

EU innovation money funds false solutions

CCS featured highly when the European Innovation Fund for innovative low-carbon technologies shortlisted its first large-scale projects in November.

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Fossil fuels behind a quarter of PM deaths

Burning of coal, oil and gas caused most of the fine particle (PM_{2.5}) related deaths in industrialised countries

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Farm emissions high on Air Convention agenda

The last CLRTAP-meeting featured a new guidance on agricultural waste burning, a new assessment report on ammonia, and the inclusion of methane in the revision analysis.

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Wind and solar power cheapest energy

New nuclear, new coal and new gas are far more expensive than wind and solar, according to financial advisor and asset management firm Lazard.

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EU renewable heating manifesto

During the ongoing EU energy policy revision, a coalition of NGOs has pushed for renewable energy and energy efficiency solutions as well as rejection of fossil fuel boilers.

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A saltier world to be expected

Sea level rise and increased evaporation due to climate change cause salinisation of freshwater. Salinisation of wetlands may also lead to higher emissions of GHGs.

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A just transition in EU farming

The EU needs to plan and act for a just transition in agriculture, is the message in a new report. Not only because it is fair, but also to mitigate the resistance to change.

Two years ago, Dutch farmers filled the roads to protest against the country's plans to cut livestock numbers by 30 per cent, as a measure to protect nitrogen-sensitive natural areas. This is one example where a transition to a more sustainable and nature-friendly farming system does not benefit everyone, at least not in the short term. This dilemma is highlighted in a recent paper "Just transition in the

EU agriculture and land use sector" from the Institute for European Environment Policy¹.

The report begins by disentangling the concept of a "just transition". It was first used by the US labour movement in the late 20th century, to describe the need for social interventions when shutting down an industry, typically a coal mine,

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

Like many others, I have a hard time focusing on anything else than the Russian war against Ukraine right now. AirClim has been working for a long time together with the environmental movement in both Ukraine and Russia. What is happening now is nothing but a tragedy for both people and the environment throughout the region.

In the previous issue a Ukrainian ecologist wrote about ocean acidification in the Black Sea. We have also had an article about the opportunities for an energy transition in Ukraine. One of my colleagues had planned to go to Ukraine to participate to workshops on setting up a national network of air pollution monitors, the same week as the invasion began. All this important work for biodiversity, climate policy and cleaner air has now had to halt.

The longer the war lasts, the more difficult it will be to resume work for a sustainable environment. In addition, there are great risks that the war will lead to severe environmental damage. As I write this one of the country's nuclear power plants is burning following Russian shelling.

Turning to the Russian environmental movement, they have been facing major difficulties for quite some time. Organisations that receive grants from abroad have long been classified as "foreign agents". The relative freedom of speech that has existed in Russia has been severely curtailed since the outbreak of war.

Another side of the coin is the dependence on inputs such as oil, gas and fertilisers, all of which are important export products for Russia. For example, neither India nor Brazil, have taken a stand against Russia. It is certainly not the only reason but both countries rely on Russian fertilisers for their domestic agriculture. And the dependence of most EU countries on Russian gas and oil is widely known. A leading energy adviser at IEA recommends that Europeans turn

down their thermostats by one degree to save on gas and reduce dependency on Russian imports¹.

The security policy argument has put a fast conversion to renewables and the decommissioning of fossil fuels high on the political agenda. The German government's decision to halt the Nord Stream 2 pipeline was a first step. But it must be followed by more concrete measures to stop all fossil fuel imports from Russia.

When it comes to synthetic fertilisers it is easy to intuitively think that skyrocketing world market prices would lead to a reduction in use. But it is not that simple. As Russia and Ukraine account for a significant share of global exports of wheat and maize, the prices of these raw materials are rising. This in turn means that it is likely to remain profitable for farmers to use large amounts of fertiliser. Another consequence is significantly higher food prices. Several power-wielders, including the Agriculture Commissioner², now want to use this development as an excuse to water down the environment ambition in the Farm to Fork strategy. However, preserving Europe's input-dependent agriculture means continued support for Putin.

Yet another factor that this crisis brings with it is increased spending on military defence, at a time when we really need to be spending large sums on the climate transition instead.

We are committed to working for peace and democracy, since this is a prerequisite for a sustainable future throughout Europe.

Kajsa Pira

¹ The Guardian 3 March <https://www.theguardian.com/environment/2022/mar/03/turn-down-heating-reduce-need-russian-imports-europeans-told>

² Statement by Janusz Wojciechowski 2 March 2022 <https://twitter.com/gerardofortuna/status/1499084279304933379>

**“war will lead
to severe
environmental
damage”**



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High hopes for German renewables reform

Germany's government has initiated the first steps in a wide-ranging renewables reform that should make the country's power supply almost 100 per cent renewable by 2035. In a draft paper the economy and climate ministry proposes higher renewable capacity targets for 2030, aligning the German clean energy path with the 1.5°C warming limit. In a novel move, the ministry will legally oblige power suppliers to reduce bills for consumers after the levy for renewables on the power price is scrapped in July 2022.

Source: Clean Energy Wire, 1 March 2022, <https://www.cleanenergywire.org/news/germany-aims-100-green-power-2035-will-present-gas-reduction-plan>

Germany's GHG emissions increased by nearly 5% in 2021

Germany's greenhouse gas emissions increased by 4.5 per cent between 2020 and 2021, the Federal Environment Agency (UBA) has said in its annual report on emission trajectories.

The country's Federal Environment Agency warned that the "Corona windfall profits" in terms of emissions reduction are being lost too quickly. The government said it wants to tackle the lack of structural changes in the buildings and transport sectors, both of which failed on

their specific emission reduction targets. The economy and climate ministry said it plans to reap the double benefits of energy independence and climate action, with an emergency programme that is to triple renewable capacity expansion. A "heat pump boom" is also expected this year, as households strive to become independent from Russian fossil fuels.

Source: Clean Energy Wire 15 March 2022, <https://www.cleanenergywire.org/news/emissions-45-2021-after-pandemic-slump-transport-and-heating-fail-targets>



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Delay in Euro 7

The European Commission meeting on the Euro 7 proposal, "Development of post-Euro 6/VI emission standards for cars, vans, lorries and buses", has been delayed. Instead of being discussed at the beginning of April it will now be discussed on 20 July 2022.

Details of meetings are at [ec.europa.eu/transparency/documentsregister/detail?ref=SEC\(2022\)2405&lang=en](https://ec.europa.eu/transparency/documentsregister/detail?ref=SEC(2022)2405&lang=en)

Dirty air harms birds and bees

New evidence shows that birds and bees are also affected by the air pollution we humans emit. Birds seem especially vulnerable to ozone and PM_{2.5} exposure by potentially decreasing their antioxidant defence, as highlighted by a new PhD thesis (Ziegler et al. 2022). With regards to insect pollinators, such as bees, it has been found that diesel exhaust and ozone may contribute to pollinator declines, through either direct effects on their health or by reducing their foraging capacity. The smell of a flower is important for many pollinators. Each flower species has a special smell comprised of a unique combination of chemicals, known as volatile organic compounds (VOCs). Nitrogen oxides and ozone act and react with VOCs and could thus interfere with this process. Some pollinator insects were more susceptible than others, such as bees and butterflies, probably depending on how important

smell is compared to other senses. The foraging behaviours of pollinating insects are likely to be most affected at times when pollution levels are the highest, such as sunny days for ozone and traffic peaks for diesel exhaust. The authors stress an urgent need for further investigation into the potential of air pollutants to disrupt the many insect-mediated ecological processes and ecosystem services upon which humans and nature rely.

Ann-Kathrin Ziegler, Impacts of urbanisation on birds, 2022 <https://portal.research.lu.se/en/publications/impacts-of-urbanisation-on-birds-disentangling-the-effects-of-mul>

Anthropogenic air pollutants reduce insect-mediated pollination services, Environmental Pollution, Volume 297, 15 March 2022, <https://doi.org/10.1016/j.envpol.2022.118847>



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A just transition in EU farming

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for environmental reasons. The term has subsequently been taken up by international organisations and widened to mean the general striving for fairness in a transition process. One example is the European Green Deal, which includes a Just Transition Mechanism that aims to support regions and citizens facing the greatest difficulties in a transition to a greener economy.

One important observation is that aspirations for a just transition are not only a matter of principle, but also of tactics. The parties that are impacted most by change are less likely to obstruct the transition if they are compensated in some way for their losses. The authors write: “Current hostility to some of the Green Deal agenda in parts of the farming community might be softened and be less of a barrier to change if credible and measured forms of support for potential losers figured more prominently in the debate.”

They then try to sketch out what a just transition would mean for agriculture and land use. They note that the food and farming sector differs in several important respects from mines and traditional manufacturing industries (table). These differences mean that you cannot just copy experiences from other sectors.

Another difficulty is that there is no common view of what a transition in agriculture would look like, however the



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authors identify four elements where there is relatively good agreement:

- Changes in the overall composition and quantity of food being produced, alongside changes in consumption patterns, including increased plant-based foods.
- A reduction in the agricultural area allowing more land devoted to carbon sequestration in forests and peatlands and biodiversity restoration and conservation.
- Changes in the mix of farming systems and accompanying practices. This will give rise to a range of systems spanning different levels of intensity extending from organic farming and agroecology to contained, vertical cropping systems and cell culture.
- A systematic focus on reducing both carbon and non-carbon GHG emissions, energy use, curtailing waste and increasing recycling in the primary production sector.

Based on this, the authors make qualified guesses about who would be potential winners and losers in an agricultural transition in the European Union. Among the winners they see: producers of foods that in the future will have high added value, such as vegetables, fruit, nuts and meat produced with high standards of animal welfare; early-adopters of new sustainable technologies; providers of new inputs, knowledge and training; and producers in well-organised collective structures that can share knowledge and equipment etc.

Among the losers they find parts of livestock industry; farmers with barriers to change because of age, poor economy or low education; producers who today are heavily dependent on agri-chemical inputs; providers of agri-chemical inputs; farmers on land that is re-wetted; and regions that currently have less sustainable systems and where a transition can be difficult, for example, due to acute water shortages.

The authors believe that more comprehensive analyses of winners and losers need to be made. This will enable the design of policy systems that can compensate the less-favoured for their expected losses.

