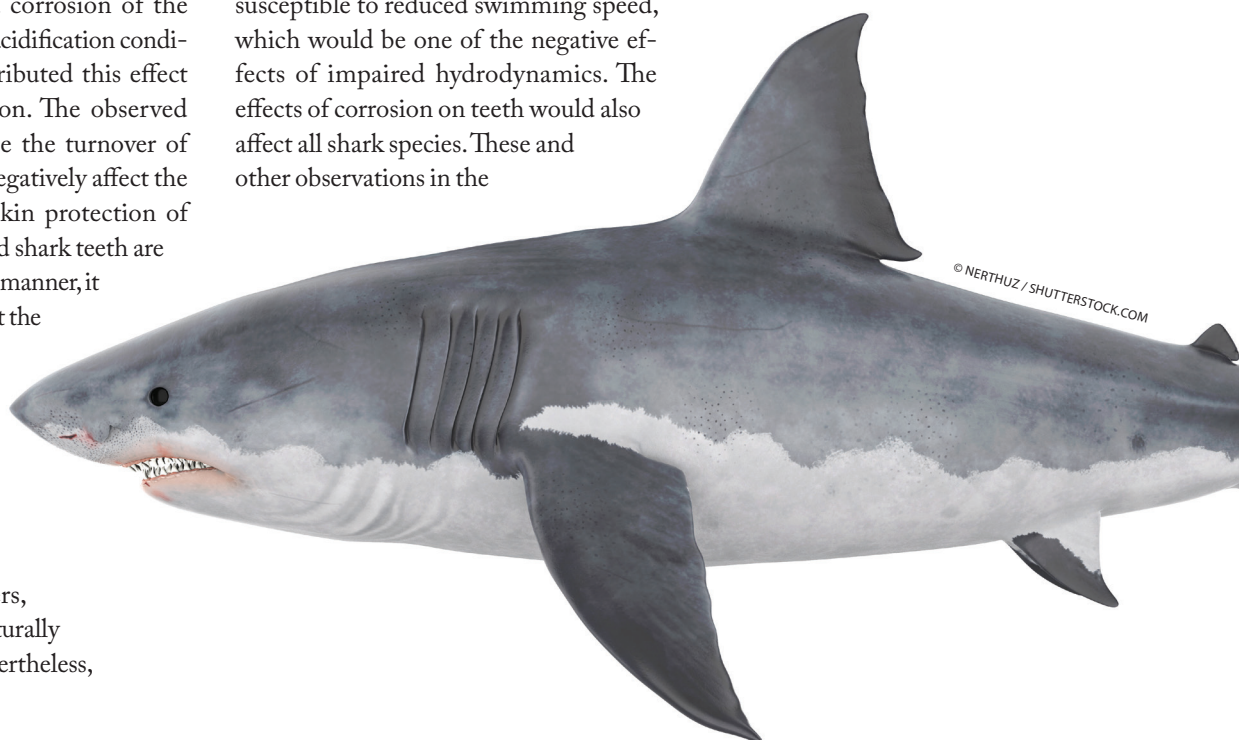
the results suggest that with increased ocean acidification, this and other endemic species in the area could be threatened due to the corrosive effects.

The shark species under study is bottom-dwelling, and does not need to swim in order to breathe. However, larger shark species in open waters that do need to be in constant motion, could be highly susceptible to reduced swimming speed, which would be one of the negative effects of impaired hydrodynamics. The effects of corrosion on teeth would also affect all shark species. These and other observations in the

study indicate that ocean acidification is a threat to a group of animals that is already vulnerable.

The article: "Acid-base adjustments and first evidence of denticle corrosion caused by ocean acidification conditions in a demersal shark species"

<https://www.nature.com/articles/s41598-019-54795-7>



From page 22 ►

The analysis shows that the largest PM_{2.5} improvements in the Netherlands from 1980 to 2015 result from reductions in foreign emissions (about 60%). This is to be expected as domestic emissions are responsible for only about 40 per cent of the average PM_{2.5} concentrations, the rest being imported from countries such as Germany, Belgium, France and the UK. The source sectors that contributed most to the PM_{2.5} concentration reductions were industry (54%), agriculture (23%) and transport (15%).

