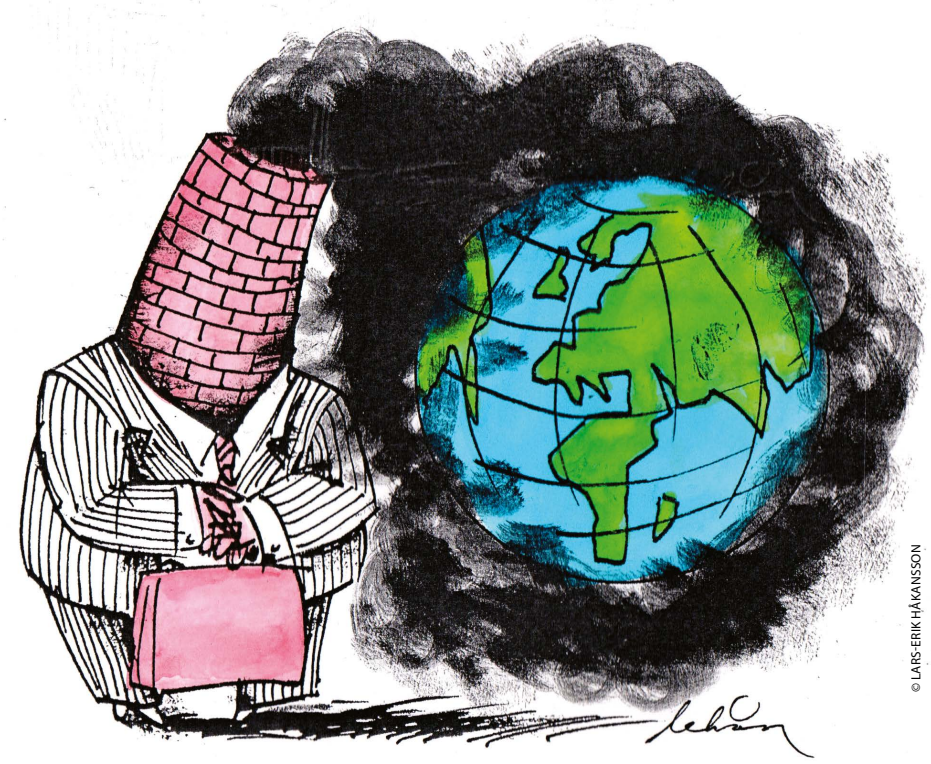
NO.2, MAY 2021

Acid News



EU industrial air pollution cost up to €433 billion per year

The cost of damage caused by pollutant emissions into the air from the largest 12,000 industrial facilities in 2017 has been estimated at €277–433 billion, and half of the total cost was caused by less than two per cent of plants.

Based on data from the European Pollutant Release and Transfer Register (E-PRTR), a recent study published by the European Topic Centre on air pollution, transport, noise and industrial pollution (ETC/ATNI) assessed the costs of damage to health and the environment from pollutants emitted by industrial facilities in the EU member states, Iceland, Norway, Serbia, Switzerland and the UK.

This study is a follow-up to two previous studies published by the European Environment Agency (EEA) in 2011 and 2014.

Many different air pollutants are covered, including the traditional main air pollutants (sulphur dioxide, nitrogen oxides, particulate matter, ammonia and volatile organic compounds), heavy metals (arsenic, cadmium, chromium IV, lead, mercury and nickel), organic pollutants (2,3 butadiene, benzene, formaldehyde, benzo(a)pyrene, dioxins and furans) and greenhouse gases (carbon dioxide, methane and nitrous oxide).

Marginal damage costs are calculated for impacts on health (from ozone, fine particulate matter and nitrogen dioxide), on crops and forests (from ozone), on building materials (from sulphur dioxide

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Acid News

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

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

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

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

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

In furtherance of these aims, the Secretariat:

- Keeps up observation of political trends and scientific developments.
- Acts as an information centre, primarily for European environmentalist organisations, but also for the media, authorities, and researchers.
- Produces information material.
- Supports environmentalist bodies in other countries in their work towards common ends.
- Participates in the 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

AirClim

The World Health Organization is shortly expected to publish revised guidelines for the main hazardous air pollutants. These will be of major importance for the forthcoming revision of the EU's Ambient Air Quality Directive – a revision proposal is scheduled to be presented by the Commission next year.

On 24 March the European Parliament adopted a resolution on the implementation of the air quality directive, calling on the Commission to align the EU's air pollutant limit values with the revised WHO guidelines, and to establish air quality standards and monitoring requirements for additional hazardous air pollutants, such as ultrafine particles, black carbon, ammonia and mercury.

"Exciting times ahead"

On 12 May, the Commission presented its Zero Pollution Action Plan (ZPAP). Environmentalists had high hopes that this would include a clear plan for how the EU intends to tackle air pollution once and for all. For example, that it should have a clearly expressed aim to reduce to zero any premature deaths and diseases that are caused by anthropogenic air pollution and to ensure that critical loads and levels for protecting ecosystems and biodiversity are no longer exceeded.

Sadly, the ZPAP falls short both on new actions and stricter objectives, and instead mainly lists existing legal obligations and ongoing or already foreseen reviews of EU laws.

Achieving clean air is dependent on updated and new regulations to cut emissions at source. Work is already ongoing on revising the Industrial Emissions Directive and the emission standards for road vehicles, with proposals expected before the end of this year.

But much more needs to be done, especially in some important laggard source-sectors, such as agriculture, domestic solid-fuel burning, and international shipping.

Air pollution can be carried by winds over hundreds and even thousands of kilometres within a few days. Health-damaging levels of $PM_{2.5}$ in cities such as Berlin or Copenhagen may be caused by precursor pollutant emissions in neighbouring countries, and excessive levels of ozone in Europe may originate from emissions in other continents.

Cross-border airborne pollution was the reason for establishing the Convention on Long-Range Transboundary Air Pollution (LRTAP) in 1979. After having agreed and implemented a series of measures over time, the Convention is now busy reviewing its 2012 Gothenburg Protocol, aiming to revise and strengthen it within the next few years.

Forty years ago, in May 1981, four Swedish environmentalist organisations invited their counterparts in other countries to join them in a European Conference on Acid Rain in Gothenburg. The meeting focused on providing information on the harmful impacts of air pollution, especially acidification, and on finding ways in which environmentalists around Europe could cooperate to cut air pollutant emissions.

One outcome of this conference was the formation of the Swedish NGO Secretariat on Acid Rain (later renamed AirClim) in January 1982, and the start of Acid News. I was personally engaged in establishing the secretariat and served as acting editor of Acid News for nearly 30 years, up to 2012, and it is now time for me to retire.

Looking back, big changes have taken place over these forty years (see pages 13–16), including drastic cuts in emissions of some air pollutants, especially of the main acidifying pollutant sulphur dioxide, which has been slashed by more than 90 per cent in Europe.

But much remains to be done. Air pollution still kills around 800,000 people every year in Europe, and nearly 9 million people worldwide. So it is imperative that all the actions listed above, and many more, will actually deliver.

Christer Ågren

From page 1 ▶

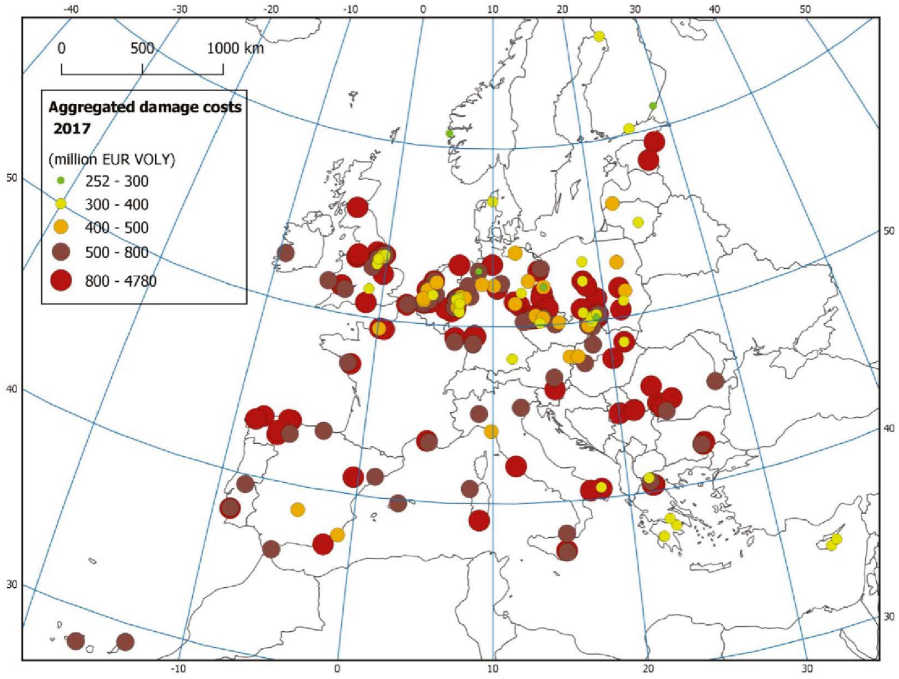

Figure 1. Locations of the 211 E-PRTR facilities that caused half the total damage costs due to air pollutants and GHG gases in 2017.

and nitrogen oxides) and on ecosystems (from eutrophication due to ammonia and nitrogen oxides). Furthermore, marginal damage costs for impacts on health have been calculated for heavy metals and organic pollutants. Impacts of greenhouse gases are accounted for using a marginal abatement cost approach.

The aggregated annual cost of damage caused by emissions reported from E-PRTR industrial facilities was estimated to amount to €415–749 billion in 2008, and to €277–433 billion in 2017, which means that the estimated damage costs due to the main air pollutants decreased by 54 per cent between 2008 and 2017.

Facilities covered by the analysis include large power plants, refineries, manufacturing, combustion and industrial processes, waste and certain agricultural activities. It was found that the energy sector (power plants) contributed the largest share, more than half of the costs. Other significant contributions came from heavy industry (production processes and combustion) and from fuel production and processing in refineries.

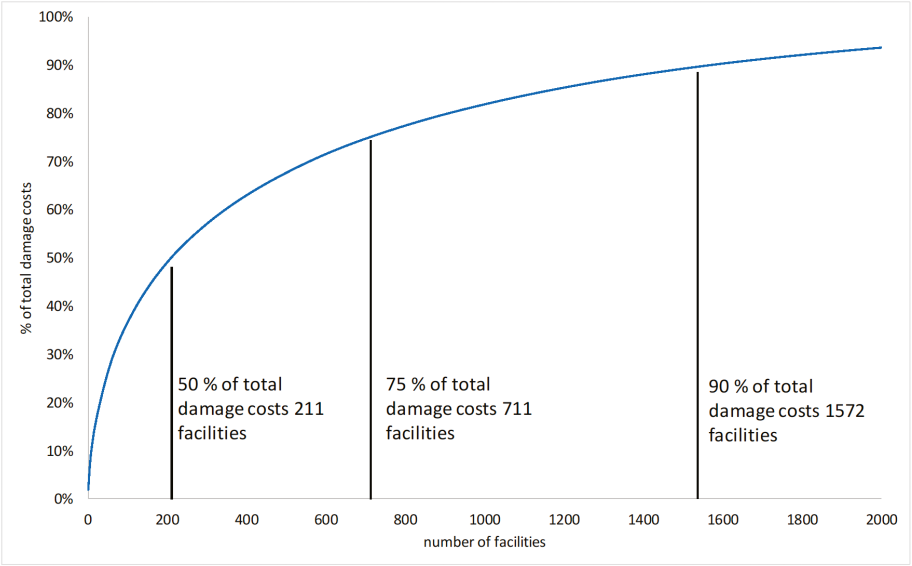

Figure 2. Cumulative distribution of the 2,000 E-PRTR facilities with the highest damage costs due to air pollutants and GHG gases in 2017.

As the study focused on emissions from large stationary sources, emissions from several other important sectors, such as transport, households and most agricultural activities, were not included. In 2017, the contributions of E-PRTR installations to total emissions were estimated to be 61 per cent for SO_2, 21 per cent for NOx, 6 per cent for VOCs and NH_3, and 4 per cent for PM_{10}.

For traditional air pollutants, the study estimated the cost of health damage by using damage costs per tonne of each emitted pollutant as a national average for each country.

Specifically for mortality impacts, a lower and a higher value were used, the former being based on the value of a life year lost (VOLY) and the latter on the value of a statistical life (VSL). The monetary valuation of VOLY is set at €101,000, and that of VSL at €3,900,000.

Regarding greenhouse gases, previous EEA reports only calculated externalities for CO_2 emissions, but this study also included methane and nitrous oxide. Unit costs for evaluating CO_2 (or CO_2 equivalent) impacts have been updated and are now based on the values for short- and medium-term impacts given in the 2019 DG Move Transport Cost Handbook, i.e. €63–109 per tonne CO_2-eq.

Most of the quantified damage cost is caused by emissions of the main air pollutants and greenhouse gases. Damage costs for heavy metal emissions and organic pollutants are significantly lower, but nevertheless contribute several millions of euros harm to health and the environment.

For the main air pollutants, average damage costs are clearly dominated by health impacts, which account for 94–98 per cent of the total in the lower (VOLY) estimate, depending on the pollutant.

A small number of individual facilities cause the majority of damage costs. Half of the total cost was caused by the emissions from just 211 installations, less than two per cent of the plants (see figure 1). And three-quarters of the total costs were caused by 711 industrial facilities – six per

Table: The top twenty E-PRTR plants estimated to have the greatest damage costs due to air pollutant and GHG emissions in 2017.