Their first recommendation is greater engagement with the farming and land managing communities, including agricultural workers. Not only to help them prepare for the expected transition, but

Table: Just transition for traditional mining/extractive industries and the food and farming sector

Considerations for a Just Transition	The extractive and declining industries	Food and farming sector
Scale and nature of businesses	Often large companies (some in public ownership), generally with large workforce	Mainly small and micro family businesses, few employees, often owning assets of value (less so for tenants)
Principal threat	Redundancies and complete shutdowns, challenge of major restructuring of local economy	Change of business operation, income loss, market disruptions, redundancies only in specific cases (e.g. extensive pastoral farms)
Decision makers driving transition	Government policy and company executives	Government policy and some consumer behaviour change (animal to plant-based diets), retail and food companies
Other drivers for change	New technology creating obsolescence, contributing to general economic and social good	Aim of reducing damage to climate and natural capital including farmers' own soils and directing more resources to public benefit. Technical change also.
Degree of spatial concentration	Highly concentrated, economically, socially and often geographically	Highly diffuse over the whole territory, but with some specific regional threats
Principal Just Transition question	How to compensate the losers, engagement/consultation	How to arrive at fair outcome and also induce transition

64% of all reported exceedances linked to dense traffic in urban centres and proximity to major road.



also to include them in the design of policy interventions. Measures that would benefit a just transition include educating farmers and farmworkers in new skills and developing new sources of income for land-users.

It is also important to ensure that farmers receive a fair share of the revenues in the food chain. This also touches on the risk for “leakage”. This occurs when higher environmental requirements make domestic products more expensive, leading to greater imports from countries with lower standards. The report states: “given the difficulties of applying Carbon Border Adjustment Taxes in the agriculture sector, alternative approaches will be needed”.

Another recommendation is to use existing funds, in particular CAP payments, to facilitate a just transition. However, they also highlight a history of using compensatory arguments to defend support within the CAP, which have not contributed to any change but instead preserved the status quo. There is a risk that the case for a just transition could be used in this way. To avoid this, measures for a just transition need to be targeted at specific groups and for a limited time. And in particular they should be followed up with evaluations to see if the interventions were justified.

Policy makers must also recognise that in addition to farmers and farm workers, whole rural communities as well as consumers will be affected by a transition. The former can be met with regionally targeted support. For the latter group they propose general welfare improvements and targeted payments to counter food poverty.

So far, a sustainable transition in agriculture in most parts of the EU, formulated optimistically, is in its infancy. Here, the Dutch example becomes particularly interesting. If they manage to phase out their intensive animal production in a just way, it may serve as a role model for the rest of the EU.

Kajsa Pira

¹ Institute for European Environmental Policy, “Just transition in the EU agriculture and land use sector”, January 2022, <https://ieep.eu/publications/just-transition-in-the-eu-agriculture-and-land-use-sector>

Road traffic causes most NO₂ exceedances

The European Environment Agency (EEA) has recently published a briefing on managing air quality in Europe. The report reviews the status of countries’ air quality plans required when air pollution limits are exceeded. The report also identified the sources behind such exceedances of air quality limits. The principal driver of exceedances of nitrogen dioxides was road traffic, with 64% of all reported exceedances linked to dense traffic in urban centres and proximity to major roads.

For many western European countries road traffic was the only major source of exceedances. In contrast, road traffic was a less important source in eastern Europe, behind only 8% of exceedances in Poland, 15% in Bulgaria and 20% in Lithuania. The number of measures put in place in the air quality plans differed widely between countries.

The briefing can be read in full at eea.europa.eu/publications/managing-air-quality-in-europe/managing-airquality-in-europe.

Brits could breathe air in line with WHO interim target by 2030

If the UK government implements its planned environmental, transport and clean air policies, most UK residents could breathe air that meets the quality levels recommended by World Health Organization (WHO) across most parts of the UK by 2030. This is one of the conclusions of a new study from the Clean Air Fund and Imperial College London.

The WHO guideline limit for PM_{2.5} was updated in 2021 from an annual average of 10 micrograms per cubic metre (WHO-10) to 5 micrograms per cubic metre, with WHO-10 now set as an interim target. This research shows that the WHO-10 interim target is achievable across 99% of the country by the end of the decade. The public health gains would be tremendous, with an average of 388,000 fewer days of asthma symptoms a year, as well as a significant fall in cases of coronary heart disease and a rise in average life expectancy

of 9-10 weeks across those born in 2018. The economic gains due to reduced health costs would be up to £380bn between 2018 and 2134. The work needed to achieve this is based on policies the government already plans to implement or that have been recommended by the Committee on Climate Change.

Sarah Woolnough, CEO at Asthma + Lung UK, commented:

“This report shows that we mustn’t accept anything less than meeting the World Health Organization’s guideline interim target of 10 µg/m³ by 2030, with ambition to go further.”

Source: Pathway to WHO: achieving clean air in the UK. <https://www.imperial.ac.uk/school-public-health/environmental-research-group/research/modelling/pathway-to-who/>

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Achieving the interim target of 10 µg/m³ would mean 388,000 fewer days of asthma symptoms a year



EU innovation fund: Most of it goes to CCS

Carbon Capture and Storage (CCS) featured highly when the European Innovation Fund for innovative low-carbon technologies shortlisted its first large-scale projects in November.

The projects will share about €1.1 billion, if investment decisions are made. Four projects include CCS, two of which are controversial “blue hydrogen” projects, i.e. hydrogen produced from fossil gas.

The Innovation Fund for innovative low-carbon technologies is a cornerstone of EU climate policy. It is huge in monetary terms and focuses on:

- highly innovative technologies
- big flagship projects
- innovative low-carbon solutions and small-scale projects that can bring about significant emission reductions.

The fund is now very well backed financially. The Commission gets its funding from the sale of ETS allowances (auctioning of 450 million allowances from 2020 to 2030). At the time of its instigation in June 2019 that would have been expected to be less than €10 billion. But as of February 2022, it may be closer to €45 billion, thanks to soaring carbon prices. The total project funding is even bigger. The EU only covers about half. The remainder is supplied by member states or private funding.

Exactly the same concept was launched in 2008, when the EU wanted to build 12 full-scale CCS plants by 2015. It was a total flop according to a report¹ from the EU auditors in 2018. No carbon was captured, but the EU did not lose very much money either. Most projects failed and the EU got some money back. And there were not many takers in the first place, which was embarrassing for the EU.

To help them to distribute all these billions, the EU set up an assessment project called NEGEM (negative emissions) with funding from Horizon 2020 (from the EU research budget). The list of partners includes several huge CO₂ emitters and CCS lobbyists, a cooperation between Shell, Italian gas giant Snam, Finnish oil company ST1, UK power company

Drax (which burns biomass from the US), a few research organisations, three (3) branches of the pro-CCS International Energy Agency, Oxford and Cambridge universities (both recipients of considerable fossil company funding) and the Zero Emission Platform ZEP.

ZEP is undoubtedly the driving force, and can be described as a front organisation for Big Oil and the Norwegian Longship, a system for transporting CO₂ from harbours in Europe to storage sites under the Norwegian North Sea, initially from a Heidelberg Cement factory in Norway. ZEP members are:

- Northern Lights (Norwegian company that aims to commercially transport and store CO₂ under the ocean floor in the Norwegian North Sea)
- Equinor (Norwegian oil and gas company, owns part of Northern Lights)
- Total Energies (French oil and gas company, owns part of Northern Lights)
- Bellona Foundation pro-CCS Norwegian NGO
- SINTEF (Branch of the Norwegian government)

- BP
- ExxonMobil
- Fortum Oslo
- Heidelberg Cement, the world’s fourth-largest cement producer and part of the Norwegian Longship CCS project.
- Massachusetts Institute of Technology, a respected university that is also closely associated with the fossil industry. It once hailed CCS as “the future of coal”², heavily influenced the IEA and the IPCC WG 3 to adopt a pro-coal pro-CCS stance, and still refuses to divest³ from fossil fuels.
- Imperial College London, which received £39 million from Shell in 2017–2020 and whose president is on Chevron’s board.
- The Port of Antwerp, one of the seven shortlisted projects, Kairos@C (see below) by the Innovation Fund.

They include many of the same companies that receive or expect money from the Innovation Fund, in particular Fortum Oslo, Northern Lights and associated oil companies, Equinor and Heidelberg Cement.

Two of the projects are for “blue hy-

Table: Projects funded by the European Innovation Fund for innovative low-carbon technologies.

Name	Activity	Companies	Location	Nations	CO ₂ avoided first 10 years	CCS
Kairos@C	Chemical industry, CO ₂ hub,	Port of Antwerp,	Antwerp	Belgium, Netherlands, Norway	14.2	yes
TANGO	Solar cells	Enel	Catania	Italy	21	no
BECCS@STHLM	bioenergy CHP CCS	Stockholm Exergi	Stockholm	Sweden, Norway	7.8	yes
Ecoplanta	waste to methanol		Taragona	Spain	3.5	no
K6	cement		Dunkirk	France	8.1	yes
Hybrit	Hydrogen for steel, ore		Gällivare, Luleå	Sweden	14.3	no
Sharco	refinery Hydrogen		Porvoo	Finland	>4	yes and no

drogen” – producing hydrogen from fossil gas with carbon capture – a technology which most or all NGOs disapprove of.

“#BlueHydrogen is about as blue as the end of a smoke stack. Don’t be fooled, it’s just another excuse for the fossil fuel industry to keep pumping out pollution to destroy our planet”, commented Greenpeace⁴.

The “innovative low-carbon technologies” are, so far, largely CCS, but also include green hydrogen steel and solar panels, though their lobby organisations are not represented in the NEGEM assessment. The beneficiaries are mainly heavy carbon emitters more or less trying to reinvent themselves, refineries, chemical industry, and power industry. Another beneficiary is the Norwegian CCS industry, as much of the captured CO₂ is to be shipped to and stored in the Norwegian North Sea.

Kairos@C in the Port of Antwerp, Belgium plans to collect CO₂ from two hydrogen plants, two ammonia plants and an ethylene oxide plant. The CO₂ will then be sent by ship to Norway or possibly somewhere else in the North Sea.

The project dates back⁵ to at least 2010. It just goes on and on.

The companies involved are BASF (German chemical giant), Air Liquide (French gas company that produces oxygen, nitrogen, argon, CO₂ and other gases), and a consortium of Antwerp@C that includes Borealis (Austrian plastics producer), ExxonMobil (oil and gas), INEOS (British chemical company, also in fracking), Fluxys (Belgian, fossil gas), the Port of Antwerp and Total (oil and gas).

The seven projects pre-selected for Innovation Fund funding are said to reduce CO₂ emissions by 14 million tonnes. As for the hydrogen and ammonia plants, CCS is a choice not to produce green hydrogen and green ammonia by electrolysis.

“It is better to focus on efficiency, innovation and electrification”, commented Joeri Thijs, spokesperson for Greenpeace Belgium⁶.

“Capturing carbon from fossil processes and dumping it underground, as BASF wants to do, is to shoot twice and miss both. Either you succeed and you have invested a lot of money, much of which is tax money, in continuing a fossil system. Or you fail, and the CO₂ still ends up in

New innovative way to store carbon.

the atmosphere due to leaks in the system. We therefore ask for a different approach: directly reducing CO₂ emissions at the source”, Thijs said.