In contrast, most of the NO₂ concentrations in the Netherlands are of domestic origin, and this is especially the case in cities. The dominant emission source is road transport, contributing about 57 per cent in 1980 and 40 per cent in 2015, and it is also domestic emission reductions in this sector that have contributed most to the lowered concentrations of NO₂.

The researchers estimated the average loss in life expectancy in 1980 caused by exposure to air pollution in the Netherlands at about 4 years. In the no-policy scenario this figure would have increased to about 7 years in 2015, while in reality it decreased to about 1 year. So, without the air pollution control policy, the average life expectancy would have been 6 years shorter than was actually the case in 2015.

When using a relatively low value of a life year lost (€50,000–110,000), the annual monetary cost of health damage from elevated levels of PM_{2.5} and NO₂ in the Netherlands was estimated at between €26 and 58 billion in 1980, falling to between €6 and 14 billion in 2015. In the no-policy scenario the monetary damage would instead have increased to between €42 and 91 billion in 2015.

Consequently, the avoided damage in

2015 amounts to between €35 and 77 billion per year, equivalent on average to €2100–4500 per capita.

The study concludes that public health in the Netherlands has profited from international cooperation and action to abate transboundary air pollution. Similarly, health and the environment in surrounding countries will have gained from emission control measures taken in the Netherlands, as the country was, and still is, a net exporter of NO₂ and PM.

Christer Ågren

The article "Effects of European emission reductions on air quality in the Netherlands and the associated health effects," published in Atmospheric Environment (5 Nov. 2019):

<https://doi.org/10.1016/j.atmosenv.2019.117109>

RIVM press release, 11 November 2019: <https://www.rivm.nl/en/node/148421>

Renewable energy – technology choices matter for air quality

Growth in EU renewable energy has reduced GHG emissions, and in most cases air pollutant emissions as well. But increased burning of biomass has actually increased emissions of health-damaging PM emissions.

A new briefing by the European Environment Agency (EEA) describes the use of renewable energy in the EU since 2005 and its contribution to the EU's climate and energy goals. It also analyses the impacts of renewables growth on air pollutant emissions. The briefing is based on a detailed analysis by the European Topic Centre on Climate change Mitigation and Energy, which is published in their report "Renewable energy in Europe – 2019".

According to EEA estimates, the share of energy from renewable sources was 18 per cent of gross final EU energy use in 2018, which is twice as high as in 2005. However, this share varies widely among EU countries, ranging from over 30 per cent of gross final energy

consumption in Austria, Denmark, Finland, Latvia and Sweden to 10 per cent or less in Belgium, Cyprus, Luxembourg, Malta, and the Netherlands.

In 2018, across the EU, half of all renewable energy sources were used for heating (49%), followed by electricity generation (43%), and a much smaller proportion was used in transport (8%).

About one fifth of all heating consumption in the EU in 2018 originated from renewable energy sources. Biomass supplied about 80 per cent of all renewable heating, mainly as solid biomass burn-

ing. But the trend since 2005 is that biogas, heat pumps and solar thermal applications are developing faster than solid biomass burning, albeit starting from a much smaller base.

Of all the electricity consumed in the EU in 2018, more than 30 per cent originated from renewable energy sources. The growth in renewable electricity since 2005 has been driven by increases in onshore and offshore wind power and



solar photovoltaic (PV) electricity, as well as by other renewable energy sources, e.g. solid biomass combustion.

In transport, renewable energy made up 8 per cent of all energy used in 2018, and various biofuels accounted for the bulk of this.

Compared with a scenario in which renewable energy would have stayed at the 2005 level, the fossil fuel savings due to the additional use of renewable energy after 2005 helped the EU achieve an estimated reduction in CO₂ emissions of 543 Mt (11%) in 2018. (Note that a zero GHG emission factor was applied to all energy uses of biomass.)