Rank	Facility name	Country	Activity	Damage cost (VOLY-VSL) (million euro)
1	Belchatow	Poland	Thermal power station	4,772-6,449
2	Neurath	Germany	Thermal power station	3,775-5,405
3	Niederaussem	Germany	Thermal power station	3,615-5,521
4	Jänschwalde	Germany	Thermal power station	3,471-5,817
5	Boxberg	Germany	Thermal power station	2,710-4,444
6	Drax	UK	Thermal power station	2,601-4,150
7	Eschweiler	Germany	Thermal power station	2,410-3,446
8	Kostolac	Serbia1	Thermal power station	1,840-5,679
9	Lippendorf	Germany	Thermal power station	1,758-3,125
10	Maritsa 2	Bulgaria	Thermal power station	1,708-2,979
11	ArcelorMittal Dunkerque	France	Thermal power station	1,641-2,336
12	Schwarze Pumpe	Germany	Thermal power station	1,583-2,498
13	Kozienice	Poland	Thermal power station	1,517-2,024
14	Nikola Tesla A	Serbia[1]	Thermal power station	1,485-4,607
15	Nikola Tesla B	Serbia[1]	Thermal power station	1,470-4,556
16	As Pontes	Spain	Thermal power station	1,247-2,122
17	Port Talbot steel works	UK	Metal ore	1,179-2,189
18	ArcelorMittal Fos	France	Pig iron & steel	1,168-1,895
19	Torrevaldaliga Nord	Italy	Thermal power station	1,146-1,460
20	Agios Dimitrios	Greece	Thermal power station	1,144-1,588

1) Because Serbia has not reported CO_2 emissions since 2014, the damage cost figures for Serbian plants only include costs for the main air pollutants.

cent of the total number (see figure 2).

The report also individually lists the top-thirty facilities identified as causing the highest damage due to air pollutants and greenhouse gases over the five-year periods 2008–2012 and 2013–2017, respectively, and for the latest year, 2017.

In 2017, 24 out of the top-thirty polluters were thermal power stations, mainly using coal or lignite, including Belchatow in Poland, Neurath, Niederaussem, Jänschwalde and Boxberg in Germany, Drax in the UK, Kostolac in Serbia, and Maritsa 2 in Bulgaria, (see table).

The top-thirty polluters also included three iron and steel plants, one facility for the processing of ferrous metals, one metal ore roasting or sintering installation and one chemical installation producing basic organic chemicals.

Nine of the 30 dirtiest facilities are located in Germany; three each in Poland, Serbia, Spain and the United Kingdom; two in France; while Bulgaria, Estonia, Greece, Hungary, Italy, Netherlands and Portugal all have one each.

Christer Ågren

The report "Costs of air pollution from European industrial facilities 2008–2017" Eionet Report – ETC/ATNI 2020/4 (published 10 March 2021).

Link: https://www.eionet.europa.eu/etcs/etc-atni/products/etc-atni-reports/etc-atni-report-04-2020-costs-of-air-pollution-from-european-industrial-facilities-200820132017

CCS around the world: lost money, lost promises

The largest CCS project in the world, at Chevron's Gorgon natural gas processing plant in Western Australia, finally started operation in 2019, three years late, and three years after gas production started. Almost five million tons of CO_2 per year that should have been captured has been released into the atmosphere. Carbon capture was a condition for the 2009 government approval of the gas project. Since capture eventually started, it has run into a lot of problems due to corrosion and sand, and has not reached capacity. Chevron has not reported how much is actually being captured. The capital cost for the project is 2.4 billion (US) dollars.

Chevron markets its LNG as green, but at best it only captures half of on-site emissions, and none of the emissions from burning the gas .

https://www.upstreamonline.com/environment/emission-increase-chevron-faces-more-gorgon-ccs-issues/2-1-943714

There are only five large-scale carbon capture and storage (CCS) projects in operation around the world, excluding those that use the CO_2 for enhanced oil recovery. "Large scale", according to the Australian CCS Institute, means at least 400,000 tons/year in capacity.

The only biomass project is agri-giant ADM's ethanol factory in Decatur, Illinois. It produces a fairly pure CO_2 stream, but of the 1 million tons/year capacity only just over half was stored in 2019, according to the EPA . The project has received at least $141 million in federal support.

On top of the five projects mentioned above, there are about 30 that use CO_2 for oil recovery. One of them was Petra Nova in Texas, which received a birthday congratulation from the Department of Energy on its third anniversary in January 2020, but is now closed for good, citing low oil prices. It took CO_2 from a coal power station and was intended to capture 33 percent of the CO_2 (and to emit 67%), but even missed that target. The Department of Energy contributed $190 million and the Japanese government provided a $250 million loan for the $1 billion investment.

https://en.wikipedia.org/wiki/Petra_Nova

Fossil fuels pose risk of stranded assets

Gas is the new coal, with risk of $100 billion in stranded assets.

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"Natural gas is falling out of favour with emissions-wary investors and utilities at a quicker pace than coal did, catching some power generators unaware and potentially leaving them stuck with billions of dollars of assets they can't sell. Citigroup Inc. and JPMorgan Chase & Co. are among the banks that strengthened their financing restrictions on thermal coal under pressure from shareholders wanting to avoid the fuel, and the expectation is that gas is next. Executives at some western European companies say they're already struggling to sell gas-fired facilities," says an analysis by Bloomberg News.

"Phasing out gas in power generation is just a first step. Cutting back use of the fuel in heating, transport and industry would wreak more potential damage. Europe wants to reach net-zero emissions by 2050, which is at odds with plans to build numerous infrastructure projects, like pipelines and terminals. If these are built but no longer needed, there's a potential 87 billion euro ($104 billion) stranded-asset risk, according to calculations by Global Energy Monitor," Bloomberg News writes.

"There is an increasing amount of funds that either don't like it or can't even invest in companies with coal," Miguel Stilwell de Andrade, EDP's chief executive officer, said in an interview.

"We're not going to wait until people tell us that gas is no longer going to be used. We're going to make sure that we're going to get out of there before."

"There's no point building assets now that will be of no use in a few years," said Frans Timmermans, the European Commission's executive vice-president. Europe can skip the transition and go straight to clean assets by spending on the right projects now," he said.

"We need to make the investments to create sustainable societies," he added. "That capital, not spent well, will create stranded assets very soon, and we will put unbearable financial burden on the shoulders of our children."

"Everyone is talking about it in terms of a transition, not a cliff," said Ryan Wobbrock, a senior credit officer at Moody's Investors Service. "At this point, it would be very difficult to completely disentangle that system."

"But now there are indications that demand in the US is topping out decades ahead of schedule with cheaper renewables and net zero moving up the agenda for utilities. Renewables could become the leading power sources on US grids by 2028," Morgan Stanley said last year.

European gas demand is still expected to grow by 3 per cent this year, according to the International Energy Agency.

At least in the short term. The European Investment Bank, for one, will end all financing for fossil fuels in December.

"To put it mildly, gas is over," EIB President Werner Hoyer said during a January press conference. "Without the end to the use of unabated fossil fuels, we will not be able to reach the climate targets."

Compiled by Reinhold Pape

https://www.bloomberg.com/news/articles/2021-04-17/gas-is-the-new-coal-with-risk-of-100-billion-in-stranded-assets

eded-short-term-climate-ambition/

Recycled batteries reduce dependence on imported raw materials

A new study assesses the raw materials needed to make electric vehicle batteries and compares them with the materials needed to run a fossil fuel car.

The transport sector urgently needs to be decarbonised and batteries are the key technology underpinning the transition of road vehicles to zero emissions. In March, Transport and Environment (T&E) published a report analysing Europe's forecasted supply and demand of battery cells and associated raw materials. T&E's report illustrates that, contrary to the view that electric vehicles (EV) will lead to the plundering of raw materials, once recycling is taken into account the amount of raw material that is used and cannot be recovered is small.

Enough batteries made in the EU for the EV market

With battery electric vehicles (BEV) projected to replace conventional cars in Europe, the demand for battery cells is set to grow in the coming years. In total, the demand for batteries in Europe is projected to reach close to 300 GWh in 2025 and more than 1,300 GWh in 2035.

Today, China has about 80% of global lithium-ion cell production, but Europe's capacity is set to expand fast. Until 2020, there was a shortfall of batteries produced in Europe to supply all the EVs on the market, but supply could meet demand in 2021 at around 90 GWh if planned production is on schedule. There are 22 battery gigafactories planned over the next decade in the EU, with total production capacity rising from 460 GWh in 2025 to 730 GWh in 2030, a number sufficient to meet the expected EV market. If production is ramped up on schedule, battery supply could even surpass European demand by the mid-2020s.

As European production increases, so will the demand for raw materials such as lithium, nickel and cobalt. But as battery technology evolves, less raw material will be needed to produce each kWh of EV battery. From 2020 to 2030 the quantities of materials needed to produce a kWh of battery capacity are expected to fall by a half for lithium, more than three-quarters for cobalt and by around a fifth for nickel.

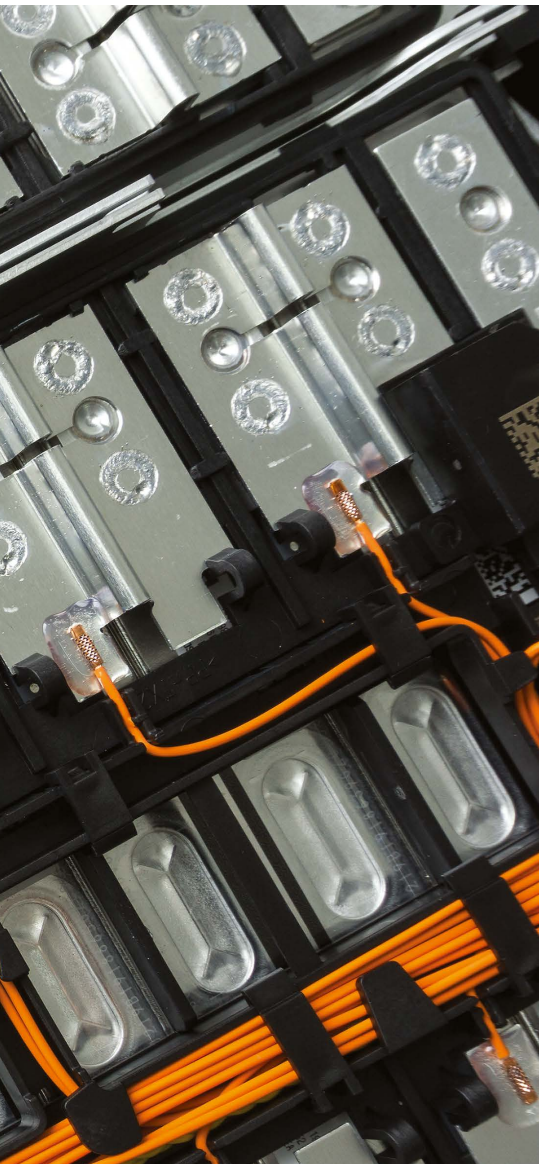
Reducing primary demand through recycling

In contrast with the fossil fuels used in internal combustion cars, EV batteries

can be part of a circular economy loop. Recycling of battery materials is essential to reduce the pressure on demand for virgin materials, and to limit the negative environmental and societal impacts that extraction can generate. If recovery rates in the draft EU battery regulation are increased to best practice, the amount of material in each battery that cannot be recycled to make new batteries can be reduced by a factor of 3 for lithium, and a factor of 2.5 for cobalt, nickel and copper.

"The recovery of critical raw materials from this e-waste stands below 1% because we do not have the necessary technology and industrial processes in place," says Commission vice-president Maroš Šefčovič. "If you just collect all the old cell phones we have in our drawers, we can immediately build four million car batteries just from the cobalt," the Commissioner added, highlighting the vast untapped potential of so-called "urban mining".[1]

If EV battery recycling is also taken into account, the need for raw materials is further decreased under the Commission's proposed targets. According to these targets, 5% of lithium, 17% of cobalt and 4% of nickel required for EV battery production should be obtained from recycled European EV batteries by 2030. In 2035, this increases to 22% of lithium and nickel and 65% of cobalt, as more cars come to the end of their lifespan. Recycling of EVs starts to have a strong impact from 2030. If current European reserves of raw materials were converted into BEV batteries in 2030, this would account for the equivalent of; the lithium for 200 million BEVs, or 20 million with no recycling, the nickel for 17 billion BEVs, or 0,3 billion with no recycling and the cobalt for 500 million BEVs, or 10 million with no recycling.



Rita Tedesco from ECOS, a network of environmental NGOs, highlights that green standards for batteries are vital to ensure the transition to electro- mobility is done in a really eco-friendly way and stated that "We need performant and durable EV batteries, which are easy to repair,reuse and recycle,".

Tedesco adds that "Parameters such as the state of health of the batteries and tests to evaluate them need to be comparable throughout different brands. A minimum set of design standards – such as lifting parts – would make the disassembly process for recycling cheaper, simpler and less time-consuming".[2]

Comparison with internal combustion engines

During its lifetime, the internal combustion engine (ICE) car burns about 17,000 litres of petrol or 13,500 litres of diesel. The metals used in battery cells weigh around 160 kg. If the battery was recycled and the majority of the metal recovered, around 30 kilograms of metals would be lost. The weight of fuel that is burned during the average lifetime of an ICE car is around 300–400 times more than the total quantity of battery cell metals that are not recovered.When it comes to energy efficiency the BEV will require 58% less energy than a petrol car over its lifetime. With regards to CO_2 lifecycle emissions, the average European BEV emits 64% less CO_2 than a conventional ICE.

Recommendations for phasing out ICE

An EU-wide phase-out date for the sale of ICE cars is needed to accelerate the transition to BEVs. A study by the Ecologic Institute in Germany for Greenpeace makes the assessment that to limit global warming to 1.5°C, ICE cars need to be phased out in Europe by 2025 and hybrid vehicles by 2028[3]. In addition, all fossil fuel subsidies, oil exploration and extraction in EU countries should be ended. Policies to use cars more efficiently through shared mobility and less private car use in urban areas, will reduce raw materials demand.

Whilst the new EU battery proposal takes an important step towards ensuring that EV batteries meet environmental and social standards, more can be done. Responsible supply chains should be made mandatory, due diligence requirements should be extended to copper, and small-scale mining must be addressed through EU development policies. The proposed battery material recovery targets should be increased to 90% for lithium and 98% for cobalt, nickel and copper.

In summary, there is no comparison between oil and battery materials as battery electric vehicles and their bill of materials are already substantially more beneficial from an environmental, economic, social and resource efficiency point of view.

Lucien Mathieu, transport and e-mobility analyst at T&E concluded that "Recycling of battery materials is crucial to reduce the pressure on primary demand for virgin materials and ultimately limit the impacts raw material extraction can have on the environment and on communities." Mathieu also added that "With batteries, the EU has the unique opportunity to move away from dependence on raw material imports like it has been for decades with fossil fuels."