TANGO is a project to develop next-generation solar cells. It will develop an industrial-scale pilot line for the manufacture of innovative and high-quality bifacial heterojunction (B-HJT) photovoltaic (PV) cells. It is led by Enel Green in Catania, Italy. Heterojunction means that the cell has two or more layers that capture the light more efficiently. HJT cells also degrade slower over their lifetime.

ECOPLANTA is a project for transforming municipal solid waste (household garbage) into methanol instead of sending it to landfill. The plant will process some 400,000 tonnes of non-recyclable municipal solid waste from nearby municipalities and will produce around 220,000 tonnes of methanol annually. This methanol will be used as a feedstock to produce renewable chemicals or advanced biofuels, cutting GHG emissions by some 200,000 tonnes each year and reducing waste that would otherwise end up in landfills, according to Enkernem, a small company in the waste business that is working on this project with Suez Recycling, Recovery Spain and oil giant Repsol.

The project does not involve CCS, but Enkernem claims to be in the business of “carbon recycling”. This is conceptually closer to CCUS than it is to the waste hierarchy of reduce, reuse, recycle, where recycle is supposed to mean making paper from paper and plastic from plastic, rather than recycling carbon atoms. The plastics industry’s preferred hierarchy is 1) landfill or burn 2) molecular recycling 3) recycle, reuse, reduce.

The K6 Program intends to produce cement with CCS in France. It is backed



by Air Liquide (again) and the German cement lobby organisation VDZ, which aims to keep on using Portland cement as a construction material, rather than new materials or other cements.

HYBRIT in Sweden is a pioneering project to replace coal and coke with green hydrogen for reducing iron oxide ore to steel in north Sweden. The hydrogen is to be produced by wind power, which is rapidly being expanded.

BECCS@STHLM is also in Sweden, see article below.

The SHARC Sustainable Hydrogen and Recovery of Carbon project in Finland will replace fossil hydrogen at Neste’s refinery with green and blue hydrogen. The exact mix of green and blue is not known, but the whole concept of blue hydrogen (fossil + CCS) is contested. Neste is an oil and gas company, majority-owned by the Finnish government and is linked to Fortum and Norwegian Equinor in several ways.

Fredrik Lundberg

¹ <https://www.endseurope.com/article/1648572/auditors-criticise-failure-ccs-support>

² <https://energy.mit.edu/wp-content/uploads/2007/03/MITEI-The-Future-of-Coal.pdf>

³ <https://mitsloan.mit.edu/ideas-made-to-matter/mit-divest-all-ideas-welcome-pursuit-one-big-goal>

⁴ <https://twitter.com/Greenpeace/status/1429367818500263944>

⁵ <https://cordis.europa.eu/project/id/241381/reporting>

⁶ https://www.nieuwsblad.be/cnt/dmf20211122_98527353

Case study: Stockholm BECCS

BECCS@STHLM is a CCS project storing CO₂ from a biomass power and heat plant in Stockholm, Sweden. The plant was built in 2016 for burning biomass. It now burns residues from the forest and forest industries – branches, tops, bark and sawdust – of which just under 60 per cent comes from Swedish forests. It does however import substantial amounts (just below 30 per cent) from the Baltics¹. It has also used coal, especially in 2018, when supplies of wood fuel were disrupted.

Power CCS is a big bet. After 50 years of CCS (Val Verde Texas started in 1972), and some 20 years of CCS as climate hype, there are only two big power plants that use CCS in the entire world.

One of them is Boundary Dam in Canada. It burns coal, and some of the CO₂ is used for enhanced oil recovery. It has shown poor performance and high costs.

Petra Nova in Texas was suspended in 2020, after three years of operation,

Stockholm Exergi is a combined heat and power plant that runs on biomass. Now the plan is to ship the CO₂ to CCS facilities in Norway.

for similar reasons. There is no natural gas power station anywhere that uses CCS.

Capturing carbon from biomass power is no simpler than it is from coal or gas power, and transport by ship to Norway will cost a lot more than dumping the CO₂ in a nearby oil well.

There is also no large-scale heat plant using CCS anywhere in the world, and obviously no combined power and heat plant, which involves more complex construction (more tubing, valves and heat exchangers) than “just” a power plant. The reason why combined power plants are built at all is that it saves fuel. A power plant has an efficiency of 30–60 per cent. A combined heat and power plant can have an efficiency of 90 per cent. But this is only possible if there is a large and simultaneous demand for hot water, such as a district heating system or nearby industry. For most power plants, it is not an option to use the heat. A district heating system is expensive to build. Combined heat and power is only efficient under certain assumptions. And it comes at a cost. It is not very flexible, as people want their homes warm regardless of whether the price of power is high or low. The hot water is of little use for half the year, and if buildings are well insulated it may only be useful for a few months.

Combined heat and power also means a lot of heat but less electricity.

As for the BECCS@STHLM project, it will produce even less electricity with the same amount of wood input, according to an email to Acid News from Stockholm Exergi, though no specific data was supplied.

When it applied for the project, 50 per cent of Stockholm Exergi was owned by Stockholm City Council and the other half by Fortum. Fortum is a Finland-based power, heat and gas company. In 2020, Fortum acquired Uniper, with the personal blessing of president Vladimir Putin². Uniper was essentially the dirty (fossil and nuclear)

parts of German Eon, with the clean parts retaining the name Eon after a 2016 split. Fortum and Uniper have assets in Finland, the Baltics, Russia, Norway, Germany and Sweden, much of it fossil and nuclear. It is majority-owned by the government of Finland. Uniper is well known to the climate NGO community after it sued the Dutch government³ in 2021 over the country’s planned coal phase-out concerning its coal power plant Maasvlakte. It also claims to be Europe’s second-largest nuclear power producer. And it is one of the top CO₂ emitters, at 48.8 million tons in 2020.

Fortum sold its share of Stockholm Exergi on 30 June 2021 (to finance its acquisition of Uniper), but the new owners (pension funds) are unlikely to change their general strategy or the strategic focus on CCS. Fortum Oslo has a similar ownership (half-owned by Oslo city) and applied to the Innovation fund for CCS from its mixed waste CHP plant; it did not qualify in the first call.

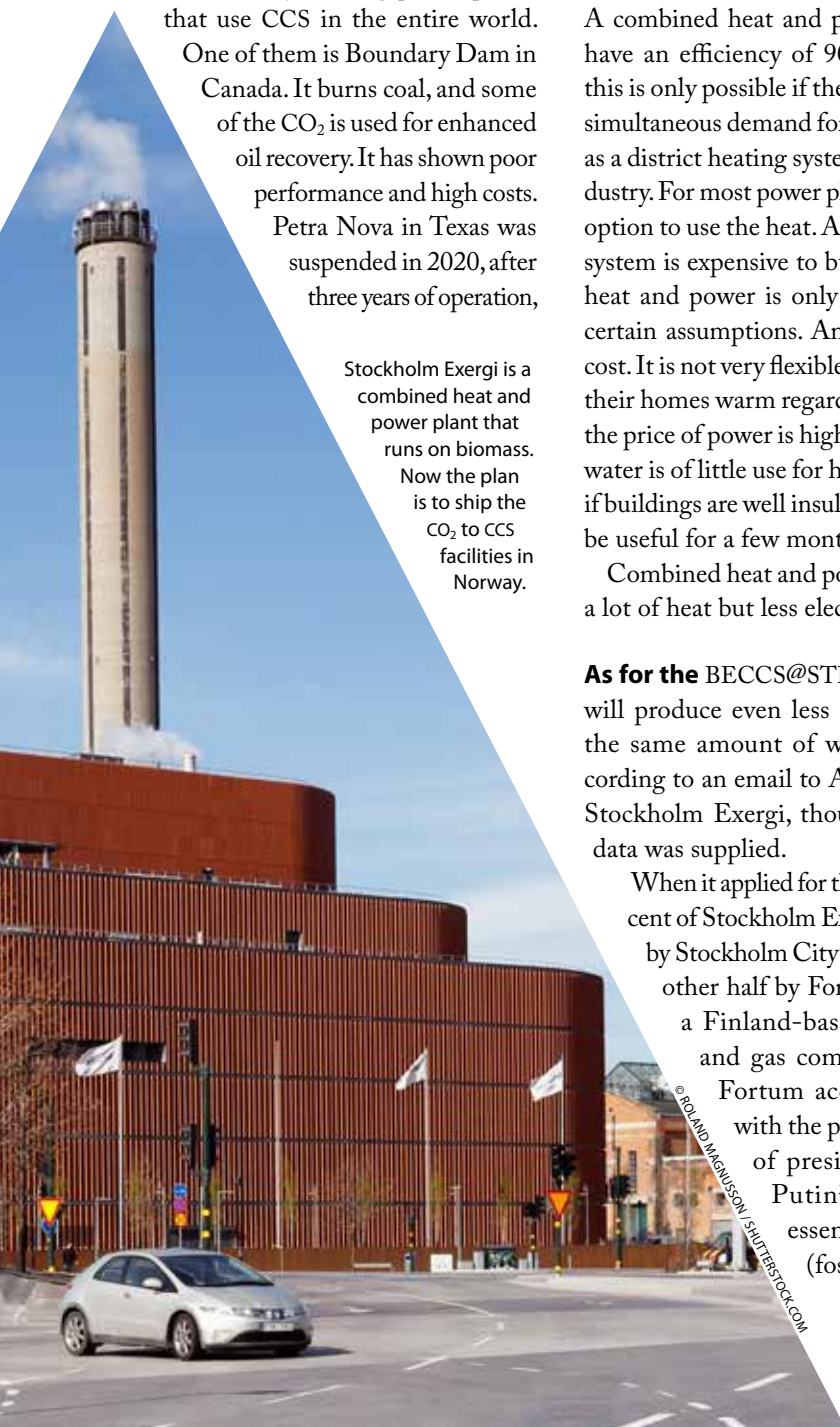
Stockholm Exergi supplies Stockholm and adjacent towns with district heat, cooling and some electricity. It ran the nation’s only coal power (and heat) plant until 2020. They had to stop as the red-green government introduced a tax on fossil fuels for combined heat and power. The tax was implemented in spite of furious lobbying from Fortum/Stockholm Exergi and their allies. After they lost that battle, they immediately took credit for phasing out coal.

Stockholm Exergi now uses three sources of heat: mixed waste, biomass (mainly residues from the forest industry such as sawdust and chipped branches), and heat pumps.

The wood CHP plant was a step forward when it was conceived in the 2000s and commissioned in 2016. Bioenergy was accepted as a major alternative to fossils and nuclear power by the political parties and NGOs from 1980 until recently.