Germany, Italy and the United Kingdom were the countries with the largest absolute reductions in domestic fossil fuel use and GHG emissions between 2005 and 2018. However, national fossil fuel use and GHG emissions were reduced most effectively in Denmark, Finland and Sweden, where the renewable energy share increased fastest during this period.

Renewable energy sources help to improve air quality and human health, for instance by supplying electricity or heat without combustion. Consequently, technologies such as wind power, solar PV electricity, geothermal energy, heat pumps or solar thermal energy are most effective at cutting air pollutant emissions.

When biomass burning replaces fossil fuel combustion, however, the outcomes are mixed. Trade-offs occur particularly when solid biomass is burned in house

holds for residential heating. Industrial emissions from combustion processes are more strictly regulated under EU legislation and have lower air pollutant intensities.

Overall, the additional use of renewable energy sources across the EU since 2005 led to a decrease in all SO₂ emissions of 156 kilotonnes (7%) in 2017, and a similar decrease in NO_x, of 46 kt (1%). In contrast, the increased burning of biomass since 2005 actually raised EU-wide emissions of PM_{2.5} by 145 kt (11%), PM₁₀ by 149 kt (7%) and VOCs by 296 kt (4%).

The EEA points out that “to maximise the climate and health benefits of the energy transition, policy makers ought to assess carefully the interplay between renewable energy sources and with the wider

energy mix, and pay attention to potential impacts from biomass burning”.

Christer Ågren

EEA Briefing published 19 December 2019: <https://www.eea.europa.eu/themes/energy/renewable-energy/renewable-energy-in-europe-key>

The ETC/CME report: <https://www.eionet.europa.eu/etcs/etc-cme/products/etc-cme-reports/renewable-energy-in-europe-2019-recent-growth-and-knock-on-effects>



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Air quality rules fit for purpose

The EU air quality limit values are enforceable and have been instrumental in driving a downward trend in air pollution exceedances and exposure.

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After a one and a half year long fitness check process, the European Commission has concluded that its two Ambient Air Quality Directives “have been broadly fit for purpose” despite a failure on the part of many member states to meet legally binding limits on air pollutants.

In its press release, the Commission states that the EU air quality legislation has led to the establishment of high-quality monitoring of air quality, set clear air quality standards, and facilitated the exchange of reliable, objective, comparable information on air quality, including to a wider public.

It recognises however that the legislation has been “less successful in ensuring that sufficient action is taken by member states to meet air quality standards and keep exceedances as short as possible”.

But according to the Commission, the directives have nevertheless “contributed to a downward trend in air pollution and reduced the number and magnitude of exceedances”.

In its Commission Staff Working Document, the Commission notes it currently (i.e. in October 2019) has thirty open infringement procedures against twenty member states for breaching limits on

particulate matter (15 cases), nitrogen dioxide (14 cases) and sulphur dioxide (1 case). Two member states are also in breach of the directives’ air quality monitoring requirements.

The European Court of Auditors has recommended that the Commission accelerates enforcement, as infringement cases have been taking between six and eight years from the initial exceedance to a referral to the EU Court of Justice, and have not yet ensured compliance with the directives.

Moreover, there have been numerous, often successful, proceedings before national courts brought by environmental NGOs demanding the elaboration or implementation of air quality plans, as required by the legislation.

According to the Commission’s analysis, the fitness check shows that:

- Air pollution continues to be a major health and environmental concern to the citizens of the EU, which underlines the relevance of the Ambient Air Quality Directives;
- The EU air quality standards have been instrumental in driving a downward trend in exceedances and exposure of populations to exceedances;

- The current air quality standards are not as ambitious as established scientific advice suggests for several pollutants, especially fine particulate matter (PM_{2.5});
- Trends in exceedance levels indicate that limit values have been more effective in facilitating downward trends than other types of air quality standards;
- Enforcement action by the European Commission and by civil society actors in front of national courts has resulted in actionable rulings, and the legislation is enforceable;
- Additional guidance or implementing acts could help to further harmonise approaches applied to monitoring, information provision, and air quality plans and measures;
- The successful establishment of an EU-wide e-reporting system based on machine-readable formats now allows for further efficiency gains.