Emilia Samulesson

Based on Transport & Environment (2021), From dirty oil to clean batteries.

1. Frédéric Simon Raw materials: the missing link in Europe's drive for batteries https://www.euractiv.com/section/energy-environment/news/raw-materials-the-missing-link-in-europes-drive-for-batteries/

2. Ibid.

3. Read more in Combustion-engine cars need to be phased out in Europe by 2025

4. p24-25 in Acid News Nr 4 December 2020 https://www.airclim.org/acidnews/no-4-december-2020

Clean air possible without lockdown

Cities can permanently achieve pandemic-low air pollution levels by accelerating the ongoing switch to zero-emission vehicles, as well as extra walking, cycling, public transport and teleworking.

Cleaner air will return faster by combing both approaches, according to a study for Transport & Environment (T&E), released one year after the first lockdowns were put in place in Europe. The report comes as governments prepare to spend nearly €700 billion in EU Covid recovery funds, a third of which is earmarked for green investments, including transport.

T&E called on mayors and governments to increase zero-emission zones, reform taxes to favour emissions-free vehicles, roll out the right charging infrastructure and zone off more public space for walking, cycling and public transport. It calls on the EU to announce a phase-out date for all fossil fuel vehicles by 2035 at the latest and tighten its 2025 CO_2 standards for cars, vans, trucks and buses.

Source: T&E, 10-11 March 2021.

The report "Blue Sky Recovery": https://www.transportenvironment.org/publications/blue-sky-recovery-how-keep-lockdown-low-levels-air-pollution-european-cities

EP wants air quality law reforms

On 25 March, the European Parliament approved a resolution calling on the Commission to tighten the Ambient Air Quality Directive to bring pollution limits in line with World Health Organization Guidelines (WHO) and to regulate more air pollutants, such as ultrafine particles, black carbon, ammonia and mercury. It also proposes the replacement of the current target values (for O_3, As, Cd, Ni and BaP) with limit values.

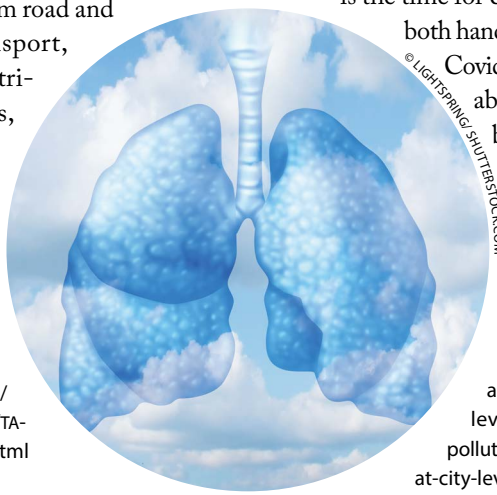
The resolution contains numerous recommendations, including improved air quality monitoring; explicit provisions in the directive to guarantee the right of citizens to justice in line with the Aarhus Convention; and strengthened legislation to reduce emissions at source, particularly from road and maritime transport, aviation, industrial installations, buildings, energy production and agriculture.

Link to the EP report: https://www.europarl.europa.eu/doceo/document/TA-9-2021-0107_EN.html

Restrict traffic in cities to tackle air pollution

Banning polluting vehicles could cut harmful PM and NOx pollution in cities of over a million residents by up to 23 and 36 per cent respectively, saving up to €130 million per year in health and other costs, according to a new study for the European Public Health Alliance (EPHA). Researchers have studied 28 types of urban policies currently used in cities, from zero-emission public buses to sharing e-scooters, to see their effect on PM and NOx reductions from traffic.

EPHA Acting Secretary General Sascha Marschang said: "A dirty cloud has been hanging over cities for many decades, causing asthma, heart disease or lung cancer. As we fight Covid-19 through vaccines, we must fight this cloud of disease, too. Now is the time for city bosses to grab with both hands some of the generous Covid stimulus funding available to truly 'build back better' to really improve people's health and their environment."



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Source: EPHA, 23 March 2021.

The report "Air pollution and transport policy at city level": https://epha.org/air-pollution-and-transport-policies-at-city-level/

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Phase-out shipping emissions

The European Parliament urges the Commission to "lead by example" in phasing out maritime emissions and support eliminating pollution from ships when in port and restrict air pollutant emissions in EU waters.

In a plenary resolution agreed on 27 April, the parliament repeated its call for the shipping industry to contribute to reaching carbon neutrality by making a 40-per-cent reduction in emissions by 2030, and for the EU emissions trading system to be extended to cover the sector.

They also added new demands, not least the urgent establishing of a sulphur emissions control area (SECA) for the Mediterranean Sea. Member states should also support "swiftly adopting" similar controls for nitrogen oxides, says the resolution, and extend both to all EU waters.

Moreover, member states should ban discharges from open-loop scrubbers, and the Commission should propose a gradual phase-out of the technology, which allows the use of cheap high-sulphur oil.

The parliament also called on the Commission to propose mandating zero-pollution shipping at berth and incentivise the use of onshore power supplies.

Source: Ends Europe Daily, 28 April 2021.

Link: https://www.europarl.europa.eu/doceo/document/TA-9-2021-0131_EN.html

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Multiple air quality law breaches

In its February infringements package, the European Commission announced that it is referring Slovakia to the EU Court of Justice for breaching the daily EU limits for PM_{10} in the Banskobystrický region, the city of Kosice and its surrounding region, almost every year since 2005.

"The air quality measures, presented by Slovakia, have not proven to be timely and effective to reduce pollution within the agreed limits and they do not contribute to keeping the exceedance periods as short as possible, as required by EU law," the Commission states.

Belgium, Czechia and Poland have all failed to bring nitrogen dioxide (NO_2) levels below EU limits.

- In Belgium, the NO_2 limit values have been exceeded in Brussels since 2010 and in Antwerp since 2015.
- In Czechia, the annual limit values for NO_2 have been exceeded in Prague and there is currently no valid air quality plan for the city.
- In Poland, the annual limit values for NO_2 have been exceeded in four urban agglomerations (Warszawska, Krakowska, Wrocławska and Górnośląska). Reports show that the measures taken to tackle the NO_2 levels are not sufficient to keep the exceedance periods as short as possible.

The Commission has now sent reasoned opinions to Belgium, Czechia and Poland, and the countries have two months to reply and take the necessary measures, otherwise the Commission may refer the cases to the EU Court of Justice.

Source: European Commission, 18 February 2021.

Link: https://ec.europa.eu/commission/presscorner/detail/en/inf_21_441

Rail travel is greenest mode of motorised transport

In terms of greenhouse gas emissions, rail travel remains the best mode of motorised passenger transport in Europe, according to two transport and environment studies published by the European Environment Agency (EEA).

Transport accounted for a quarter of EU greenhouse gas emissions in 2018. Emissions come primarily from road transport (72%), while marine transport and aviation represent shares of 14 and 13 per cent of emissions, respectively, and rail a share of 0.4 per cent (emissions by diesel trains only). On top of the direct contribution to global warming and air pollution, emissions that take place during the production, transmission and distribution of energy used by trains and aircraft were also considered. Transport also causes non-exhaust emissions of air pollutants, e.g. from the abrasion of brakes and tyres.

The Transport and Environment Report 2020 (TERM) specifically investigates the impacts of rail and air passenger travel, concluding that rail travel is the best and most sensible mode of travel, apart from walking or cycling. While aviation's emissions are much higher on a passenger-kilometre basis, flying is not necessarily the most harmful choice – travel by petrol or diesel-powered cars, especially if traveling alone, can be more harmful.

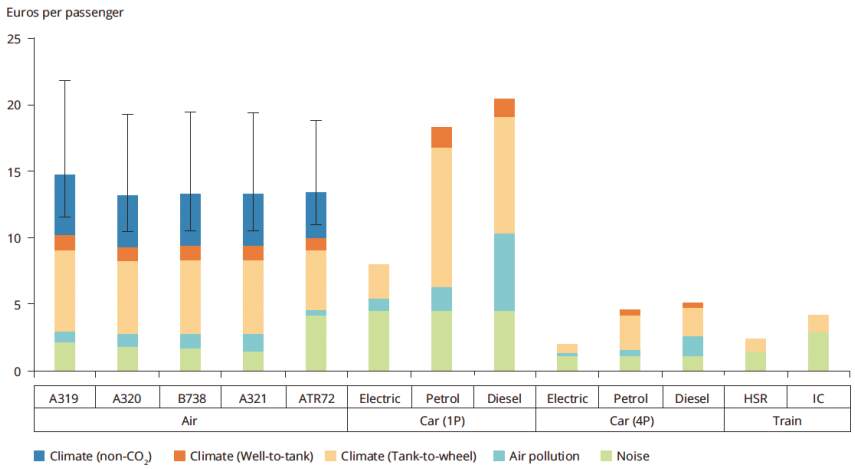

Figure: Emission costs of different transport modes (500 km)

A separate EEA Briefing on goods transport says that rail and shipping have the lowest GHG emissions per kilometre and unit transported, while aviation and road transport emit significantly more.

Source: EEA, 24 March 2021.

Link: https://www.eea.europa.eu/highlights/motorised-transport-train-plane-road

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CO_2 emissions from the cement industry can be reduced without CCS

Cement emissions in the EU fell more than 10 per cent in 2019–2020, demonstrating that fast, short-term cuts are possible.

EU emissions from cement production are of the same magnitude as total CO_2 emissions from an entire country such as the Czech Republic or Belgium.

Those emissions are of two kinds. One is CO_2 from the core process, which drives out CO_2 from the limestone to create cement clinker. Limestone is a fossil-rich rock, often 400 million years old.

The other part is CO_2 from fossil fuels, such as coal, used to heat the limestone.

Emissions from cement-making, as recorded by the EU Emissions Trading System, fell from 116.5 million tonnes of CO_2 in 2019 to 104.6 million tonnes in 2020.

Construction fell by about 5 per cent, largely due to Covid lockdowns in the second quarter of 2020. But that does not explain why emissions fell by more than 10 per cent.

One explanation is the increasing price of CO_2 in the Emissions Trading System. The cement industry has roughly 100 per cent free allocation, but it still has some incentive to cut emissions and sell the surplus, for example by cutting coal use and replacing it with waste fuel or electricity.

The use of ordinary Portland cement may also have decreased slightly, replaced by other cementitious materials. The market for such material is growing, see AN 4/20. Heidelberg Cement states in its Annual Report 2020:

"We have made further progress in the CO_2 of cements with less clinker, thereby achieving a reduction in both CO_2 emissions and costs. In several countries, the proportion of blast furnace slag, fly ash, and limestone in cement has been increased, thus reducing the clinker content."

If the cement industry does not shrink its carbon footprint of its own accord, it can be forced to do so by external competition from the construction industry.

The decline in cement-making emissions may also to some (small) degree have been replaced by completely different materials, such as wood, rock, or by reducing the cement-to-concrete ratio in some applications. Requirements for the high alkalinity of Portland cement may have been replaced by other reinforcement materials, such as glass fibre or stainless steel.

One thing that has clearly not cut emissions during 2020 is carbon capture and storage. Though widely hyped for a long time, there is still not a single cement plant in the world that uses CCS. In 2024, Heidelberg cement aims to capture 0.4 million tonnes per year in Norway – about 0.04 per cent of emissions in the ETS, of which Norway is part.

The actual reduction in 2020 contrasts with the very modest ambitions by the industry and governments, summed up by the IEA 2020 World Outlook. It does not foresee any change in the core process by 2030, only a modest decrease of CO_2 intensity from 0.54 to 0.48 tonne of CO_2 per tonne of cement between 2018 and 2030 – or one per cent per year.

This is echoed in a recent report from Agora Energiewende, Breakthrough Strategies for Climate-Neutral Industry in Europe.

"Several European cement companies are working on commercialising CO_2 capture technologies and long-term CO_2 storage before 2030. We assume that by 2030 around 10 cement plants that are close to the Atlantic Ocean or to navigable rivers could be connected to long-term CO_2 storage sites that are currently being developed in the Netherlands and Norway. This could reduce emissions by 9 $MtCO_2$ by 2030."

The reason why Agora Energiewende accepts such slow progress – a smaller reduction in 11 years than the actual reduction in the year 2020 – is that they accept the industry's view on investment cycles:

"Given the long technical lifetimes of cement plants – between 50 and 60 years – each reinvestment decision should devise an individual decarbonisation roadmap that is in line with achieving climate neutrality by 2050."

But Agora Energiewende has high hopes for later CCS:

"In the future, the development of a CO_2 infrastructure could also pave the way for negative emissions via BECCS. By using a large share of sustainable biomass in its fuel mix and sequestering the biogenic carbon share, cement works that are connected to a CO_2 infrastructure can generate negative emissions."

An alternative view would be that Portland cement has to go the same way as fossil fuels: phased out as soon as possible. Coal use is falling fast. Fossil gas is ever more controversial in the EU.

Can civilization thrive without Portland cement?

Yes. Large buildings and civil structures were built long before Portland cement was invented in the 1840s. If it needs to be done, it can be done.

Fredrik Lundberg

Costs of shipping in the Baltic Sea

Shipping is responsible for a range of various pressures affecting the marine environment, air quality and human welfare. In a new Swedish study, scientists have estimated the annual damage costs of shipping activities in the Baltic Sea to amount to €2.9 billion. When comparing the different pressures, they found that costs due to impacts on marine eutrophication (€768 million) and marine ecotoxicity (€582 million) were in the same range as the costs associated with reduced air quality (€816 million) and climate change (€737 million).

Link to the study "Valuating environmental impacts from ship emissions – The marine perspective" by E. Ytreberg, S. Åström, and E. Fridell: https://doi.org/10.1016/j.jenvman.2021.111958

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Turkey bans open-loop scrubbers

Turkey has become the latest country to ban the use of open-loop scrubbers on ships in its territorial waters, thus joining a growing list of countries taking action against open-loop scrubbers, including China, Saudi-Arabia, Singapore and many European ports and regions.

Source: Splash247, 12 April 2021.