Sweden is a large country, largely covered with forests. It also has a strong forestry lobby, dominated by paper and pulp companies and forest owners.

Biomass is seen as CO₂-free in na-



tional climate targets and in reports to the EU and UN. The rationale is that if the biomass is not used, it will emit its carbon contents into the atmosphere anyway, or that the carbon released when the biomass is burned equals the carbon sucked up by growing trees.

Whether this is really true for a whole forest, including the soil and undergrowth, over a perspective of a few decades (for example until 2045, the Swedish net-zero target year) is widely debated, and the results also depend on what the forest products are used for. Paper usually emits its carbon within a year. Planks in buildings may store the carbon for several decades.

The biomass “carbon neutrality” accounting principle had at least the advantage of being simple.

But Sweden used the Kyoto Protocol and its Land Use and Land Use Change (LULUCF) articles 3.3 and 3.4 to subtract 2.13 million tons per year because the forest carbon growth is larger than the carbon content of the felled trees, every year.

Sweden now intends to use BECCS as a principal means of attaining its (national) net-zero 2045 target, and the Stockholm Exergi project is likely to receive large sums of money from the Swedish government as well as from the EU.

CO₂ from biomass is currently accounted for as zero in the emissions trading system, so at present Stockholm Exergi will not save any money by not emitting it. At February prices the difference would be about €780 million over the first ten years in their balance sheets. A decision to go ahead, which was expected during 2023, is unlikely unless all decisions are cleared out.

¹ Source: email from Stockholm Exergi to Acid News 2022-02-22

² Reuters, 11 June 2019, Fortum CEO discussed Uniper investment restriction with Russia's Putin <https://www.reuters.com/article/us-uniper-m-a-fortum-russia-idUSKCN1TC1EX>

³ Uniper press release 16 April 2021, <https://www.uniper.energy/news/uniper-seeks-judgement-for-the-future-of-maasvlakte>

Problems with BECCS

To justify funding the Stockholm Exergi project the EU must believe that the technology will, or at least can be, replicated on a large scale. There are several questions over this.

FERN is an NGO “whose mission is to achieve greater environmental and social justice, focusing on forests and forest peoples’ rights in the policies and practices of the European Union”. It listed Six Problems with BECCS¹ in a Briefing Note 2018. They are summarised here:

1. **BECCS may not deliver large-scale carbon dioxide removals.** Biomass is not carbon neutral, because not all logging is sustainable. Emissions from the logged land, logging machinery, transport, and CO₂ capture and storage reduce the climate benefit.
2. **BECCS has technical barriers and is expensive.** In several climate scenarios, BECCS is supposed to be scaled up massively and very fast. This was unproven in 2018, and is still unproven in 2022. The cost was difficult to estimate in 2018. Since the Norwegian Longship project we at least have a benchmark, which is about €500 per ton, but that is closer to a storage site and uses a purer stream of CO₂ than most BECCS projects can be expected to produce.
3. **BECCS would require a huge amount of land and push up the price of food.** This may not be true for an individual BECCS plant such as in Stockholm, but there is an inevitable conflict of interest if BECCS goes from million-ton scale to billion-ton scale. (As for example in the International Energy Agency Net Zero scenario of 2021.)
4. **BECCS would harm biodiversity.** This problem also comes with the scale. “The areas considered to have good potential for dedicated bioenergy crops overlap with protected areas, especially in central Europe, the Mediterranean, the

United States of America, Central America, South-East Asia and Central Africa”, according to FERN.

5. **BECCS would take a huge amount of water and threaten planetary boundaries.** Some of the biomass, from bio-crops, will require a lot of water, which is already a scarce resource in many parts of the world (though not in Sweden). Carbon capture from thermal power plants also uses more water than power plants without CCS, as even more recent research² underscores.
6. **BECCS is a barrier to energy transition.** FERN sees BECCS as a way to blur distinctions between renewables and fossils, as does the switching of fuel from coal to biomass in power plants. “Bioenergy without CCS is already offering a life-line to coal, as many coal power plants are being converted to allow the co-firing of biomass and coal.” Recent development points in the same direction. Fortum Oslo wants to keep burning mixed household waste: biomass and plastics, instead of applying the solar, wind and waste hierarchy. Stockholm Exergi has similar ambitions.

¹ FERN, Six problems with BECCS https://www.fern.org/fileadmin/uploads/fern/Documents/2021/Six_problems_with_BECCS.pdf

² Berkeley, 4 May 2020, New research shows hydrological limits in carbon capture and storage <https://chemistry.berkeley.edu/news/new-research-shows-hydrological-limits-carbon-capture-and-storage>



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Amazon nears climate 'tipping point'

"Savannification" of the Amazon would be hugely disruptive, in South America and across the globe.

Hammered by climate change and relentless deforestation, the Amazon rainforest is losing its capacity to recover and could irretrievably transition into savannah, with dire consequences for the region and the world, according to a new study published in *Nature*. Besides the Amazon, ice sheets on Greenland and the West Antarctic, Siberian permafrost loaded with CO₂ and methane, monsoon rains in South Asia, coral reef ecosystems, and the Atlantic ocean current are all vulnerable to tipping points that could radically alter the world as we know it.

Source: Phys org 12 March 2022 <https://phys.org/news/2022-03-amazon-nears-climate-faster.html>

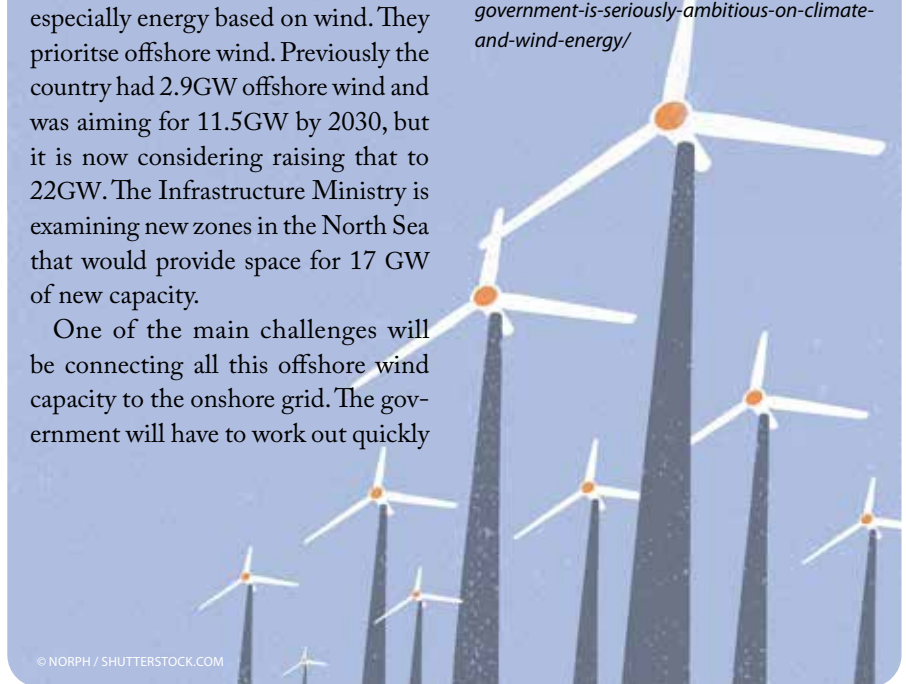
Dutch government launches ambitious climate and wind energy package

The coalition government took office nine months ago. Now they have agreed to cut CO₂ emissions from the Netherlands by at least 55%-60% by 2030 (compared to 1990) – and by 70% by 2035 and 80% by 2040. These cuts entail substantial growth of the share of electricity in the energy mix especially energy based on wind. They prioritise offshore wind. Previously the country had 2.9GW offshore wind and was aiming for 11.5GW by 2030, but it is now considering raising that to 22GW. The Infrastructure Ministry is examining new zones in the North Sea that would provide space for 17 GW of new capacity.

One of the main challenges will be connecting all this offshore wind capacity to the onshore grid. The government will have to work out quickly

how to tackle this given the long time it takes to plan and build new grid infrastructure. They also need to focus on expanding electricity demand by stimulating the electrification of energy intensive industry.

Source: Wind Europe, 13 January 2022, <https://windeurope.org/newsroom/news/new-dutch-government-is-seriously-ambitious-on-climate-and-wind-energy/>



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Mediterranean Sea could become a low-sulphur fuel area by 2025

The EU, together with countries around the Mediterranean Sea, committed to further efforts to protect the Mediterranean environment. By 2025, the Mediterranean Sea could become an emissions control area mandating the use of low-sulphur marine fuels.

Ship leaving Piraeus, Attica, Greece.

© AERIAL-MOTION / SHUTTERSTOCK.COM

On 10 December 2021, in Antalya, Turkey, 22 signatory governments agreed to establish a sulphur emission control area (SECA) for shipping in the Mediterranean Sea. The decision came as part of a meeting of the UN Barcelona Convention on the Protection of the Marine Environment and the Coastal Region of the Mediterranean. The plan is for the proposal to be submitted for adoption to the Marine Environment Protection Committee (MPEC) in June 2022 and apply to the IMO to add the resolution to the next MPEC meeting in October 2022, which would clear the way for the control zone to begin as early as 2025. A broad range of NGOs had long advocated for this action.

The ships steaming through the Mediterranean would only use fuels containing a low sulphur content, which is specified as 0.1% sulphur from 1 January 2025, instead of current levels of 0.5% (since 1 January 2020). Although measures have not yet been decided for nitrogen oxides, the Barcelona Convention signatories agreed to discuss the establishment of the NECA zone (to limit NO_x emissions) within the next two years.

Source: Bureau Veritas Marine & Offshore <https://marine-offshore.bureauveritas.com/newsroom/sulphur-emission-control-area-seca-mediterranean-sea-2025>





Solar parks can benefit bumble bees

If solar parks are managed as meadows they could provide valuable habitats for pollinators. This is an example of how renewable energy and nature conservation can work together.

© INACIO PIRES / SHUTTERSTOCK.COM

New research from Lancaster University shows that simple changes to how solar parks are managed could boost ground-nesting bumble bee populations in the parks and surrounding areas.

Alternative management scenarios that offered varying degrees of resources for bumble bees were examined in the research. The findings indicated that solar park land managed as meadows supports four times as many bumble bees as solar park land managed as turf grass. Another finding was that large, elongated and resource-rich solar parks could boost bumble bee density up to one kilometre outside of the parks themselves, delivering pollinator services to crops in surrounding agricultural land. Farmers who have solar parks on or near their land, could choose to plant pollinator-dependent crops close to these pollinator-dense areas.

The research comes in the midst of what scientists are calling an “insect apocalypse” as the abundance of bugs around the world is falling by 1 to 2 per cent each year.