Environmental organisations were generally supportive of the Commission’s conclusions.

ClientEarth lawyer Ugo Taddei said that the air quality directive and its enforcement, both by the Commission and civil society, have been essential to accelerate action

to fight harmful air pollution and protect people's health across the EU. Nevertheless, he stressed that better implementation is key to addressing the ongoing health crisis, and that the Commission should immediately produce implementing acts to ensure better air quality monitoring, more harmonised modelling and stronger air quality plans.

Margherita Tolotto at the European Environmental Bureau (EEB) concluded that even though EU legislation has been the main driver to reduce air pollution over the last decade, much still needs to be done.

Stressing the need for coherent policies to deliver clean air, she specifically pointed out the Common Agricultural Policy, and emphasised that full implementation of the National Emissions Ceilings Directive is key to delivering improved air quality.

Anne Stauffer at the Health and Environment Alliance (HEAL) welcomed the Commission's conclusions, which she said demonstrate that the legally enforceable air quality standards are a key instrument to protect the health of Europeans. She also urged the Commission to present new legislative proposals, including "putting

forward a strong and ambitious Zero Pollution Strategy as part of the Green Deal, as well as presenting a timeline for the updating of the current standards to WHO's health-based recommendations".

Christer Ågren

Sources: Press releases from the European Commission, HEAL and ClientEarth, 29 November 2019.

The Commission's full evaluation of the fitness check as well as the evidence collected can be found at: https://ec.europa.eu/environment/air/quality/aqd_fitness_check_en.htm

New air quality infringement decisions

In its February infringements package, the Commission sent letters of formal notice to Romania, Greece and Malta, calling on them to adopt National Air Pollution Control Programmes and to communicate them to the Commission, as required under the National Emissions Ceilings Directive. Such programmes should have been adopted and reported by 1 April 2019.

Reasoned opinions were sent to Greece and Portugal, urging them to comply with the requirements of the Ambient Air Quality Directive. Greece has not taken adequate measures to reduce as soon as possible NO₂ pollution in Athens, which has been above the maximum threshold since 2010. Moreover, Greece has not provided data about the situation across its territory for certain years and has incorrect and inadequate air pollution monitoring in certain areas.

In Portugal, the limit values for NO₂ are exceeded in several zones, and the measures taken to lower air pollution as soon as possible and keep it under control have been ineffective. Portugal should also establish the proper functioning of the system to monitor air pollution.

Source: European Commission, 12 February 2020

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World's largest real-time air quality databank

The United Nations Environment Programme (UNEP) together with UN Habitat and IQAir have jointly developed the largest real-time air quality databank, bundling real-time air quality data for particulate matter (PM_{2.5}) from thousands of initiatives run by citizens, communities, governments and the private sector.

The platform also allows for individuals to collect data, which gives the double benefits of a larger volume of individual measurements and greater public awareness of air quality. It currently receives data from more than 4,000 providers (including governments) and has a following of more than 15 million users.

Source: UNEP News, 11 February 2020.

The map: <https://environmentlive.unep.org/wesr/airvisual>

71% want tougher EU laws on air pollution

The results of the latest Eurobarometer survey, which asked over 27,000 people from across the EU several questions about air quality, revealed a poor awareness of EU air quality legislation as only 31 per cent of respondents had heard of them. Most of those who have heard of the standards believe they should be strengthened (63%).

Respondents were also asked who is responsible for improving air quality. More than half of respondents in all countries believe that households, car manufacturers, energy producers, farmers and public authorities are not doing enough to cut air pollution. Over two-thirds (71%) of EU citizens think the EU should bring in tougher measures to improve air quality.

Poor communication was a theme of the results, with a majority (54%) of respondents saying they do not feel well-informed about air quality problems in their country.

Source: Air Quality News, 3 December 2019.