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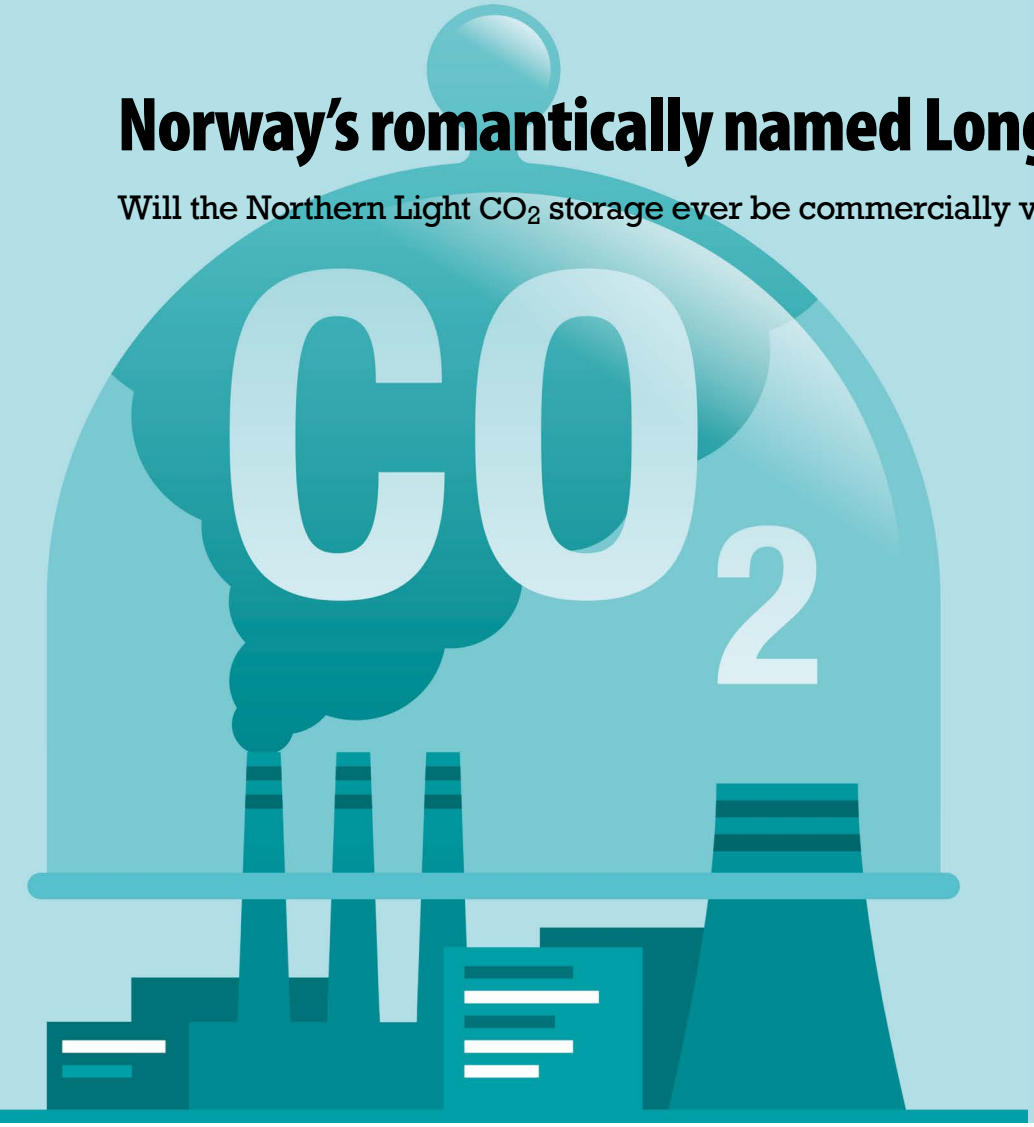
Lisbon going for electric ferries

Ten new electric ferries will come into service in Lisbon, Portugal, between 2022 and 2024, replacing ferries currently running on diesel. The ships will be supplied by ABB and operated by public ferry company Transtejo. They will have total battery capacity of 1,860 kWh per ship, and each ferry will be able to carry up to 540 passengers, at a maximum speed of 17 knots.

Source: Ship & Bunker, 12 April 2021.

Norway's romantically named Longship CCS project

Will the Northern Light CO_2 storage ever be commercially viable?



The Norwegian government announced in September 2020 that it would launch a Carbon Capture and Storage project (CCS) called the Longship. The CO_2 storage part is called the Northern Lights project. A carbon capture installation will be built at a cement factory in Porsgrunn in Norway. The captured CO_2 will be transported by tankers to a terminal on the west coast of Norway. A pipeline will transport the CO_2 out into the North Sea. There, the CO_2 will be pumped down into a geological formation deep under the sea floor. The intention is that the CO_2 will then be kept out of the atmosphere, and will not contribute to dangerous global warming and climate change.

The then Norwegian Prime Minister, Jens Stoltenberg, famously declared in 2007 that a Norwegian CCS project was going to be Norway's equivalent to the moon landing. The first attempt, the Mongstad CCS project, was called off by the outgoing government of Mr. Stoltenberg on its last day in office in 2013. The reason given was that the carbon capture plant was going to be too expensive. It would therefore not contribute to a lower unit cost for carbon capture plants generally. This was important if CCS were to grow and become a real solution for reducing CO_2 emissions. The newspapers concluded that the moon landing had crashed. When the new project was launched in 2020, one headline was predictably: "To the Moon in a Longship".

The cost per unit stored underground is also important in 2021. The cost per tonne of CO_2 captured from the cement factory alone will be 104 euro (see Lundberg, Acid News December 2020). To that, you must add transportation and storage costs. For comparison, the price for CO_2 emissions in the ETS is currently around 40 euro/tonne. (EMBER 270421). The Longship project does not seem to bring down the cost of CCS to a level that makes it competitive in the market. It will need massive government subsidies, during both the construction phase and the operational phase.

The real long-term cost of the storage facility may also increase. The cost per tonne of CO_2 stored will be lower the more it can store. The storage capacity may be smaller than anticipated, and this will drive the cost up. An increasing volume of CO_2 from foreign commercial customers will also lower the unit cost. But foreign customers are facing legal and economic barriers. An international convention has been amended to allow for the export of CO_2 across international borders. However, this amendment has not yet been ratified by the signatories of the convention. There is also a great deal of uncertainty about the willingness of foreign governments to subsidise the export of CO_2 from their countries to the CO_2 storage facility.

Even if the problems listed above are somehow resolved, it is difficult to say with absolute certainty that the Northern Lights storage will provide really safe storage for thousands of years. The owners will of course maintain that the storage is safe, and will argue that it will be monitored closely. The proof will be if no leaks can be detected. However, there is a saying that "Absence of proof does not equal proof of absence". In other words, the detection methods may just not be good enough to detect the very small leaks of CO_2 that could compromise the safety of the storage. In order for storage to be safe, it must contain the CO_2 for 10,000 years with a yearly leakage rate of less than 0.01 per cent from the total amount of stored CO_2. It is hard to imagine a monitoring technology sensitive enough to detect such low leakage rates. If the CO_2 from the storage enters the atmosphere though faults in the rock above, the storage is not safe. Previous studies of the existing CO_2 storage at the Sleipner CCS project in the North Sea show the potential for significant leaks. Numerous faults and natural holes in the overlaying rock layers may lead to considerable leaks. This is not unusual in North Sea geological formations. The conclusion is that leakage is a huge risk connected with underground storage of CO_2, a risk that may compromise the safety of the storage.

Tore Braend

Looking back over 40 years

1980

Four Swedish environmentalist organisations set up a joint project for the international dissemination of information on air pollution and acidification. This leads to the establishment of the Swedish NGO Secretariat on Acid Rain in January 1982, re-named the Air Pollution & Climate Secretariat (AirClim) in 2008.

An eight-year research project in Norway confirms that there had been an increase in the acidity of precipitation and that there is a connection between acidification and reduced fish stocks.

1981

Reports begin to appear in the West German press of a marked increase in damage to forest trees, which could be attributed to air pollution.

A cost-benefit study produced by the OECD shows that the economic gains of halving West European emissions of sulphur over a 10-year period could be worth as much as six times the costs.

1982

At the Stockholm Conference on Acidification of the Environment, scientists state that if acidification of the surface waters in sensitive areas is to be avoided, annual depositions of sulphur should be less than 3–5 kg per hectare. Afterwards, West Germany, which had been strongly opposed to any international action, surprises a meeting of environment ministers by urging that all countries should tackle air pollution at its source.

1983

The first International Acid Rain Week takes place in April, accompanied by a series of awareness-raising activities carried out by environmentalist organisations in several European countries.

Entry into force of the 1979 Convention on Long-Range Transboundary Air Pollution (LRTAP). At the first meeting of the Convention's Executive Body, Sweden, Norway, and Finland jointly propose that countries should reduce their emissions of SO_2 by at least 30 per cent by 1993. Five other countries – Austria, Canada, Denmark, Switzerland and West Germany – back the proposal.

A proposal for a new EC directive to reduce emissions of SO_2, NOx and dust from large combustion plants – evidently influenced by West German legislation adopted earlier in the year – is put forward by the Commission.

1984

Ten countries, meeting in Ottawa in March, commit to reducing their emissions of SO_2 by at least 30 per cent by 1993. A June meeting of ministers in Munich boosts the membership of this 30-per-cent club to 18.

1985

By signing the first protocol to reduce emissions under the LRTAP Convention, 21 countries commit to reducing their emissions of sulphur dioxide by at least 30 per cent from 1980 to 1993.

Environment ministers of EC countries agree on new emission standards for cars, to be introduced in stages over three years, starting in 1988.

1986

A report published by the Nordic Council in April sets out critical loads for sulphur and nitrogen based on scientific evidence. Basing their claims on the Nordic Council's report, European environmentalist organisations put forward a call to reduce SO_2 and NOx emissions by at least 90 and 75 per cent respectively, adding that emissions of ammonia and VOCs would also have to be cut considerably.

1988

In a further protocol to the LRTAP Convention, 26 countries agree not to let their emissions of NOx exceed 1987 levels after 1994. The critical load concept is adopted by the Convention, thus making it central to the development of future protocols.

After five years of negotiation, in November the environment ministers of the EC adopt a directive to limit emissions of SO_2, NOx and dust from large combustion plants, known as the LCP directive.

Recognising the problem of potential global climate change, the World Meteorological Organization and the UN Environment Programme establish the Intergovernmental Panel on Climate Change (IPCC). In June, the Toronto Conference on the Changing Atmosphere becomes the first high-level international meeting to recommend targets for reducing greenhouse-gas emissions.

1989

In June, the EC environment ministers decide to set stricter requirements for cars. With effect from 1993 all new petrol-driven cars must be equipped with catalytic converters.

1989–1990

The turmoil occasioned by political change in Central and Eastern Europe leads to a marked fall in industrial output and energy consumption, with a consequent reduction in emissions of air pollutants.

1990

Researchers at Stockholm Environment Institute publish an assessment recommending that the temperature rise should be limited to 0.1°C per decade, and the maximum rise in the mean global temperature above the pre-industrial level should not exceed 1.0 to 2.0°C (low and high risk limits).

Legislation on industrial emissions passed in West Germany in 1983 has resulted in the commissioning of almost 200 desulphurisation plants at power stations with a total generation capacity of 38,000 MW. In addition, power stations with a capacity of more than 30,000 MW have been equipped for selective catalytic reduction (SCR) of NOx emissions.

1991

Twenty-one countries sign the VOC protocol to the LRTAP Convention, most of them with the aim of reducing their emissions by at least 30 per cent between 1988 and 1999.

A strategy to limit emissions of CO_2 and improve energy efficiency is proposed by the European Commission.

1992

The UN Framework Convention on Climate Change (FCCC) is adopted in May. Although it involves no binding commitments, industrialised countries promise to aim to keep CO_2 emissions below their 1990 levels after the year 2000.

1993

In its Fifth Environmental Action Programme, the EC states that the

long-term objective for acidification is that critical loads should never be exceeded. Moreover, "all people should be effectively protected against recognized health risks from air pollution," and WHO values should "become mandatory at EC level" by the year 2000.

1994

The second sulphur protocol to the LRTAP Convention, signed by 26 countries, is the first to use the critical loads approach. Setting separate ceilings for each country's emissions, it was expected to more than halve overall European emissions of SO_2 by 2010, in relation to 1980 levels.

1995

Austria, Finland and Sweden join the European Union (EU). The EU Council of environment ministers decides to develop an EU-wide acidification strategy with the eventual aim of ensuring zero exceedances of critical loads. The acidification strategy was adopted by the Commission in 1997.

1996

Completion of the first installation for flue-gas desulphurisation (FGD) at a British coal-fired power plant. This cuts emissions from one of Europe's largest coal-fired plants (Drax, 4000 MWe) by more than 90 per cent, from around 300,000 to between 20,000 and 30,000 tonnes of SO_2 per year.

The European Commission proposes new exhaust and fuel standards for road vehicles largely based on the outcome of several years of collaboration between the Commission, the oil industry and vehicle manufacturers under the Auto-Oil programme. The new standards were adopted by the Council in 1998–99.

1997

Revised air quality guidelines are issued by the World Health Organization (WHO). These guidelines subsequently influence the setting of limit values in EU directives for air quality.

After seven years of debate, the first global standards aimed at reducing air pollutant emissions from ships (Annex VI to the MARPOL Convention) are adopted by the UN International Maritime Organization (IMO).

EU environment ministers agree in March that the aim of global climate negotiations should be to strive to reduce emissions from industrialised countries by 15 per cent between 1990 and 2010.

The Kyoto protocol to the UN FCCC is signed by 160 countries. It is expected to bring about a 5.2-per-cent reduction in industrialised countries' emissions of greenhouse gases between 1990 and 2008–2012.

1998

The Commission presents a proposal for revision of the 1988 directive on emissions of SO_2, NOx and dust from large combustion plants.

In an agreement with the Commission, the car industry promises that average emissions of CO_2 from new cars sold in the EU will not exceed 140 g/km by 2008/09.

1999

Two new EU directives for air pollution control are adopted. One limits the sulphur content of heavy fuel oil to 1.0 per cent (from 2003) and that of gas oil to 0.1 per cent (from 2008). The other sets new, stricter emission limits – so-called Euro III, IV and V standards – for heavy-duty vehicles, to be introduced in three stages between 2000 and 2008.