This decline is largely because of human activities like deforestation, climate change, agriculture, the introduction of competing species, and pollution.

Fears are sometimes expressed that the expansion of photovoltaics will lead to competition with other land uses, such as arable land or nature conservation areas (the “plate or tank debate”). These fears

are unfounded from the perspective of nature conservation and environmental protection, especially for areas where energy crops such as maize are currently being cultivated. On the contrary, a considerable increase in value can be achieved here through conversion if it is done right.

Hollie Blaydes, a PhD researcher at Lancaster University stated: “Our findings provide the first quantitative evidence that solar parks could be used as a conservation tool to support and boost pollinator populations. If they are managed in a way that provides resources, solar parks could become valuable bumble bee habitat.”

In the study, in order to understand how solar park management could impact bumble bee density within solar parks and surrounding areas, the researchers used a geographic information system (GIS) to create solar parks of different sizes, shapes and management approaches based on real UK examples in real UK landscapes. This GIS was combined with a state-of-the-art pollinator model called Poll4Pop, which predicted bumble bee density and nest density inside the solar parks and surrounding buffer zones. They then used statistical analyses to investigate differences in bumble bee density and nest density across the different solar parks in the model.

There are barriers to solar parks being managed in ways that benefit bumble bees

and other wildlife. For instance, there are costs associated with establishing and managing habitats for pollinators and there are currently no economic incentives for the solar industry to do this. Subsidies within agricultural policy system could provide mechanisms for this.

Blaydes and her team would like their ideal, bee-friendly solar parks to move from model to reality. There are already signs that things are moving in this direction. Solar Energy UK has established a Natural Capital working group. Solar Energy UK Chief Executive Chris Hewitt stated: “By supporting healthy ecosystems at a local level whilst avoiding climate change-causing emissions from coal and gas power stations, solar PV can play a significant role in the UK’s response to both the climate and biodiversity emergencies.”

Source: The Guardian, “Solar parks could be used to boost bumblebee numbers, study suggests”, 13 December, last accessed 1 February. <https://www.theguardian.com/environment/2021/dec/13/solar-parks-could-be-used-to-boost-bumblebee-numbers-study-suggests>

Even low levels of PM_{2.5} can increase health risks

Air pollution below current air quality standards in Europe has been linked to mortality. In a large joint research programme the focus was on understanding effects of exposure levels below the current EU Air Quality Directive annual limit. The studies support efforts for more ambitious air quality standards in Europe and other global regions as severe health effects were found. Long-term exposure to concentrations of PM_{2.5} and NO₂ was associated with non-accidental, cardiovascular, non-malignant respiratory, and lung cancer mortality in seven large European cohorts.

Source: [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(21\)00277-1/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(21)00277-1/fulltext)



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Updated urban air quality atlas

The European Commission's Joint Research Centre (JRC) has recently published its Urban PM_{2.5} Atlas 2021 report. The report states that many European cities still suffer from poor air quality and exceed the EU air quality standards for PM_{2.5}. The JRC concludes that for many cities, local actions at the city scale are an effective means of improving PM_{2.5} air quality, but the geographical scales over which mitigation is most effective differ from city to city.

Find the report here: <https://publications.jrc.ec.europa.eu/repository/handle/JRC126221>



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Fossil fuels behind a quarter of PM deaths

Burning of coal, oil and gas caused most of the fine particle (PM_{2.5}) related deaths in industrialised countries, shows a new study. Shipping and farming had higher impacts than are widely recognised.

Fossil fuel combustion was the major source of air pollution and contributed to more than a quarter of all deaths from outdoor fine particulate matter (PM_{2.5}), says a new report published by the Health Effects Institute (HEI). Coal combustion was responsible for half of those deaths, with natural gas and oil combustion accounting for the other half. The burning of solid biofuels, such as wood for indoor heating and cooking, was the second major source of PM_{2.5}, especially across South Asia and Sub-Saharan Africa.

HEI initiated the Global Burden of Disease from Major Air Pollution Sources (GBD MAPS) project to determine which air pollutant sources or fuels contribute most to outdoor PM_{2.5} concentrations and their associated mortality. The results can help to identify priorities for source-specific policies and interventions. McDuffie and colleagues started by ex-

panding and updating the only publicly available global emissions inventory for seven key atmospheric pollutants (nitrogen oxides, carbon monoxide, sulphur dioxide, ammonia, non-methane volatile organic compounds, black carbon, and organic carbon), eleven anthropogenic sectors (including agriculture, energy, industry, and transportation), and four fuel categories (coal, biofuel, liquid fuel, and a remaining category that included such industrial processes as fugitive emissions). The investigators used the emissions data in a model and combined those results with satellite data to model outdoor PM_{2.5} at a spatial resolution of 0.01° × 0.01° (about 1 km × 1 km at the equator). They compared the modelled concentrations with measurements of PM_{2.5} from many stations in different countries to confirm the model results. They then calculated average outdoor PM_{2.5} exposures for all

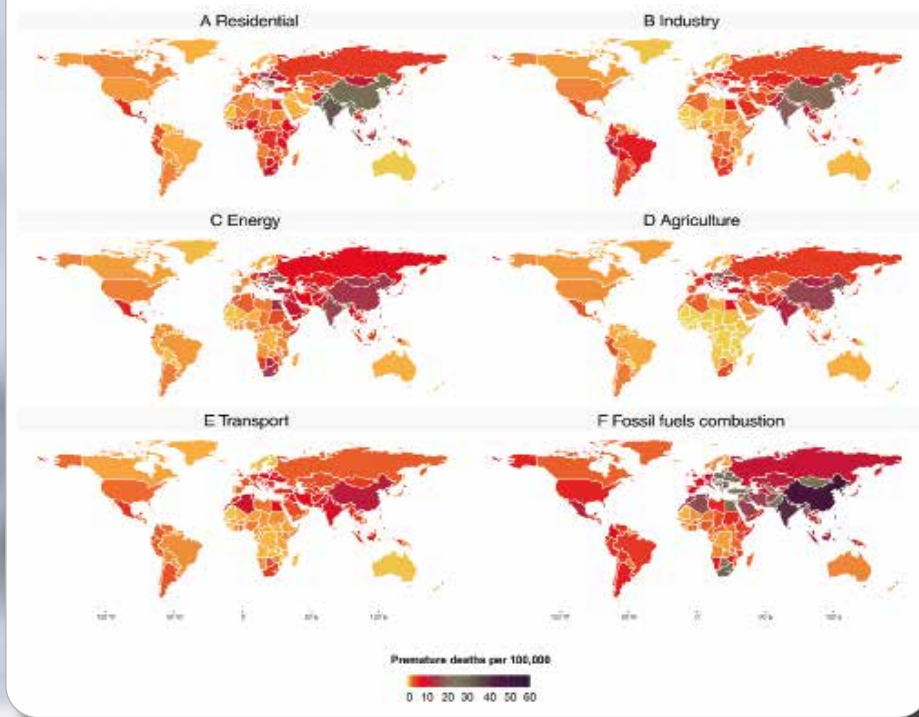


Figure above: Premature deaths per 100,000 attributable to population-weighted mean ambient $PM_{2.5}$ mass from selected sectors in 2017.

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Serbia's first air quality programme

Serbia is launching its first draft air protection programme and an air pollution action programme. During the heating season Belgrade sometimes tops the list of most-polluted cities and the urgency of tackling this problem is huge. The action plan identifies the activities needed to implement measures and covers a five-year period through 2026.

Source: Balkan Green Energy News, 4 November 2021, <https://balkangreen-energynews.com/serbia-prepares-its-first-air-protection-program/>



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Protest against the poor air quality in Belgrade, in November 2021.

Coal pollution has killed 200,000 Turks since 1965

HEAL's new analysis on "Chronic coal pollution Turkey: Cumulative health effects" highlights that the country's decades-long dependency on coal power generation has led to unacceptably high health impacts and costs. Between 1965 and 2020, coal power generation in Turkey led to almost 200,000 premature deaths, 62 million lost working days, 11 million hospital admissions and other health impacts, with a cost of up to EUR 320 billion.

Source: HEAL "Chronic coal pollution Turkey: Cumulative health effects" January 2022 <https://www.env-health.org/chronic-coal-turkey-cumulative/>



the people living in different countries and world regions for all the source sectors and fuel categories. Finally, the investigators applied relationships between air pollution and health at different ages to calculate the mortality impact of the outdoor $PM_{2.5}$ sources. They assumed that all particles are equally toxic, which of course could have implications for e.g., windblown dust in the western sub-Saharan Africa region.

Energy generation, including electricity and residential cooking and heating, was the largest source sector. Agriculture was an important source contributor in some regions because of emissions of ammonia, which is a precursor to $PM_{2.5}$. Combustion of fossil fuels (coal, oil, and natural gas) contributed one fourth, and as much as one third in South Asia or East Asia, of all attributed deaths globally. Of the fossil fuels, coal contributed the highest emissions and related deaths. International shipping and agriculture sectors had higher impacts than are widely recognised. Biofuel and remaining emissions from fossil fuels

and other sources also had substantial contributions. Windblown dust had a large variation in their contribution. The new report highlighted that major source of $PM_{2.5}$ vary by country and region, and different parts of the world were impacted by air pollution in different ways. While fossil fuel combustion made up most of the $PM_{2.5}$ across the industrialised nations of the global north, windblown dust was a major source of $PM_{2.5}$ in African countries. Overall, the report indicates that a majority of $PM_{2.5}$ in outdoor air comes from anthropogenic fuel combustion, suggesting that integrating air quality, energy, and climate policies is key to achieve health benefits from reducing air pollution.

Ebba Malmqvist

The research team has made all datasets, code, and visualisations publicly available (gbdmaps.med.ubc.ca).

Decades of chronic coal pollution in Turkey have led to a large, unacceptable health burden

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Millions of people may be affected by loss of coral reefs in Southeast Asia and the Indian Ocean

Although corals occupy only a small part of global sea areas, they are extremely important for marine biodiversity, including sectors that are of great value for human livelihoods. Cited in the environmental newsletter DownToEarth, Roxy Mathew Koll, who is a climate scientist at the Indian Institute of Tropical Meteorology, Pune, said: "...they [corals] occupy only 0.1 per cent of the global sea surfaces. But more than 25 per cent of marine biodiversity is supported by them, which includes fisheries as well. They are the first that get affected by high temperatures."

The IPCC's Sixth Assessment Report on Impacts, Adaptation and Vulnerability, which was recently released, highlights

Fishing boat close to coral reef in Indonesia.



how global warming (together with other human activities) are a threat to coral reefs. There are about 3.35 million fishers in Southeast Asia, and around the Indian Ocean the corresponding figure is 1.5 million. In an economic context,

examples of losses include staggering figures estimated to range between \$27.78 and \$31.72 million per year in Nharang Bay, Vietnam, depending on different scenarios. As another example, the coral reefs of St. Martin's Island in Bangladesh contribute \$33.6 million per year to the local economy.