Eurobarometer report: <https://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/survey/getsurveydetail/instruments/spacial/surveyky/2239>

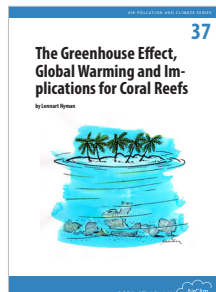
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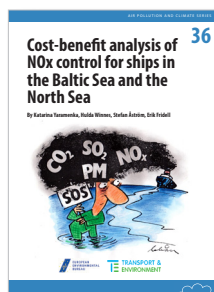
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The Greenhouse Effect, Global warming and Implications for Coral Reefs (March 2018). By Lennart Nyman. Tropical coral reefs harbour some 25 per cent of all marine species.



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



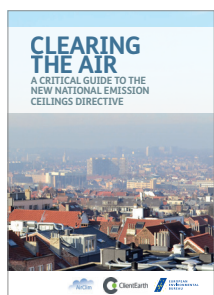
A vision for zero emissions in the Nordic-Baltic region by about 2030 (March 2018). By Fredrik Lundberg. A scenario for the electricity, heat and industrial sectors.



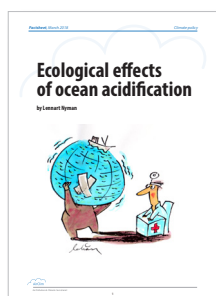
Paths to a sustainable agricultural system (Dec 2017). By Johan Karlsson et al. Exploring ways for sustainably feeding the Nordic countries.



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.



Phasing out coal in Europe by 2025 (Feb 2019). By Fredrik Lundberg. An updated list of coal power stations throughout Europe and a proposal of phasing out coal by 2025.

Coming events

IMO Intersessional Working Group on reduction of GHG emissions from ships. London, UK, 23 - 27 March 2020. Information: www.imo.org

IMO MEPC 75 (Marine Environment Protection Committee). London, UK, 30 March - 3 April 2020. Information: www.imo.org

Rethinking transport: Towards clean and inclusive mobility. Helsinki, Finland, 27 - 30 April 2020. Information: <https://traconference.eu>

8th Global Nitrogen Conference. Berlin, Germany, 3 - 7 May 2020. Information: <https://inn2020.com>

Air Pollution threats to Plant Ecosystems Conference. Paphos, Cyprus, 4 - 8 May 2020. Information: <http://www.ozoneandplants2020.com>

CLRTAP Working Group on Strategies and Review. Geneva, Switzerland, 26 - 29 May 2020. Information: www.unece.org/env/lrtap/welcome.html

7th International Conference on Energy, Sustainability and Climate Change (ESCC 2020). Skiathos Island, Greece, 1 - 3 June 2020. Information: <http://esc.uth.gr/submission-info/>

UN FCCC First sessional period - SB 52. Bonn, Germany, 1 - 11 June 2020. Information: <http://unfccc.int/>

European Clean Air Day 18 June 2020. Organised by European Citizen Science Association (ECSA). Information: <https://cleanairstay.eu>

EU Environment Council. Luxembourg, 22 June 2020. Information: www.consilium.europa.eu/en/press/calendar/

EU Sustainable Energy Week 2020. 22 - 26 June 2020. Information: <https://www.eusew.eu>

International Day of Clean Air for Blue Skies 7 September 2020. UN international day for clean air. Source: http://www.airrang.com/News/News_View.asp?nseq=248062

CLRTAP EMEP Steering Body and the Working Group on Effects. Geneva, Switzerland, 14 - 18 September 2020. Information: www.unece.org/env/lrtap/welcome.html

International Transport and Air Pollution (TAP) Conference. Graz, Austria, 15 - 16 September 2020. Information: www.tapconference.org

IMO MEPC 76 (Marine Environment Protection Committee). London, UK, 19 - 23 October 2020. Information: www.imo.org

UNFCCC COP26. Glasgow, UK, 9 - 19 November 2020. Information: <http://unfccc.int/>

2020 Annual POLIS Conference. Arnhem-Nijmegen City Region, Netherlands, 2 - 3 December 2020. Information: <https://www.polisnetwork.eu/2020-annual-polis-conference>

CLRTAP Executive Body. Geneva, Switzerland, 14 - 18 December 2020. Information: www.unece.org/env/lrtap/welcome.html

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