The first daughter directive under the 1996 framework directive on ambient air quality is adopted. It covers SO_2, NO_2, particles (PM_{10}) and lead, and sets limit values to be achieved by 2005 or 2010.

In June the Commission puts forward a proposal for a new directive, adapted to its acidification and ozone strategies, setting binding national emission ceilings for four major air pollutants (the NEC directive).

In Gothenburg, 27 countries sign the LRTAP Convention's Protocol to abate acidification, eutrophication and ground-level ozone (also known as the Gothenburg Protocol), which sets national emission ceilings for 2010 for four air pollutants. This is expected to bring down overall European emissions of SO_2 by 63 per cent, those of NOx and VOCs by 40 per cent, and of NH_3 by 17 per cent, all from 1990 levels.

2000

A proposal for a European climate change programme is presented by the Commission. It suggests setting up a greenhouse gas emissions trading scheme (ETS), starting in 2005.

2001

According to the third assessment report of the IPCC, global temperatures could rise between 1.4 and 5.8°C over the next hundred years.

In its Clean Air For Europe (CAFE) programme, the Commission says that it intends to bring all its efforts to improve air quality under one umbrella. The first major outcome will be a thematic strategy on air pollution to be adopted in 2004.

Towards the end of the year, the directive on national emission ceilings (NEC) and the revised LCP directive (setting stricter emission standards for large combustion plants) are adopted. The NEC directive is expected to cut emissions of SO_2, NOx, VOCs and NH_3 from the 15 EU member states by 76, 51, 60, and 18 per cent respectively, between 1990 and 2010.

At UN FCCC meetings in Bonn and Marrakech, an agreement is finally reached – after four years of negotiating – on how the Kyoto Protocol should be interpreted.

2002

In its Sixth Environmental Action Programme, the EU sets long-term objectives for air quality, acidification and eutrophication, including the stipulation that critical loads and levels should never be exceeded.

An EU strategy on air pollution from seagoing ships is presented by the Commission, including a proposal to regulate the sulphur content of marine fuels.

2003

After conciliation, a new EU directive is adopted that will lower the sulphur content in petrol and diesel for road vehicles to 50 ppm from 2005, and to 10 ppm from 2009.

The world's biggest experiment in congestion charging begins in London in February and reduces overall traffic levels by 15–20 per cent.

2004

Representing the largest number of countries ever admitted at one time, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia accede to the EU on 1 May.

Air pollutants, primarily fine particles ($PM_{2.5}$), are responsible for the premature death of some 370,000 people every year in the EU25, according to calculations for the EU's CAFE programme.

2005

The Kyoto Protocol comes into force. The EU Heads of State back calls for a 15–30 per cent reduction in GHG emissions from industrialised countries by 2020. They also endorse the goal of keeping global temperature rise below 2°C above pre-industrial levels.

Late implementation and inadequate plans result in many cities in most EU member states not meeting the air quality standards for PM_{10} that became mandatory from January this year.

By revising the directive on sulphur in liquid fuels, EU legislation now sets limits on the maximum allowable sulphur content of shipping fuels used in European sea areas.

The 1997 Annex VI to the IMO's MARPOL Convention comes into force. The IMO's Marine Environment Protection Committee agrees to revise Annex VI, with the aim of adopting stricter new global emission standards for international shipping before the end of 2007.

The Commission presents its Thematic Strategy on Air Pollution, which sets the level of ambition regarding air quality in the EU until 2020. As part of the strategy, the Commission also proposes a new air quality directive, adding standards for $PM_{2.5}$.

2006

The WHO reinforces its air quality guidelines for a number of pollutants and makes them global.

In December, new EU passenger cars emission standards for NOx and PM are agreed, with Euro 5 standards to become mandatory from 2009, and Euro 6 standards from 2014.

Allowing greenhouse gas emissions to continue to increase may cost up to 20 per cent of global GDP, according to a report by former World Bank chief economist Nicholas Stern, published on 30 October.

2007

EU Heads of State agree that EU greenhouse gas emissions must be cut by at least 20 per cent between 1990 and 2020. Moreover, 20 per cent of energy used in the EU in 2020 must come from renewable sources.

Evidence that human activities are causing the planet to warm is now "unequivocal", the IPCC says in its fourth assessment report. To meet the target of 2°C with a reasonable degree of confidence, emissions in 2050 must be 50–85 per cent below the 1990 level.

A new scientific study reveals that emissions from international shipping kill up to 64,000 people a year, including 27,000 in Europe, at a cost to society of more than USD 330 billion per year.

2008

A new EU directive on air quality is adopted, setting the first-ever limits for $PM_{2.5}$, which must not exceed the annual mean of 25 µg/m3 from 2015. This is significantly weaker than the WHO guideline limit of 10 µg/m3. It also allows EU states to delay implementation of existing limit values for PM_{10} (from 2005 to 2011) and NO_2 (from 2010 to 2015).

After three years of negotiations, new global limits on emissions of SO_2 and NOx from international shipping are adopted by the IMO. This means that the maximum content of sulphur in marine fuels will come down from the current 4.5 per cent, to 3.5 per cent in 2012 and then down to 0.5 per cent in 2020.

In December, the EU 2020 Climate Package is agreed, with the goal of reducing GHG emissions by at least 20 per cent by 2020, from base year 1990. It also sets goals of a 20-per-cent share of renewables and 20-per-cent energy savings to be achieved by 2020.

2009

Euro VI emission standards for heavy-duty vehicles are adopted. The new emission limits, which also include particle number (PN) limits, become effective from 2013.

A new EU regulation for passenger cars establishes a CO_2 emission target of 130 g/km to be reached by 2015. The regulation also defines a long-term target of 95 g CO_2/km to be reached from 2020.

In the run-up to the UN FCCC's COP15 in Copenhagen in December, a coalition of island states and least-developed countries jointly call for global GHG emissions to peak by 2015 and be cut by 85 per cent by 2050, from 1990 levels. Moreover, rich countries should reduce emissions by 40 per cent by 2020 and 95 per cent by 2050. Such reductions are needed to keep temperature rise as far below 1.5°C as possible.

While COP15 in Copenhagen managed to gather most world leaders, the outcome was widely seen as a failure, as no timetable for binding new emission reductions was agreed.

2010

A new EU directive to prevent and control emissions from industrial installations is adopted. The industrial emissions directive (IED) incorporates into a single legal text seven older directives, including those on integrated pollution prevention and control (IPPC) and large combustion plants (LPC), and sets stricter emission limits for SO_2, NOx and dust.

The IMO designates waters off North American coasts as an emission control area (ECA), mandating max 0.1 per cent sulphur in marine fuels from 2015 and stricter NOx emission standards for new ships from 2016.

2011

The Commission announces in March that prompt action is required to further reduce air pollution by PM, NO_2 and ground-level ozone, and that an up-to-date clean air strategy is to be adopted in 2013, including a proposal to revise the NEC directive.

Europe should take an integrated approach for management of reactive nitrogen, say scientists in the European Nitrogen Assessment programme. They estimate that the overall health and environmental costs of nitrogen losses amount to €70–320 billion per year.

2012

After five years of negotiations, a revised Gothenburg Protocol to the LRTAP Convention is finalised in May, establishing new binding country-by-country emission reduction targets for five main air pollutants, to be achieved by 2020.

A new EEA assessment of compliance with the NEC directive shows that 12 EU member states exceeded one or more of their emission ceilings for 2010.

The WHO expert group IARC concludes that diesel exhaust can cause lung cancer.

The EU revises its directive on sulphur in marine fuels, primarily to bring EU regulations into line with MARPOL Annex VI on sulphur limits for ships operating in emission control areas (ECA). Moreover, the IMO global 0.5 per cent sulphur limit will become mandatory in EU waters outside ECAs by 2020.

2013

A new global treaty to cut mercury pollution – the Minamata Convention – is agreed, containing a mixture of mandatory and voluntary measures.

The WHO-led project REVIHAAP shows links between $PM_{2.5}$ and mortality at levels below the current WHO air quality guideline of 10 µg/m3 and recommends a revision of the guidelines by 2015.

In December, the Commission presents its "Clean Air Programme for Europe". The main legislative proposal is to revise the NEC directive, setting new country-by-country emission reduction requirements for six main air pollutants up to 2030. The monetised health benefits of less air pollution in 2030 are up to 42 times greater than the emission abatement cost.

2014

To keep its international climate pledges, the EU must cut GHG emissions by 40 per cent between 1990 and 2030, says the Commission. Emissions covered by the ETS should fall by 43 per cent, and the share of renewables in the energy mix should be at least 27 per cent by 2030. No binding target for energy efficiency is proposed.

The WHO reports that air pollution (outdoor and indoor) is now the world's largest single environmental health risk, linked to around 7 million deaths in 2012.

A Dutch study finds that diesel-driven Euro 6 cars emitted around 500 mg NOx/km in real-world driving – more than six times the emission limit of 80 mg/km.

Air pollution from residential heating with solid fuels (wood and coal) causes more than 60,000 premature deaths per year in Europe, according to a study by a LRTAP Convention expert group.

2015

From 1 January, all ships in the Baltic Sea and the North Sea must comply with the ECA limit of max 0.1 per cent sulphur in marine fuels. The same limit also applies in waters within 200 nautical miles of North American coasts.

In September, the US EPA announces that Volkswagen breached federal emissions legislation by fitting illegal software (defeat devices) to cheat emissions tests, resulting in excessive NOx emissions of 10–40 times the US limit. "Dieselgate" is soon found to involve millions of diesel cars in Europe.

In Paris, on 12 December, the UN FCCC adopts a new legally binding international treaty to limit global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels.

2016

The new NEC directive is finally adopted after more than two years of negotiations. It is expected to cut EU emissions of SO_2, NOx, $PM_{2.5}$, VOCs and NH_3 by 79, 63, 49, 40 and 19 per cent respectively by 2030, compared to 2005, and almost halve the health impacts of air pollution. During the negotiations, member states managed to remove the ozone precursor methane completely from the directive, despite objections from the Parliament and the Commission.

Stricter air pollution standards for machinery are adopted in the revised non-road mobile machinery (NRMM) directive, covering diesel and petrol engines in a wide variety of off-road applications, including bulldozers, trains, chainsaws and larger inland ships.

2017

In a landmark ruling, the EU Court of Justice in April finds Bulgaria to be in breach of the air quality directive, having systematically and continuously exceeded PM_{10} limit values and having failed to prepare effective air quality plans.

Stricter air pollution emission standards for large combustion plants are set out in a new reference document for best available techniques (BREF) under the industrial emissions directive. The new standards will apply from 2021.

Three-quarters of EU ecosystems are exposed to more nitrogen deposition than they can cope with and nearly one-tenth is still receiving too much acid fallout, according to new data from CLRTAP experts at the Coordination Centre for Effects.

2018

Germany's highest federal administrative court in February rules that German cities in areas where air pollution exceeds legal limits can introduce diesel restrictions with immediate effect.

In its first Clean Air Outlook, the Commission shows that only a handful of countries will have to take additional measures to meet their 2030 emission targets for SO_2 and NOx, while more effort is required by many countries to achieve the targets for VOCs and $PM_{2.5}$, and especially for NH_3.

Noting that the Commission has 30 ongoing infringement proceedings on the air quality directive, the European Court of Auditors urges tougher action on air pollution by member states and the Commission. It also proposes to update the directive, including alignment of the standards with the latest WHO guidance.

The IMO finally agrees an initial greenhouse gas strategy for shipping, aiming to reduce emissions by at least 50 per cent by 2050, compared to 2008. Specific short-, medium-, and long-term measures are to follow later.

Responding to the IPCC's 1.5°C report, published in October, Climate Action Network Europe concludes that the EU must cut domestic GHG emissions by at least 3 per cent per year, and reach near-zero emissions by 2040.

2019

Establishing an emission control area (ECA) in the Mediterranean Sea areas would slash emissions of SO_2, NOx and $PM_{2.5}$ and bring significant health and environmental benefits, according to two independent expert studies.

New calculations show that air pollution causes nearly 800,000 premature deaths each year in Europe and 8.8 million worldwide, nearly double previous estimates.

The LRTAP Convention celebrates its 40th anniversary in November and decides to start a review of the 2012 Gothenburg Protocol.

In December, the Commission announces the European Green Deal, including plans to come forward with a series of initiatives and legislative proposals relevant to the climate and air pollution, such as a climate law, revision of the ETS, action plans on circular economy and zero pollution, and a farm-to-fork strategy.

2020

Measures introduced to combat the global Covid-19 pandemic result in (temporarily) reduced emissions of air pollutants and GHG. The lockdowns have significantly improved air quality, particularly in big cities.

In its NEC directive implementation report, the Commission says that most member states are at risk of not complying with their 2020 or 2030 emission reduction commitments, and that efforts are especially needed to reduce ammonia emissions from agriculture.

In September, the Commission proposes a new EU target for 2030 to reduce GHG emissions by at least 55 per cent compared to levels in 1990, a target that was later also supported by member states. But the European Parliament wants a target of 60 per cent, and environmental groups say that at least 65 per cent is needed in order to avoid dangerous climate breakdown.

Christer Ågren

Big benefits of shore-side electricity

Shore-side electricity can drastically reduce the emissions from fossil-fuel-powered auxiliary engines of ships at berth, according to a new study that has estimated the auxiliary power demand at berth for 714 major ports in the European Economic Area and the UK.

The level of emission reductions depends on whether the auxiliary power demand at berth would be supplied from national grids or from green (CO_2-neutral) electricity. The former could reduce annual CO_2 emissions by 3 Mt, and the latter by 5 Mt. This equals an average reduction of overall shipping emissions by 2.2 (3.7) per cent and requires only 0.2 per cent (6.4 TWh) of the current electricity generation capacity of the EEA and the UK. Using shore-side electricity from the grid can also contribute to substantial annual local air pollution reductions of 86,400 tonnes of NOx, 4,100 t SOx, 1,600 t PM_{10}, 4,300 t CO, 94 t CH_4, 4,800 t NMVOC, and 235 t N_2O.