The threats that these habitats are experiencing are caused by rising temperatures, ocean acidification due to the greenhouse gas carbon dioxide, and many other human-related pressures. Bleaching of coral reefs is already a tragic fact in these and many other waters.

Sources: Down to Earth, 8 March 2022, <https://www.downtoearth.org.in/news/wildlife-biodiversity/degradation-loss-of-coral-reefs-can-affect-4-5-million-people-in-southeast-asia-ipcc-report-81854>

IPCC 6th AR WGII <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>

Unlocking onshore wind in Poland

A new report from Ember highlights that Poland's onshore wind policy is not compatible with the EU's climate targets. The report assesses onshore wind distancing rules in all EU member states, showing that Poland's current policy is among the most strict. The development of onshore

wind energy in Poland has been paralyzed since 2016 due to legal restrictions. An amendment was proposed mid-2021, but it keeps getting delayed for political reasons. Without changing the onshore wind law, Poland will likely compromise 2030 climate targets for the whole EU and disrupt Europe's current efforts to reduce fossil fuel import dependency, which calls for urgent intervention from the European Commission.

Source: EMBER 15 March 2022 <https://ember-climate.org/insights/research/change-is-in-the-wind/>



99.7% of Polish land is excluded from wind investments due to distancing rules.

New Zealand wants to charge road users for air pollution, noise and GHG emissions

Early this year the New Zealand Ministry of Transport published a consultation document "Driving Change: Reviewing the Road User Charges System". The document highlights that other than road damage, other externalities, such as water, noise or air pollution, accidents, congestion, and greenhouse gas emissions are not explicitly considered when setting road user charges (RUC) today. The government acknowledges that decarbonising land transport is going to be challenging and requires a broad set of measures to achieve the reductions recommended by the Climate Change Commission. Further, they believe that bringing up externality costs related to such emissions might make the shift to a low-carbon society more economically fair. They acknowledge that buying an electric vehicle might be a

large cost and that biofuels might be more expensive, but incorporating more of the true costs of fossil fuels might lessen this gap. Providing an exemption or reduced rate of RUC could help support and promote the uptake of new fuels. This assistance would most likely be through exempting vehicles subject to RUC, such as electric vehicles, or through charging a lower RUC rate than equivalent petrol or diesel vehicles, to offset higher operating costs. The document adds that if the intent is to support technologies or fuels that are currently more expensive than existing fuels, but which assist with reducing greenhouse gas emissions, RUC could be used to support this shift.

The consultation is open until 22 April 2022 and can be accessed at <https://www.transport.govt.nz/consultations/road-user-charges-consultation/>.

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Farm emissions high on Air Convention agenda

The last CLRTAP meeting featured a new guidance on agricultural waste burning, a new assessment report on ammonia, and the inclusion of methane in the revision analysis.

The United Nations Economic Commission for Europe (UNECE) held the 41st session of the Executive Body for the Convention on Long-range Transboundary Air Pollution (CLRTAP), also known as the Air Convention, on 6–8 December 2021. The Air Convention came into force almost 40 years ago and counts more than 50 countries as parties, including the EU, Canada, the United States, and several other European and Central Asian countries. The Air Convention has been extended to include eight specific protocols. The Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone covers five of the main air pollutants: sulphur dioxide, nitrogen oxides, ammonia, volatile organic compounds (VOCs) and particulate matter (PM_{2.5}). Black Carbon (BC) is only regulated under the Gothenburg Protocol as a component of particulate matter. New guidance was adopted at the 41st session suggesting that within the UNECE region, additional measures for wood-fuelled heating stoves and agricultural waste burning can reap the biggest benefits in reducing both PM_{2.5} and BC emissions, promising benefits for air quality, climate, biodiversity and health. While guidance for wood burning had already been adopted in 2019, the focus this time was on guidance to reduce emissions from agricultural waste burning. There was agreement that agricultural waste burning has many negative impacts, such as air pollution, greenhouse gas emissions, soil erosion, loss of biodiversity and soil nutrients, of which the latter must be replaced by using expensive fertilisers to maintain crop yields.

Agricultural practices were also discussed in the context of a new assessment report on ammonia (NH₃), finding the need for a 30–50% reduction within the UNECE region to avoid damage to ecosystems and



Burning of agricultural waste is still practised in parts of Europe.

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health. Ammonia from agriculture is the culprit for many environmental problems, as a PM_{2.5} precursor and by polluting water and damaging ecosystems, and is regulated under the Gothenburg Protocol. While the damage that ammonia emissions cause to public health and ecosystems costs €10–25 per kg of ammonia, the abatement costs vary from €0 to €4 per kg of ammonia for most countries, and up to €15 per kg of ammonia in some areas with a high density of livestock. Parties at the 41st session of the Executive Body also welcomed the imminent entry into force of the Protocol on Persistent Organic Pollutants (20 January 2022) and the Protocol on Heavy Metals (8 February 2022), promising further benefits for clean air in the region.

Another important emission in agriculture is methane, and reductions would be of great benefit to both air quality and climate. Methane emissions are not yet directly regulated in the Gothenburg Protocol. The Parties agreed to include

methane in the analysis for the revision of the Protocol, which is a promising first step for future inclusion of methane in the protocol in the future.

The ongoing Gothenburg Protocol review was also discussed with some insight on how the Convention could evolve in the years to come through stronger cooperation both within and beyond the UNECE region. To strengthen this, the Convention Parties launched a new initiative in 2019, the forum for international cooperation on air pollution, to exchange information and mutual learning at both technical and policy levels and enable greater international cooperation on solutions to improve air quality globally. The Parties established a new Task Force for International Cooperation on Air Pollution, chaired by Sweden and the UK and consisting of experts from Parties and other interested countries and international organisations.

Ebba Malmqvist



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EU paves the way for carbon farming credits

Dutch government plan for farm buyouts

The Netherlands aims to reduce the total cattle herd by 30% over the next seven years, mainly by buying out farmers. Documents from coalition talks reveal that the government is going for the more ambitious of two proposals prepared by the environmental planning agency last autumn. The package of measures includes buyouts of farmers and investments in farm housing and technology that reduce nitrogen pollution. It is expected to cost 30 million euro, with the buyouts accounting for a little more than half. If enough volunteers are not found, the government does not exclude the option to force farmers to sell their land. The background is a court ruling from 2019, which states that nitrogen deposition in Natura 2000 areas is too high.

Source: <https://www.dutchnews.nl/news/2022/02/cattle-herd-to-be-cut-by-30-over-next-decade-to-meet-nitrogen-targets/>

Northern Ireland gets its first climate bill

Northern Ireland will soon get its first climate change bill. It includes a target for net-zero emissions by 2050, which means that they will be in line with the rest of the UK. The Green Party had put forward an alternative bill that would allow net-zero to be achieved five years earlier.

As this is an agricultural region, methane emissions from livestock have been central to the negotiations. An amendment proposed by the agriculture & environment minister removing agricultural emissions from being part of the net-zero target was rejected. Instead, they passed an amendment to limit the reduction of methane to 46% by 2050.

Source: BBC, 10 March 2022, <https://www.bbc.com/news/uk-northern-ireland-60670559>



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All farmers should have access to carbon emission and removal data for their land by 2028. Carbon credits play a key role in the EU Commission's plans to boost carbon sequestration on farmland.

In mid-December, the European Commission presented a communication on Sustainable Carbon Cycles¹. The first part of the action plan presents several short-term measures to increase carbon removal in agriculture.

The central aim is to create more incentives for landowners to adopt practices that contribute to carbon storage, so-called carbon farming. This includes a broad range of activities such as: afforestation, agroforestry, conversion of arable land to permanent grassland, cover crops, conservation tillage and restoration of peatlands.

The Commission recognises that most of these measures can already be supported through Common Agricultural Policy. However, the extent to which this is done is up to the member states in the formulation of strategic plans. Most member states submitted their strategic plans to the EU Commission at the turn of the year for approval. In a recent evaluation carried out by the European Environment Bureau², climate measures are either absent or insufficient in most of these plans. The Commission has the power to reject plans that do not deliver

adequately on the set climate ambition. To what extent they will do that remains to be seen. At a conference in January, Vice-president Commissioner Frans Timmermans answered vaguely that they "will not be shy in pointing out the deficiencies" and "we are going to help member states doing the right thing".

Is there a failing belief in member states' willingness to pay for the necessary increase in carbon sequestration themselves? Much effort is put into preparing for a more widespread sale of carbon credits on a voluntary market. Potential buyers would be food companies with claims of being carbon neutral. Or even private individuals who would buy credits to soothe their climate conscience.

There is already a small and so far, unregulated market for carbon farming credits. However, among the pioneering projects there is considerable variation in how the carbon credits are calculated and validated. This is not good for an industry that is based on trust. The remedy put forward by the Commission is standardisation of monitoring, reporting and verification (MRV) methodologies for carbon farming. They have previously

Carbon sequestration in numbers

- ✗ Net removals of carbon in the EU land sector were 249 Mt CO₂eq in 2019. In the proposal for a new LULUCF legislation there is a target to increase annual removals to 310 Mt CO₂eq by 2030. Environmental organisations say that more is feasible and necessary, for example CAN Europe propose a doubling of current removal.
- ✗ In its communication, the Commission proposes that various measures in carbon farming should account for around two-thirds, 42 Mt CO₂eq, of the increase required to reach the LULUCF target.

- ✗ More than twice as much carbon sequestration, 84 MtCO₂eq, could be achieved by restoring all Annex I habitats in the Biodiversity Directive, according to a recent report by WWF and IEEP.³

³ Institute for European Environmental Policy, "Climate mitigation potential of large-scale nature restoration in Europe", February 2022. <https://ieep.eu/publications/climate-mitigation-potential-of-large-scale-nature-restoration-in-europe>



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The Commission will consider applying the polluter-pays principle to emissions from agriculture.

announced a law proposal for carbon farming credits by the end of this year.

To gather knowledge and experience from member states and stakeholders, the Commission announced that they will set up an expert group on carbon farming. Improving the quality of carbon farming credits and MRV methodologies is highlighted as a central task for the expert group. Furthermore, it is declared that every land manager should have access to verified emission and removal data by 2028.

The communication also contains proposals for research and development. A special section is dedicated to development of carbon storage in marine environments, so called blue carbon. This could include carbon farming through nature-based solutions, for example on coastal wetlands as well as seaweed and mollusc regenerative aquaculture and

marine permaculture.