Link to the study "The CO_2 reduction potential of shore-side electricity in Europe" by B. Stoltz et al: https://doi.org/10.1016/j.apenergy.2020.116425

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Deteriorated rivers breathe out greenhouse gases

Rivers and streams have been found to release up to 3.9 billion tonnes of carbon annually[1]. Whereas carbon emission from rivers is a natural ecosystem process, the emission rates can be significantly increased by human-induced degradation of rivers. This problem is especially pronounced for urban rivers. A study from the Cuenca urban river system in Ecuador showed, for instance, a clear relationship between pollution status and greenhouse gas emissions, and the global warming potential of heavily polluted rivers was up to ten times higher than that of rivers with acceptable water quality[2]. Similarly, a study of rivers in Hong Kong showed that emissions of carbon dioxide, methane, and nitrous oxide were 2.2, 1.5 and 4.0 times higher, respectively, from polluted rivers than from those in better condition[3].

A consequence of such findings is that the protection and restoration of rivers could significantly decrease emissions of greenhouse gases from these water bodies. In the EU, the implementation of river restoration programmes as part of the European Green Deal, the Water Framework Directive and the EU Biodiversity Strategy for 2030 is vital in order to improve the state of European rivers. The urgency of such measures was recently highlighted in a scoping paper by the Living Rivers Europe Coalition[4], which builds on a position paper by more than 20 NGOs in Europe.

1. https://aslopubs.onlinelibrary.wiley.com/doi/full/10.1002/lol2.10055

2. https://bg.copernicus.org/preprints/bg-2020-311/

3. See https://www.bbc.com/future/article/20210323-climate-change-the-rivers-that-breathe-greenhouse-gases, which was the main source of information for this text

4. https://eeb.org/library/protecting-and-restoring-river-ecosystems-to-support-biodiversity-scoping-paper-on-eu-restoration-targets-for-free-flowing-rivers-and-freshwater-ecosystems/

Agri-PV a useful synergy between agriculture and solar energy

The co-developing of land for both solar photovoltaic power and agriculture has gained interest. Experts state that the synergy would benefit food and energy production, as well as decreasing both water demand and carbon emissions.

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The idea of agricultural photovoltaics (Agri-PV) was introduced early in the 1980s. It was stated that energy collectors and agriculture could share the same land area and that this coexistence would in fact boost the benefits. It would also avoid the land-use conflict between the different kinds of solar harvesting. Forty years later and a growing concern are indeed land-use conflicts between food and energy production.

In recent decades the cost of solar development has decreased and with it the volume of solar energy generation has increased. The plummeting cost of turning sunlight into electricity is beating forecasts by decades, speeding the transition toward a clean energy system. Solar prices have sunk low enough to make photovoltaics the cheapest source of electricity in most of the world, undercutting fossil fuels in price without even including costs such as air pollution and climate change.

In late 2020, SolarPower Europe launched a report focusing on boosting the development of Agri-PV in rural areas of Europe. The development empowers farmers to be at the heart of the European Green Deal and the post-Covid green recovery. Agri-PV supports the transition to a sustainable food supply and ecosystem, as well as supporting the objectives of the Common Agricultural Policy, the Farm to Fork Strategy and The Clean Energy Package.

The process is still developing, and methods are being established to adapt solar sharing to the production processes of many different crops. Most commonly, solar panels are attached to taller arrays to allow farm production beneath, such as machinery access, crop growing and animal movement. Originally, panels were spaced to allow for optimum light access and specific wavelengths to reach the crops and the PV panels. Today, the methods for accomplishing this are more advanced, as

panels can be made translucent or mechanically adjustable. This allows finer control of the amount and/or which wavelengths of light that are absorbed by the panel or allowed to reach the crops.

The development of Agri-PV can mitigate risks associated with extreme weather conditions. It can shade crops, protecting it from high temperatures and thus decreasing water stress during droughts.

Agri-PV can also shield crops from extreme weather events, such as hail. With the aid of digital solutions, Agri-PV can adapt to the needs of the crops by optimising the level of shading or humidity needed with the generation of electricity.

Furthermore, by protecting agricultural output and providing a revenue complement to farmers, Agri-PV systems reduce the need for government intervention in case of crop failures due to climate change impacts. Between 2007 and 2016, land temperatures in Europe were about 1.6°C warmer than in pre-industrial times. The reported economic losses, between 1980 and 2016, from weather and extreme climate-related events are estimated to be over €436 billion.

It has been estimated that deploying Agri-PV on one percent of global cropland could help meet total global energy demand. Since 2014, around 2,800 Agri-PV systems have been deployed worldwide, mostly in Japan, South Korea, and China, where regulatory frameworks and support schemes have already been in place for a number of years. If Agri-PV were deployed on only one percent of Europe's arable land, its technical capacity would be over 700 GW, generating more than 25 percent of the EU's current electricity consumption. The development of Agri-PV in Europe is fragmented among EU member states, with growth concentrated in France[1].

In France, research conducted on a vineyard showed that solar panels reduced water irrigation needs between 12 to 34 percent through shading. Additionally it showed an increase in the quality of the fruit. Grapes grown in this manner will generate an additional 13 percent of anthocyanins, the phenolic compounds that give red wine its distinctive colour, and 9 to 12 percent of additional acidity. Agri-PV can also create benefits for biodiversity. In the UK, renewable energy developer Ecotricity became one of the first "bee guardian" businesses in the country with its plans to create a "bee haven" at its solar farm in Lincolnshire. They planted a 20,000-panel solar farm with native wildflower seeds to encourage bees and insects to the site.

Unemployment in rural communities, specifically for young people, is an important challenge. Between 2015 and 2017, the average unemployment rate for young people in rural areas was 18 percent. Furthermore, the rural population is decreasing across the EU. Between 2013 and 2017, approximately 500,000 people left rural areas in favour of larger urban centres.

The solar industry stimulates the social and economic fabric of rural areas, generates new employment opportunities, and diversifies the economic structure of rural communities. Solar creates more jobs per megawatt of power generated than any other energy source. The development of Agri-PV projects supports jobs in the downstream activities of the PV sector, such as installation, engineering, or operation and maintenance of the Agri-PV installations.

Agriculture represents the majority of water consumption in the EU, accounting for approximately 40 percent of water resources in 2019. Globally, farming activities account for 70 percent of global water withdrawals, reaching as much as 95 percent in some developing countries[2]. Sustainable management of scarce water resources will be essential to maintaining agricultural practices. Agri-PV contributes to decreasing the water needs of farming by sheltering crops from heat and by reducing evaporation. Soil below the shade of PV panels retains moisture, providing ideal conditions for certain types of crops.

Water consumption can be further improved with digitalised Agri-PV solutions that can register solar irradiation and better regulate the microclimatic conditions beneath the panels. Additionally, Agri-PV can be used to power the pumping of underground water for irrigation, replacing diesel generators.

Alain Desvigne, CEO of Amarenco Group and Chair of SolarPower Europe's Agri-PV workstream, said: "Agri-PV is not only a solution towards building more resilient economies and mitigating the global impact of climate change, it is one of the most versatile technologies as it integrates the production of low carbon and local energy together with the farming of local crops, the conservation of biodiversity, and the protection of agriculture against major climatic events, achieving multiple key benefits on the very same land."

Emilia Samuelsson

Based on

SolarPower Europe (2020). Agri-PV: How solar enables the clean energy transition in rural areas. Briefing Paper. Accessed 11 February 2021.

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2. EPRS (2019) European Parliamentary Research Service. Irrigation in EU agriculture. Accessed 12 February 2021.

Direct Air Capture: Billionaires dream of vacuuming carbon out of the atmosphere

Direct air capture of CO_2 is getting a lot of media traction, and a lot of finance from US billionaires. But the very few machines do not suck up much CO_2, so Carbon Engineering uses Photoshop to increase their numbers.

Direct Air Capture (DAC) is a simple idea. It means sucking up CO_2 from ambient air with big fans, capturing it in a liquid and disposing of it.

This is what a tree, or other photosynthesising organisms do. Can a machine do it better and cheaper? Can it do it on a relevant scale to stop and reverse climate change?

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One of the few companies behind the DAC media blitz is Canadian Carbon Engineering, which claims that it is engineering a DAC plant that will capture one million tons/year, and will start construction in 2023. If so, it will be by far the largest such plant in the world.

If this really happens, and the plant operates at capacity, it is important to put one million tons in perspective. Global CO_2 emissions were 31,500 million tons in 2020, so it will take a lot of DAC to make a dent. Wind and solar produced 2,154 TWh of electricity globally in 2019, which with the present world energy mix means that they mitigated CO_2 emissions by just over 1,000 million tons that year, with much more to come.

The one million tons that Carbon Engineering is aiming for will not exactly be one million tons of mitigation, as the CO_2 is to be used for enhanced oil recovery in Texas . The more CO_2 that goes into the well, the more oil will be produced. Occidental is one of the financiers. Carbon Engineering is also backed by Bill Gates, Chevron, and BHP and oil sand financier N. Murray Edwards. It has also received funding from the Canadian government.

Carbon Engineering says that the energy input for capturing one ton of CO_2 is

either 10 GJ of natural gas or 1500 kWh .

The latter figure is more relevant, because a lot of electricity is needed to run the giant fans. If this electricity is generated using coal power, the whole system will emit more CO_2 than it will capture.

If the electricity is renewable the effect will still be the same. New renewable power will then drive DAC fans instead of replacing fossil power.

This is why many of the billionaire backers, such as Bill Gates, want new kinds of nuclear power – to power the DAC plants.

Yet another billionaire, Peter Thiel, the founder of PayPal, a Trump advisor and big-time Republican Partydonor, is behind Climeworks in Switzerland, the one company in the world that actually sells DAC systems (though not many). Thiel is a climate skeptic, is opposed to women's right to vote, and has injected himself with young people's blood in order to postpone or inhibit his death.

Bill Gates is behind Climeworks, too. His Breakthrough Institute, which supports DAC, nuclear and this and that, is also financed by the Putin-ish oligarch and major shareholder in Facebook and Twitter, Yuri Milner, renowned from the Panama papers .

The largest plant that uses Climeworks tech and the largest DAC plant in the world is on Iceland, next to a geothermal plant. It captures 4,000 tons (0.004 million tons) of CO_2 per year .

It uses even more energy than Carbon Engineering: 2000 kWh of heat and 650 kWh of electricity per ton of CO_2, and those are "figures expected for scaled-up machines".

Climeworks offers subscriptions for negative emissions . For €49/month you can save 0.6 ton of CO_2 per year. That is €980/ton, which may be a realistic estimate of the cost of DAC, but is more than 20 times the CO_2 price in the EU emission trading system.

They use alkaline rock (basalt) to absorb the CO_2. This rock exists because Iceland is volcanic, and volcanoes emit very alkaline rock. If left alone this rock will slowly absorb CO_2 from the air and become less alkaline.

"We turn CO_2 into stone", is the slogan of the Icelandic company Carbfix that uses the Climeworks technology.

Unless you have fresh volcanic rock, the storage part will be even more difficult and expensive. The plant in Iceland offers other unusual advantages. It gets free heat from the nearby geothermal plant, and electricity on Iceland is abundant, coming either from geothermal or hydro power. Water is also abundant, which is not the case everywhere. The plant also gets money from the EU on top of that from US billionaires.

On a smaller scale, Climeworks has released CO_2 from one of its plants into a greenhouse, where it enhances the growth of produce. But the final fate of that carbon is not known.

Carbon Engineering uses some CO_2 combined with hydrogen to produce synthetic fuel, on a scale at which cost per litre is no object.

They now have what appears to be their first customer. They sell negative emissions to Shopify, an e-commerce company led by billionaire Tobias Lütke – 10,000 tons from a plant they hope to build one day.

A third DAC manufacturer is Global Thermostat, based in New York and supported by Exxon. They claim they "intend to build a one gigaton plant", but even a much smaller 20,000 ton/year plant for a supposed contract with Coca Cola is getting nowhere .

Still more billionaires believe in Direct Air Capture. As might be expected, Elon Musk is one. He has instigated a $100 million prize for what he with characteristic modesty calls "Gigaton-Scale Carbon Removal", with a photo of himself against the background of the Earth from space.

But the world's richest man is trying to do things on the cheap. A $100 million prize will not achieve gigaton removal.

Clean energy investment totalled $500 billion in 2020, according to Bloomberg New Energy Finance.

But could DAC benefit from economy of scale, learning curve, etc?

A little, yes, but not by very much.

The major components are fans, tubes, pumps and absorption chemicals. They have all been produced on a very large scale for a very long time. There is no way to achieve a radical cost reduction, such as happened with electronics and non-crystalline solar cells.

Reinventing the tree should also be compared with actual trees. One study has estimated a potential of 205 gigatons of carbon capture from reforestation and afforestation. As with all such studies, the result is contested, but not the order of magnitude, and there are additional ways of enhancing natural carbon sinks.

Forests deliver a lot more than just carbon removal: biodiversity, clean water and clean air for starters.

A few hundred thousand giant vacuum cleaners, using huge amounts of dangerous chemicals, could do the same job but for a much higher price.

Another thing the billionaires have in common is that they want us to go to Mars, presumably because their egos are too large for just one planet.

But that planet is the one we have.

Nuclear-powered DAC has no chance of saving the planet. All the money in the world can't buy that. But a few billions spent by the billionaires can influence the discourse in ways that are both subtle and less subtle.

The so-called startup Climate Engineering (set up in 2009) has little to show off in the real world. So they produce fictional images of a lot of non-existent plants. They managed to get such an image published together with a promotional news article in Science Magazine . It was also published by Bloomberg's AP News, the Houston Chronicle and several hundred other publications. The Guardian at least mentioned in its caption that it was an "artist's impression". Most did not.

A striking image that costs nothing is very tempting for a magazine or newspaper – even when it is fake.

Fredrik Lundberg

1. https://www.reuters.com/article/idUSL1N2FL0RT

2. https://carbonengineering.com/our-technology/

3. https://www.nytimes.com/2017/11/05/world/yuri-milner-facebook-twitter-russia.html

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9. https://www.scientificamerican.com/article/massive-forest-restoration-could-greatly-slow-global-warming/.

2021 – the make or break year for climate action

In April 2021 the World Meteorological Organization published a new assessment in its State of the Global Climate 2020 report

"This is a frightening report," said United Nations Secretary-General António Guterres, "it needs to be read by all leaders and decision-makers in the world."

"This report shows that 2020 was also another unprecedented year of extreme weather and climate disasters. The cause is clear. Anthropogenic climate change – climate disruption caused by human activities, human decisions and human folly," he said.

The report is accompanied by a story map showing details of key climate indicators, including record greenhouse gas concentrations, increasing land and ocean temperatures, sea level rise, melting ice and glacier retreat and extreme weather. It also highlights impacts on socio-economic development, migration and displacement, food security and land and marine ecosystems.

2020 was one of the three warmest years on record, despite a cooling La Niña event. The global average temperature was about 1.2° Celsius above the pre-industrial (1850–1900) level. The six years since 2015 have been the warmest on record. 2011–2020 was the warmest decade on record.

"Our challenge is clear," said the UN Secretary-General. "To avert the worst impacts of climate change, science tells us that we must limit global temperature rise to within 1.5 degrees of the pre-industrial baseline. That means reducing global greenhouse gas emissions by 45 per cent from 2010 levels by 2030 and reaching net-zero emissions by 2050," he said.

"I count first on developed countries to deliver on climate finance and, as I mentioned, the promised 100 billion dollars a year at the G7 Summit in June. Then, I will urge the G20 countries to take on the greening of the broader financial architecture, to address debt and make climate-related financial disclosure mandatory," said Mr Guterres.

"This is truly a pivotal year for humanity's future. This report shows we have no time to waste," he said.

Compiled by Reinhold Pape

https://trello.com/b/2o9b9c5w/state-of-the-global-climate-2020

http://webtv.un.org/watch/joint-press-conference-the-un-secretary-general-ant%C3%B3nio-guterres-and-the-secretary-general-of-the-world-meteorological-organization-professor-petteri-taalas-on-the-report-on-the-state-of-the-global-climate-in-2020/6249402584001/?term=

EU lawmakers fail again to increase EU climate target

EU should increase the target for 2030 to reduce GHG emissions by at least 65 per cent compared to 1990 levels.

In April 2021 the EU reached agreement on the Climate Law. Climate Action Network Europe is critical of the results of the trilogues and said that "EU lawmakers rushed an agreement on the Law and failed to deliver on what could have been an ambitious climate governance framework, including a strong 2030 emissions reductions target, and expanding the climate neutrality objective to all member states individually". CAN Europe had called on the EU to increase the target for 2030 to reduce GHG emissions by at least 65 per cent compared to 1990 levels. Wendel Trio, Director of Climate Action Network (CAN) Europe, said repeatedly in recent months, "countries are not living up to the promises they made more than five years ago in Paris. As a historic emitter that has already used a high amount of the available carbon budget, the EU needs to make more stringent cuts than the rest of the world".

EU lawmakers have failed again to use the opportunity of the Climate Law negotiations to increase the EU's climate target beyond the already agreed minimum of 55 per cent. "Last minute changes to the way carbon removals will be integrated in the overall target do not really change this," commented CAN Europe.

Wendel Trio further added: "The fact of the matter is that the outcome of the Climate Law negotiations do not bring us any additional emission reductions on top of what the EU had already agreed. The 'at least 55 per cent emission reduction target for 2030' is not in line with the Paris Agreement's ambition to limit temperature rise to 1.5°C. European decision makers missed a historic opportunity to adequately address the climate crisis. This Climate Law is nothing more than a new package for what already exists, rushed by EU lawmakers to bring something to the Leaders' Summit organised by the US. This is definitely not the kind of Climate Law that will help the EU to lead the global efforts to tackle climate change."

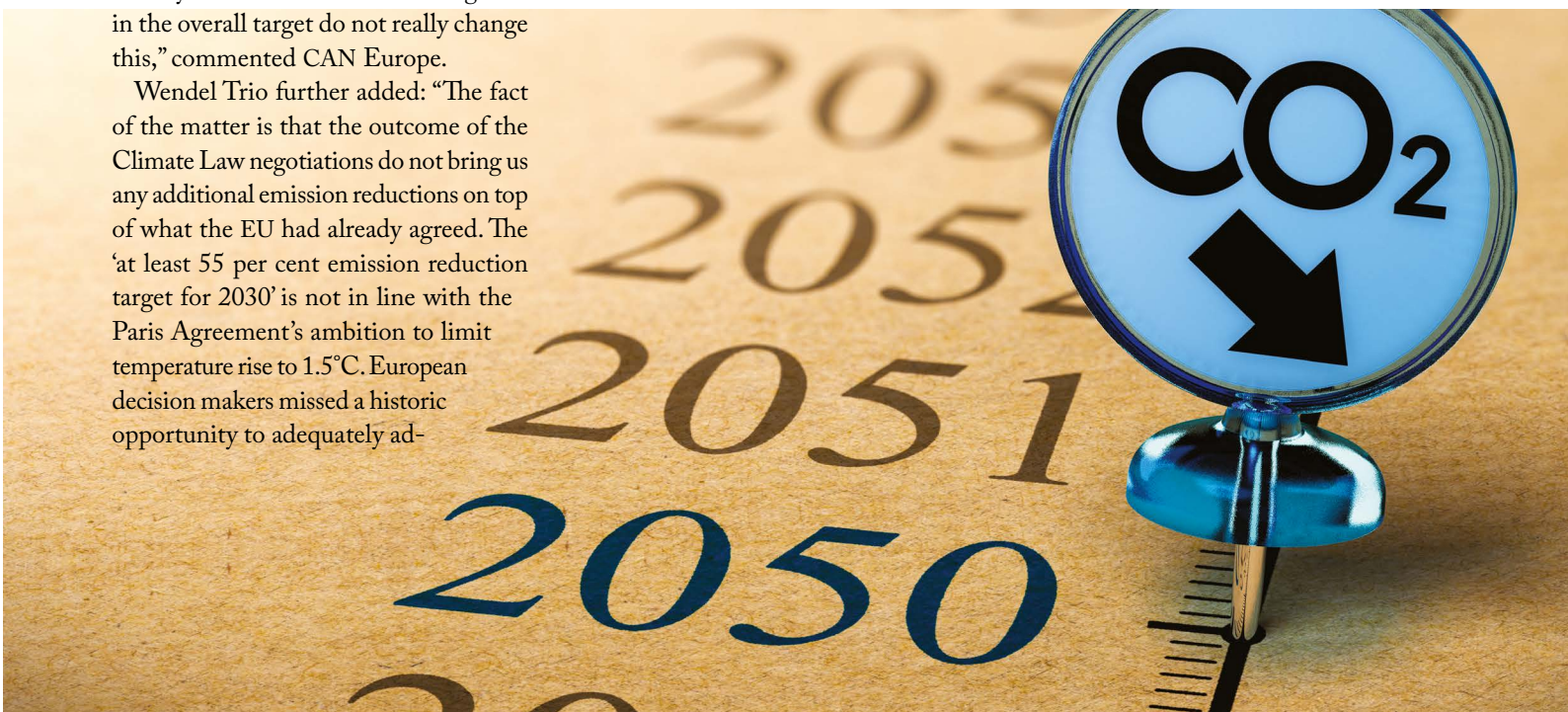
The World Meteorological Organization's most recent report, the "State of Global Climate 2020", has underlined that 2020 was already 1.2°C warmer than pre-industrial times and unprecedented action is needed in the next decade if the world leaders are serious about keeping their promises under the Paris Agreement to limit the global temperature rise to 1.5°C. Unfortunately, the EU Climate Law is far from including an ambitious 2030 climate target that would be aspirational to other big economies. Its final version includes some wording on the additional EU action but does not address the issue of international shipping and aviation. In this way, the Climate Law leaves all decisive action for further increasing the EU's climate ambition to the upcoming climate and energy legislation under the "Fit for 55" package.

On a more positive note, CAN Europe assesses, that "the Climate Law includes the establishment of an expert advisory body that would advise EU decision makers on emissions budgets, targets and trajectories, and the consistency of EU policies. The way the wording currently stands in the text is that the Body is to deliver 'scientific advice on already existing European measures'. However, this risks limiting its role in providing forward-looking policy recommendations across sectors and on the consistency of policies."

"Other key elements of the Climate Law such as extending climate neutrality to all member states or access to justice for citizens ended up not seeing the light of day in the final text due to massive push back from the Council," CAN Europe concluded.

Compiled by Reinhold Pape

https://caneurope.org/the-eu-has-a-climate-law-but-still-fails-to-deliver-the-much-needed-short-term-climate-ambition/



German offshore wind vital to EU target

Germany's plan for a massive expansion of offshore wind farms has now been approved by the European Commission. The goal is to ramp up the construction target from 15 GW by 2030 to 20 GW. By 2040 the goal is to have wind farms that provide 40 GW of capacity.

The plan will include a price premium over 20 years to developers of designated offshore wind locations allocated through "open and transparent competitive tenders", the Commission stated. Subsidies will be granted to developers submitting the lowest bids. The Commission's approval for the plan is valid until 2026.

A contribution of 20 GW offshore wind capacity by 2030 would bring the EU closer to the target of 60 GW by 2030 set by the EU Offshore Renewable Energy Strategy that the EU Commission tabled last year. It mapped out the regulatory framework for the expansion and set a target of 300 GW for offshore wind for the EU by 2050, 25 times more than the EU has today.

Europe invested €26.3 billion in new offshore wind farms in 2020, financing 7.1 GW of new capacity, despite the COVID pandemic, according to WindEurope. "€26 billion in new investments in 2020 is a huge vote of confidence in offshore wind. Investors see that offshore wind is cheap, reliable, and resilient – and that governments want more of it," said Giles Dickson, CEO of WindEurope. Dickson added "Let's keep up this momentum. We now need a comprehensive legislative framework for hybrid offshore wind projects, improved maritime spatial planning and streamlined permitting procedures to unleash the full potential of Europe's offshore wind".

Source: ENDS, March 30th 2021

https://www.endseurope.com/article/1711482/commission-approves-german-scheme-become-offshore-wind-giant

EU expansion of electric vehicle charging infrastructure too slow

The European Court of Auditors (ECA) evaluated the European Commission's support for member states' deployment of charging stations and the associated EU funding. The auditors' finding was that that funding provided through the EU's Connecting Europe Facility, which aims to improve cross-transport infrastructure, was not always used effectively.

The ECA found that despite successes such as promoting a common EU plug standard, and improving access to different charging networks, obstacles to electric vehicle travel across the EU still remain. The availability of charging stations varies between countries, payment systems are not harmonised with minimum requirements and there is inadequate information for users.

In the absence of a comprehensive infrastructure gap analysis, the Commission has been unable to ensure that EU funding goes where it is most needed. The EU is still a long way off its Green Deal target of one million charging points by 2025, and it lacks an overall strategic roadmap for electro-mobility. The Commission has set a target to have one million charging points by 2025 and is aiming to reduce greenhouse gas emissions from transport by 90 per cent from 1990 levels by 2050.

The number of charging points in the 27 EU nations and the UK increased by roughly 36,000 a year from about 34,000 in 2014 to 250,000 in September 2020.

There is a significant risk that the target of one million public charging points by 2025 would not be reached if deployment continues to follow current trends, the auditors said.

About 150,000 new points would be needed each year – almost 3,000 a week – to close the gap.

Source: Euractive April 14th 2021

https://www.euractiv.com/section/electric-cars/news/deployment-of-eu-electric-vehicle-charging-stations-too-slow-auditors-say/

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101 Nobel Prize laureates urge leaders to end fossil fuel expansion

A hundred and one Nobel laureates are calling for governments around the world to sign up to a fossil fuel non-proliferation treaty to help tackle the climate crisis.

In an open letter to world leaders, scientists, past presidents, novelists and religious leaders are urging governments to commit to a fast and just transition away from fossil fuels, and a "transformational plan" to ensure everyone around the world has access to renewable energy.

The signatories are experts in the fields of peace, human rights, security, economics, literature and the natural sciences, and say they "are seized by the great moral issue of our time: the climate crisis and commensurate destruction of nature".

The letter states that "for far too long, governments have lagged, shockingly, behind what science demands and what a growing and powerful people-powered movement knows: urgent action is needed to end the expansion of fossil fuel production, phase out current production, and invest in renewable energy."

Source: The Guardian, Euractive April 21st 2021

https://www.theguardian.com/environment/2021/apr/21/101-nobel-laureates-call-for-global-fossil-fuel-non-proliferation-treaty

Carbon dioxide levels are now higher than at any time in the past 3.6 million years

The atmospheric burden of CO_2 is now comparable to the level it was at during the Mid-Pliocene warm period around 3.6 million years ago, when concentrations of carbon dioxide ranged from about 380 to 450 parts per million, reports NOAA. During that period the sea level was about 24 metres higher than today, the average temperature was around 4°C higher than in pre-industrial times, and studies indicate that large forests occupied areas of the Arctic that are now tundra.

Levels of the two most important anthropogenic greenhouse gases, carbon dioxide and methane, continued their unrelenting rise in 2020 despite the economic slowdown caused by the coronavirus pandemic response, NOAA has announced.

The global surface average for carbon dioxide (CO_2), calculated from measurements collected at NOAA's remote sampling locations, was 412.5 parts per million (ppm) in 2020, rising by 2.6 ppm during the year. The global rate of increase was the fifth-highest in NOAA's 63-year record, following 1987, 1998, 2015 and 2016. The annual mean at NOAA's Mauna Loa Observatory in Hawaii was 414.4 ppm during 2020.

Analysis of samples from 2020 also showed a significant jump in the atmospheric burden of methane, which is far less abundant but 28 times more potent than CO_2 at trapping heat over a 100-year time frame. NOAA's preliminary analysis showed the annual increase in atmospheric methane for 2020 was 14.7 parts per billion (ppb), which is the largest annual increase recorded since systematic measurements began in 1983.

Compiled by Reinhold Pape

https://research.noaa.gov/article/ArtMID/587/ArticleID/2742/Despite-pandemic-shutdowns-carbon-dioxide-and-methane-surged-in-2020

Advertisements from fossil fuel firms with tobaccolike health warnings

According to the environmental law charity ClientEarth, many of the world's biggest fossil fuel companies have used advertising to "greenwash" their impact on the climate crisis.

ClientEarth compares adverts produced by a range of companies with their overall climate impact and progress toward climate-safe business models.