Finally, the Commission also promises by 2023 to carry out a study to assess the potential to apply the polluter-pays principle to emissions from agricultural activities. This seems a little out of place considering the focus on carbon removal in the communication. Although it may be justifiable in the sense that if you get paid for carbon sequestration, you must also pay for your emissions.

Kajsa Pira

¹ Sustainable Carbon Cycles COM(2021) 800 https://ec.europa.eu/clima/eu-action/forests-and-agriculture/sustainable-carbon-cycles_sv

² CAP Strategic Plans – are they likely to deliver on given promises? February 2022 <https://eeb.org/cap-national-strategic-plans-will-fail-to-deliver-on-european-green-deal-environmental-and-climate-objectives-ngo-assessment-reveals/>

War is no excuse to weaken Farm to Fork

More than 85 environmental and agriculture organisations have written an open letter calling on the EU not to derail the Farm to Fork and Biodiversity Strategies on the “false claim that European food security is threatened by the current Russia-Ukraine war”.

The letter comes as a reaction to the statement by EU agriculture commissioner Janusz Wojciechowski that “if food security is in danger, then we need to have another look at the objectives of the Farm to Fork strategy and correct them”.

Instead, they believe the contrary to be true: “the crisis in Ukraine is yet another reminder of how essential it is to implement the Green Deal and its Farm to Fork and Biodiversity Strategies”.

Source: BirdLife pressrelease 10 March 2022 <https://www.birdlife.org/news/2022/03/10/joint-open-letter-eu-food-supply-shortage-russia-ukraine-war/>



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Insect poop can be used as a fertilizer

Insect frass is simply the faeces of insects. Researchers have concluded that the frass is rich in nitrogen as well as other nutrients that can improve soil quality and plant growth. In addition to the nutrients, the insects' faeces also contain microbes that can contribute to biocontrol of plant pests and diseases.

Because industrial production of insects intended for food and feed is growing, there will also be a growing stream of by-products. The researchers hope that the application of these residual streams as soil amendments can further contribute to a sustainable and circular agriculture.

Source: Trends in plant Science 2 March 2022, [https://www.cell.com/trends/plant-science/fulltext/S1360-1385\(22\)00007-3](https://www.cell.com/trends/plant-science/fulltext/S1360-1385(22)00007-3)



Excretions from insects like the black soldier fly may promote plant growth when mixed into soil.

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IEA "net zero" scenario shows little faith in renewables

"If you continue to invest in dirty energy, you risk losing money. If you invest in clean energy, you can make some handsome profit", said Fatih Birol, head of the IEA when he launched its annual World Energy Outlook (WEO) in October. The new WEO marks a substantial change for the organisation and the international establishment. That change is a victory for NGOs' efforts to make Paris and 1.5 degrees the new normal.

The International Energy Agency IEA was formed by the OECD in 1974 as a countermove against high oil prices set by the oil-producing countries in the Middle East. This objective has remained constant ever since, under the banner "security of supply", meaning an ample supply of oil and gas at low prices for the rich countries. Most of the time it was to be accomplished with more coal, more nuclear and more oil and gas production in Europe and America, including tar sands and fracking.

As recently as 2017, Fatih Birol, executive director of the IEA, told upstream oil industry leaders in Houston, Texas to "Invest, invest, invest".

For a long time the IEA has claimed to be a climate champion, but all its scenarios have accepted big temperature increases. Those high-fossil scenarios have been used by the fossil fuel industries and the entire financial sector to justify continued use of fossil fuels.

That is now changing.

At long last, in May 2021, the International Energy Agency produced a Net Zero scenario that aims to keep temperature rise below 1.5°C. It has now been integrated, more or less, into the new WEO just in time for COP26 in Glasgow.

It calls for an immediate stop to fossil investments and a speed limit of 100 km/h on motorways by 2030. But it relies heavily on nuclear power and CCS.

NGOs welcomed one message in May: "From today no investment in new fossil fuel supply projects".

"Finally the IEA is starting to get it," said Greenpeace International.

"Big oil and gas companies like Shell and BP have relied on previous, less ambitious IEA scenarios to justify inadequate climate plans and pledges. That hiding place is now gone," commented Oil Change International, a group that has campaigned specifically against the IEA's self-fulfilling prophecies.

If you know the feeling of having a favourite toy, you know how the IEA feels about nuclear power.

"For years, we've seen fossil fuel companies and governments justify their fossil fuel expansion plans – from the TransMountain tar sands pipeline expansion to Arctic oil drilling to the Adani coal mine – on the backs of scenarios from the International Energy Agency (IEA)," they said earlier.

This shift has put some fossil companies in an awkward position, for example in Norway, where investments in oil and gas are rising.

In the WEO presentation on October 13, Birol claimed that even if the climate targets are not reached, they are already disrupting the energy markets. He also said that the new energy economy will be cheaper, cleaner, fairer, more resilient and safer. He specifically said that it was wrong to blame the high energy prices in late 2021 on clean energy.

The IEA's chief energy modeller, Laura Cozzi, also pointed out that we are now beginning to bend down the CO₂ curve.

But it is not a completely new IEA that has appeared, especially not at the detailed level of the scenario numbers.

Their "net zero" does not mean zero. It does not mean the end of coal mining or oil and gas drilling. It still projects consumption figures of 85 exajoules of gas, 35 of coal and 89 of oil in 2050. That is a billion tonnes of coal, two billion tonnes of oil and 1.6 billion tonnes of gas. The fossil emissions are to be counteracted mainly by CCS, see below.

The IEA has a track record of underestimating the growth of solar and wind. It seems hard to kick the habit. Photovoltaic growth is projected to be 21% per year during the first decade, 2020–2030, slowing to 9% in 2030–2040 and a mere 3% in the final decade to 2050. Wind power



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Figure: The world is starting to bend the emissions curve. New Policies, cost reductions, and the pandemic have pulled the projected emissions curve down. Updated NDCs and long-term net zero pledges decouple emissions and economic growth this decade.

growth falls from 15% per year in the first decade to 3% in 2040–2050.

Does renewable growth decelerate because the power system can't integrate more? If so, why does the Energy Transitions Commission – no less illustrious and established than the IEA – project twice as much solar by 2050 in its scenario from April 2021?

The slow growth of solar and wind is important, as the holes have to be filled up with something else: biomass, nuclear or CCS.

Biomass use is projected to increase 64 per cent from 2020 to 2050. A large share (some 25 per cent) of that biomass comes from short-rotation woody crops.

One of the great sources of CO₂ is deforestation, which must be reversed. Is there enough land for both large-scale afforestation and so much more biofuels?

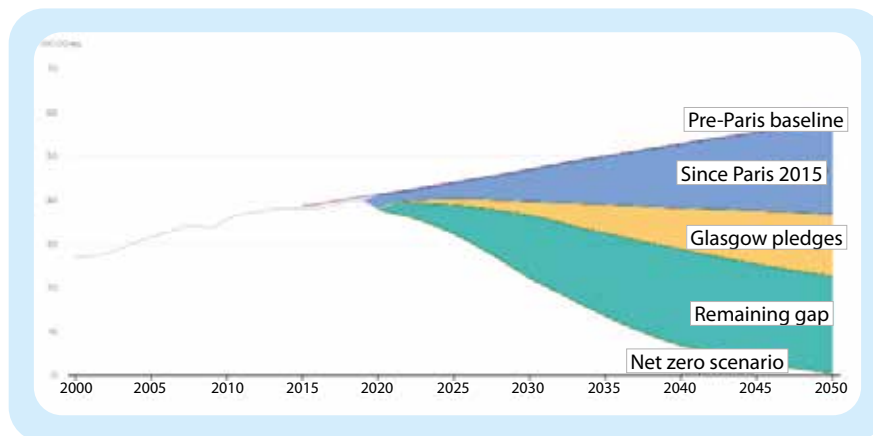
Nuclear energy is projected to increase to twice what it is now. This has been the modus operandi of the IEA since 1974. They always expect nuclear to grow.

Reality check: nuclear power peaked in 2006 at 2661 TWh and has never exceeded that figure. It will contract further over the next several years. A large number of reactors will close in Europe and America, in Korea and Taiwan. Construction of new reactors is not enough to stop the decline.

But the IEA has built its save-the-world scenario on the hope of a nuclear revival.

Carbon capture: The IEA's Net Zero scenario projects that 7.6 billion tonnes of CO₂ will be captured per year by 2050. In other words the weight of captured CO₂ will be greater than current global oil consumption (4.4 billion tonnes in 2019). Pipelines would carry more CO₂ than they currently carry natural gas, and a large share of world shipping will be transporting CO₂.

As carbon storage increases from 2030 through 2040 to 2050, the scenario does not mention when CCS will stop. The implication is that 200 billion tonnes of CO₂ or more would be stored, safely and forever.



Direct carbon capture (DAC), using giant vacuum cleaners that draw down CO₂ from the air, features high in the IEA future. By 2050, 663 million tonnes of CO₂ are to be removed that way. That would require 112–150 million tonnes of oil equivalent, according to an IEA calculation and much more according to other sources.

What CO₂ price would be needed to cover such costs?

CCS has been heavily hyped for 20 years, but the results are meagre and in minor niches, as it is far too expensive.

DAC hardly exists and would be still more expensive. It will not happen.

If fossil fuels are phased out earlier and replaced with more solar and wind, emissions would be cut faster and much, much cheaper.

A strange feature of the report is also that 40 per cent of the hydrogen in 2050 will come from natural gas with CCS ("blue hydrogen"). In the same year 1713 TWh electricity will be produced from hydrogen. One third of this hydrogen would be "blue", which would be very helpful for the fossil gas industry. The rest would be electrolytic and a huge waste.

Net Zero is only one of four scenarios in the WEO. The other three are:

- "Stated Policy". This would result in a 2.6°C temperature rise.
- "Announced Pledges", e.g. Paris commitments in the NDCs. (These keep coming in by the day.)
- "Sustainable Development" results in a 1.65°C rise. It is not sustainable but is retained for the sake of continuity with earlier IEA projections.

The momentous choice the scenarios represent may well be compared to a

turning point in the Second World War, say the Battle of Moscow in December 1941, and somebody had presented the Red Army with four options on how to counter the Nazi assault:

1) we give up right now; 2) we continue the trend to lose c) we lose, but not so fast and d) we will use our troops as best we can to fight back and win the battle and eventually the war, but only if we are allowed use magic. (The Net Zero.)

One reason why it is so difficult for the IEA to give a straight answer to a simple question: "1.5, how?" is that they keep using the same methodology that has produced so many wrong results before. The real thing in energy and climate is coal, gas, oil and CO₂. But the IEA's model has the GDP at its core, and uses derived concepts such as energy intensity" and "carbon intensity" as if they were real.