Saudi Arabia's Aramco said it conducted business "in a way that addresses the climate challenge", yet it is the world's largest corporate greenhouse gas emitter and plans to continue exploring for more oil and gas, despite having reserves greater than those of Exxon, Chevron, Shell, BP and Total combined. Shell said it was investing in "lower-carbon biofuels and hydrogen, electric vehicle charging, solar and wind power", yet in 2020 it earmarked $17bn for fossil fuel operations, but just $2bn to $3bn per year for low-carbon businesses. Equinor has talked of increasing its renewable capacity tenfold by 2026, but renewables are planned to make up just four per cent of its energy mix by that date.

"We're currently witnessing a great deception, where the companies most responsible for catastrophically heating the planet are spending millions on advertising campaigns about how their business plans are focused on sustainability," stated Johnny White, one of the lawyers at ClientEarth.

The lawyers are urging policymakers to ban all fossil fuel company advertisements unless they are presented with tobacco-style health warnings about the risks of the climate crisis to people and the planet.

Source: The Guardian and ClientEarth, April 19th 2021

https://www.clientearth.org/the-greenwashing-files

https://www.theguardian.com/business/2021/apr/19/a-great-deception-oil-giants-taken-to-task-over-greenwash-ads

Opportunities for the Renewable Energy Directive

The current Renewable Energy Directive does not deliver the results needed to meet the Paris Agreement. The transition of the energy system in EU member states from fossil fuels to 100% renewable energy must accelerate.

Increasing the share of renewable energy (RE) is a key building block to achieving the Paris Agreement. Last year, the European Commission launched a public consultation for the potential revision of the Renewable Energy Directive (RED). The aim of the consultation was to align policy with the Green Deal and its follow-up initiatives and as the RED is EU's main RE policy legislation and it is vital that it is strengthened. There are several opportunities that can and needs to be put forward to improve the current RED policy framework. A reform proposal is expected this summer and the article highlights some of the updates this proposal should include.

Background to the RED

The original RED 2009/28/EC establishes an overall policy for the production and promotion of energy from renewable sources in the EU. An EU target for 2020 was set at a 20% share of energy from RE sources in final energy consumption. Additionally, this 20% target was imposed on the states through national binding targets. In December 2018, the recast directive 2018/2001/EU entered into force (often referred to as REDII, but in this article referred to as RED), as part of the Clean energy for all Europeans package. The revised legal framework included an overall binding RE target for the EU of at least 32% of final energy consumption by 2030. However, there were no new binding national RE targets.

Under the Regulation on the Governance of the Energy Union and Climate Action (EU) 2018/1999, EU countries are required to draft national energy and climate plans (NECPs) for 2021–2030, outlining how they will meet the new 2030 targets for RE and for energy efficiency. An analysis conducted by the European Commission in September 2020 shows that if Member States meet the national contributions for RE as spelled out in their NECPs, the EU is expected to reach a share of RE between 33,1% and 33,7% by 2030.

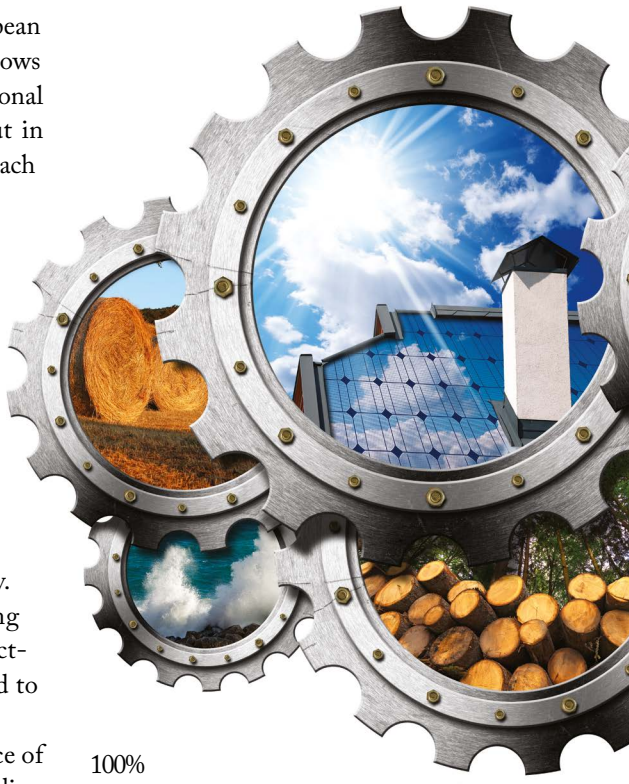
However, some member states have not committed to the minimum country-specific benchmarks. The system needs to incentivise these governments to be more ambitious through both stronger tools and obligations[1]. Without these developments the inconsistency of the commitments will harm RE investment security. Thus, the removal of the binding national targets undermined predictability and certainty, and they need to be reintroduced.

Another reason to the importance of binding targets is that "the non-binding nature of the targets at Member State level may pose challenges if faced with a Member State who is uncooperative or unwilling to make meaningful efforts toward achieving the targets. There is no obvious legal recourse for the Commission should a Member State fail to act".

Higher ambition level

The level of ambition of RED needs to be higher. CAN Europe has called for an EU binding target for the share of RE in gross final energy consumption of at least 50% by 2030, and an EU long-term target for 100% RE by the 2040. The Paris Agreement Compatible (PAC) scenario shows that to limit global temperature rise to 1.5°C, a transition to a 100% RE-based energy system is necessary and feasible by the year 2040[2].

Additional research has shown that a



100% RE system can be created sooner than the current ambitions suggest. A new study[3] illustrates that it is possible for Europe as a whole to become fully climate neutral by 2040 by merely going completely renewable, without technologies such as carbon capture and storage (CCS). According to the study's modelling the total cost of achieving 100% RE by 2050 is 6% lower than the cost of inadequate action under the scenario.

Improved regulatory framework to increase sustainable implementation

Another important change is to address the barriers embedded in the regulatory framework, which result in complex processes of permit-granting. The time-consuming administrative procedures

are an obstacle to increased and faster deployment of RE. Addressing permitting bottlenecks is critical to unlock the potential of renewables.

At present, licensing frameworks do not enable the scale and volume of renewable investments needed to deliver an EU green recovery, let alone the European Green Deal. Permitting rules and procedures for new and repowered renewable energy projects remain too complex and lengthy, despite the provisions in the recast RED that ask member states to simplify and shorten them. Slow processes prevent the use of the most efficient technologies available, which would be able to deliver the transition at the lowest cost for society.

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It is naturally important that the deployment of RE should be sustainable and thus guided by spatial planning that respects biodiversity and includes public involvement. RE sources are not without environmental impacts and targeted actions are vital to reduce the impact of e. g. extraction of raw materials for manufacturing RE and energy storage technologies.

Keep the RED for renewables

The RED should push for the immediate phasing out of all direct and indirect fossil fuel subsidies. Thus, the revision of the directive should not be used to include provisions that incentivise -so-called "low-carbon" fuels which are still fossil based fuels. In line with this the EU and its member states should agree on phase-out dates for the production and use of all fossil fuels.

The revised RED needs to strengthen the sustainability criteria for bioenergy, to ensure that bioenergy delivers significant, near-term greenhouse gas savings compared to fossil fuels. The current directive does not prevent the use of an increasing amount of forest biomass for energy purposes. External costs from greenhouse gas emissions, air pollution, biodiversity loss and habitat destruction are not adequately mitigated or priced in the various incentives that apply to forest biomass.

Faster decarbonisation of the heating and cooling sector

The RED should support faster decarbonisation of the heating and cooling sector for buildings and industry. In 2019, only about 20% of the energy used for heating and cooling of these sectors came from renewable sources[4]. In addition, stronger binding measures need to be added to the RED to incentivise greater use of renewable electricity, geothermal and solar heating, facilitated through heat storage and district heating. Policy measures should also ensure that heating and cooling recovery systems are entirely renewables-based.

The RED should also ensure increased deployment of rooftop solar on public and private building stock. Heating and cooling account for about 80% of the energy used in residential buildings[5]. An integrated energy system needs measures that support demand-side flexibility options such as charging stations, heat pumps and battery storage that interact with the grid.

Coordination with legislation such as the Energy Performance of Buildings Directive and the Energy Efficiency Directive is vital. The RED should make sure that the Efficiency First principle is applied to a higher degree in legislation.

Address the untapped potential of industry

When it comes to the industrial sector in particular, the RED should create stronger incentives for RE usage. Industries will benefit from RE technologies that are currently technically mature and available for their various processes. Their energy sources can be changed, by generating or buying renewable electricity or making fuel switches. One effective addition to the RED would therefore be an obligation for industry to use a minimum amount of sustainable RE. This obligation would be subject to reform of the EU's criteria on bioenergy mentioned above.

In summary, there are numerous opportunities that need to be put forward to improve the current RED policy framework and to help the EU achieve its commitments under the Paris Agreement. The implementation measures needs to be strengthened and RE targets for 2030 needs to be higher. However, an early draft of the EU's upcoming RED has confirmed an objective of sourcing 38-40% of its energy from RE by 2030[6]. The European Commission's revised RED will be presented on the 14th of July as part of the wider "fit for 55" package of climate and energy legislation designed to implement the EU's new 2030 emissions reduction target.

Compiled by Emilia Samuelsson

Based on Climate Action Network Europe's briefing on the RED

1. Pave the way for increased climate ambition; Opportunities and Gaps in the final National Energy and Climate Plans https://www.caneurope.org/docman/energy-union-governance/3613-opportunities-and-gaps-in-final-necps/file

2. https://www.pac-scenarios.eu

3. SolarPower Europe and LUT University (2020): 100% Renewable Europe: How To Make Europe's Energy System Climate-Neutral Before 2050.

4. Eurostat, Statistics Explained - Renewable energy statistics https://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics#Over_one_fifth_of_energy_used_for_heating_and_cooling_from_renewable_sources

5. A renovation wave for Europe – Greening our buildings, creating jobs, improving lives. COM(2020)662.

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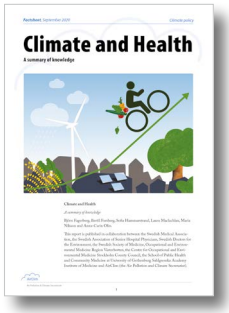

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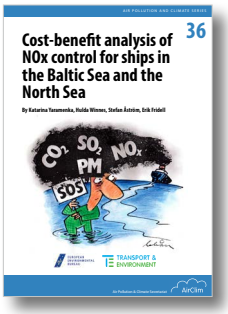

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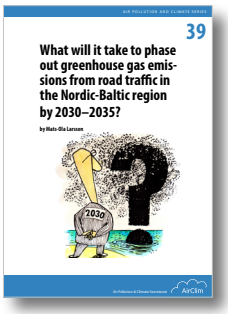

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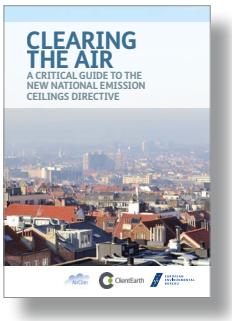

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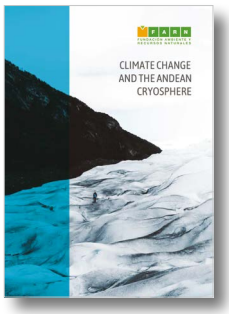

Climate change and the Andean Cryosphere (2019). By Catalina María Gonda The cryosphere has unique functions and influences the physical, biological and social systems.

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.

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Coming events

CLRTAP Working Group on Strategies and Review. Remote meeting, 18 - 21 May 2021. Information: www.unece.org/env/lrtap/welcome.html

IMO 8th Intersessional Working Group on reduction of GHG emissions from ships. Remote meeting, 24 - 28 May 2021. Information: www.imo.org

8th Global Nitrogen Conference (INI2021). Remote meeting, 31 May - 3 June 2021. Information: https://ini2021.com/

EU Green Week - Focus on "zero pollution ambition". 31 May - 4 June 2021. Information: https://ec.europa.eu/info/events/eu-green-week-2021_en

UN FCCC Bonn Climate Change Conference. Bonn, Germany, 31 May - 10 June 2021. Information: http://unfccc.int/

IMO Marine Environment Protection Committee (MEPC 76). Remote meeting, 10 - 17 June 2021. Information: www.imo.org

EU Environment Council. Luxembourg, 21 June 2021. Information: www.consilium.europa.eu/en/press/calendar/

4th Transport and Climate Change Week. Berlin, Germany and worldwide, 21 - 25 June 2021. Information: https://www.transportweek.org

CLRTAP EMEP Steering Body + Working Group on Effects. Geneva, Switzerland, 13 – 17 September 2021. Information: www.unece.org/env/lrtap/welcome.html

Youth4Climate: Driving Ambition. Milan, Italy, 28 - 30 September 2021. Information: https://www.minambiente.it/pagina/towards-cop26-pre-cop-and-youth-event-youth4climate-driving-ambition

PreCop26. Milan, Italy, 30 September - 2 October 2021. Information: https://www.minambiente.it/pagina/towards-cop26-pre-cop-and-youth-event-youth4climate-driving-ambition

Air Pollution threats to Plant Ecosystems Conference. Paphos, Cyprus, 11 - 15 October 2021. Information: http://www.ozoneandplants2020.com

IMO 9th Intersessional Working Group on reduction of GHG emissions from ships. London, UK, 18 – 22 October 2021. Information: www.imo.org

IMO Marine Environment Protection Committee (MEPC 77). London, UK, 1 - 5 November 2021. Information: www.imo.org

UN FCCC COP26. Glasgow, UK, 1 - 12 November 2021. Information: http://unfccc.int/

2021 Global Conference on Health and Climate Change. Glasgow, UK, 6 - 7 November 2021. Information: https://www.who.int/news-room/events/detail/2021/11/06/default-calendar/2021-global-conference-on-health-and-climate-change

2021 POLIS Annual Conference. Gothenburg, Sweden, 1 - 2 December 2021. Information: https://www.polisnetwork.eu/2021-annual-polis-conference/

CLRTAP Executive Body. Geneva, Switzerland, 6 - 10 December 2021. Information: www.unece.org/env/lrtap/welcome.html