They also assume a 3% growth in world GDP, which is more than we had in 2010–2020.

The Red Army generals in 1941 were stupid and crude enough, but they did not see defeat as an option. And they did not lay down "3% GDP real growth for 1942–45" as a condition for fighting.

Fredrik Lundberg

¹ <https://jpt.spe.org/ceraweb-ia-chief-upstream-industry-invest-invest-and-invest>

² <http://priceofoil.org/2021/10/13>

³ <https://www.reuters.com/article/norway-economy-oil-idUSL5N2ND13B>

⁴ <https://www.energy-transitions.org/wp-content/uploads/2021/04/ETC-Global-Power-Report-pdf>

⁵ www.iea.org/reports/direct-air-capture

⁶ e.g. <https://www.nature.com/articles/s41467-020-17203-7>

CCS projects around the world

The situation for Carbon Capture and Storage (CCS) in Canada, Norway and Italy.

Canadian scientists protest against CCS support

"We urge you to not introduce the proposed investment tax credit for CCUS because it will constitute a substantial new fossil fuel subsidy. As well as undermining government efforts to reach net-zero by 2050, the introduction of this tax credit would contradict the promise made by your government to Canadians during the election period to eliminate fossil fuel subsidies by 2023 as well as our international commitments under the Paris Agreement."

This is the beginning of a letter signed by more than 400 climate scientists and other members of academia to Chrystia Freeland, Deputy Prime Minister and Minister of Finance in Canada, sent in January 2022. Freeland is a member of Justin Trudeau's government, and of the same Liberal Party.

The group of academics includes two IPCC lead authors and are from diverse fields, including physics, chemistry, engineering, economy, and philosophy, and more.

"Despite the billions of taxpayer dollars spent by governments globally on CCUS, the technology has not made a dent in CO₂ emissions," they write.

Canada has long supported CCS, with several past and future projects, mainly for enhanced oil recovery. Policy favouring CCS, as well as nuclear, is also supported by the right-wing Progressive Conservative Party, the biggest opposition party.

Canada claimed to be a climate leader at the COP in Glasgow.

This is not reflected in the data. Canada had only 4 TWh of solar and 36 TWh of wind in 2020. Its greenhouse gas emissions increased from 602 Mtons to 730 Mtons between 1990 and 2019 according to the UNFCCC data. Its coal production has decreased, but gas has increased some 70 per cent and oil production almost trebled since 1990, much of it from tar sands.

Fredrik Lundberg

Boundary Dam CCS far below capacity

Boundary Dam #3, the world's only coal power CCS project since PetraNova in Texas was shut down indefinitely, has not lived up to expectations.

"The carbon capture facility at Boundary Dam was designed to capture 3,200 metric tons of CO₂ daily, or slightly more than 1 million metric tons annually. It has barely achieved that goal on any single day and has never done so over any extended period," according to David Schliessel at the Institute for Energy Economics and Financial Analysis. His analysis covers the period up to the first quarter of 2021.

During the rest of 2021 performance has been even worse, according to SaskPower, which operates Boundary Dam.

To judge from its charts, it captured less than half of its designed capacity of one million tonnes a year.

The company's website asks the question "Why Carbon capture and storage on coal?" and answers: "By capturing and safely storing CO₂ emissions before they reach the atmosphere, we can help ensure a brighter future for both our province and the world."

This defence of coal (in this case brown coal) is not up to date, as the Canadian government has promised to phase out coal power by 2030 and has gone a long way towards doing so. It produced more than 100 TWh in 2005 and no more than 36 TWh in 2020.

SaskPower has decided not to retrofit

the sister plants Boundary 4 and 5 with CCS, as there was "simply no business case" to do so. It has already shuttered one and will shutter the other by 2024.

SaskPower is not transparent on where the captured CO₂ ends up. Some of it goes to enhanced oil recovery and some is supposed to go into geological storage, but it gives no data on how much goes to which, nor how much actually goes straight up into the air.

The economics of the project were criticised early on and Canada's parliamentary budget office concluded that it would double the cost of electricity. That was in 2016 when the poor performance was not yet known.

Fredrik Lundberg

Norwegian CCS project going ahead

In September 2020 the Norwegian government initiated a Carbon Capture and Storage project called the Longship. The CO₂ storage part is called the Northern Lights project. CO₂ will be captured at a cement factory in Porsgrunn, Norway. From there it will be transported by ship to a terminal on the west coast, near Bergen. The CO₂ will then be pumped through a pipeline to a facility in the North Sea. Here, it will be pumped down into a subsea geological structure for storage.

Of two potential CO₂ capture facilities, only the project in Porsgrunn received government financing. A CCS plant at the waste incineration facility at Klemetsrud in Oslo only received a promise of partial financing of NOK 3

billion. This was on condition that the EU would cover the rest, NOK 4 billion.

In late November 2021, the EU decided that it did not want to finance the Klemetsrud plant. The reasons cited for the decision were that the project was too small and not mature enough. Some Norwegian politicians argued that the Norwegian government should shoulder the whole bill for the carbon capture plant at Klemetsrud. That demand has not gained enough support, so far.

A new development (17 December 2021) is the production of low-emission ammonia from fossil gas. The resulting CO₂ will be captured. The project will be situated at the Melkøya gas processing plant in Northern Norway. It will

use the CO₂ storage already in place in connection with the Snøhvit gas field in the Barents Sea. The Norwegian government has financed the project to the tune of NOK 482 million. The CO₂ storage at Snøhvit has not been operating since a catastrophic fire in the gas processing plant at Melkøya in September 2020. This is where the gas from Snøhvit is processed, and CO₂ separated from the gas is pumped back out to storage under the seabed. Since the gas processing plant was shut down for repairs and will remain closed until spring 2022, the CCS facilities have not been active during this period.

Tore Braend

Enel CEO does not believe in CCS

Francesco Starace, CEO of the giant Italian power company Enel, sees CCS as a lost cause.

The company brought forward its net zero emissions pledge by 10 years to 2040 in November 2021, but it is not betting on carbon capture as a way of achieving it.

“We have tried and tried – and when I say ‘we’ I mean the electricity industry,” Starace said to the business TV channel CNBC.

“The fact is that it [CCS] doesn’t work, it hasn’t worked for us so far. And there is a rule of thumb here: If a technology doesn’t really pick up in five years – and here we’re talking about more than five, we’re talking about 15, at least – you better drop it.”

Enel is a heavyweight in European power and in global green power, and

Starace was president of the European power lobby Eurelectric from 2017 to 2019.

Enel is the biggest power company in the world, by revenue, according to Power Technology, ahead of Electricité de France (though it produces less electricity). It operates plants of all kinds from Russia to Chile, and claims a strong focus on renewables, from which it got just above 50 per cent of its generation in 2020. Its GHG emissions per kWh were 214 grams per kWh in 2020, slightly less than the EU average of 230 grams. Enel has set a target to cut this to 148 g per kWh in 2023 and below 82 g per kWh by 2030 in its 2020 sustainability report. It plans to phase out all coal power by 2027.

Fredrik Lundberg

The second part of the survey will be published in the next issue of Acid News.

Wind and solar power cheapest energy

New nuclear, new coal and new gas are far more expensive than wind and solar, according to financial advisor and asset management firm Lazard. Renewables can even beat existing fossil and nuclear power under some circumstances.

Lazard, a financial advisory and asset management company in New York, Paris and London presents data for the cost of electricity from different sources every year. The results for late 2021 come from version 15.0, and can be seen in a table below.

Table: The levelized costs of electricity in USD per MWh, for various sources, according to Lazard.

Source	USD/MWh
Solar utility scale	28-41
Solar rooftop residential	147-221
Geothermal	56-93
New nuclear	131-204
Existing nuclear	29
Wind onshore	26-50
Offshore wind	83
Offshore wind subsidized	9-40
New coal	65-152
Existing coal	42
New coal CCS, ex trp and storage	152
Gas combined cycle, new	45-74
Existing gas	24
Gas with CCS or mix hydrogen	89,129
Gas peaker	151-196

Wind power (onshore) is the cheapest energy, at \$26-50/MWh, followed by large-scale photovoltaics at \$28-41. This is far, far lower than nuclear at 131-204, and new coal from 65 upwards.

If governments and power companies follow advice from Lazard they should not build any new conventional power. CCS is also an absolutely hopeless proposition.

That advice is pretty much followed in America and Europe – not in rhetoric but in actual investment.

As for the competition with existing coal, gas and nuclear power stations, the situation is not as clear-cut. Gas and nuclear for base load, i.e. when plants are run at full capacity most of the year, costs about as much as wind and solar. Coal loses out again.

In the real world, of course, things are more complex, in two senses.

Just because wind and solar are cheaper

you can't switch overnight. Licensing and permitting can take years, though the construction time is not so long for solar and wind.

Energy that can deliver when needed is more valuable than energy that can't. Gas peakers produce expensive electricity, but can be very worthwhile for the few hours they are online to avoid blackouts or brownouts. So can batteries, an emerging alternative, which can make room for even more wind and solar. Lazard also follows the cost development for batteries.

Even through the difficult Covid years 2020-2021 when there was severe supply chain disruption, wind and solar costs continued to drop, from \$28-54 for wind in 2019 to \$26-50 in 2021, and for solar from \$36-44 to \$26-50.

Fredrik Lundberg



New parliamentary vote to ramp up offshore wind production in EU

More offshore renewable energy is needed to meet Europe's climate goals, but permits for new sites need to be approved quicker, according to the European Parliament.

On 16 February the European Parliament voted on an own-initiative report on the European Commission's offshore energy strategy (published in November 2020). The report was adopted with 518 votes in favour, 88 against, and 85 abstentions. The report proposed a massive expansion in offshore wind capacity to reach 60 GW by 2030 and 300 GW by 2050. For wave and tidal, the goals are 1 GW by 2030, rising to 40 GW by 2050.

The vote shows that the Parliament welcomes the Commission's strategy, while proposing additional focus areas. The main bottleneck to be addressed is the permitting process, which needs to be simplified. MEPs called on the Commission to make offshore wind a core component of the EU's energy system by 2050 as well as considering the impact of increasing the 2050 target from 300 GW to 450 GW. The need to boost investment in "circular and nature-inclusive" projects was also stated. MEPs highlighted that offshore wind farms can benefit marine biodiversity if they are designed and built sustainably. The circular focus can contribute further to a sustainable future for the clean energy sector and this will both increase the efficiency of the decarbonisation and reduce the reliance on material imports.

The latest report from WindEurope, published on 24 February, shows that in 2021 the EU installed 11 GW of wind power and is estimated to install an average of 17.6 GW between now and 2026. The sector needs 32 GW to reach the EU's target of 40% of renewables in its energy mix by 2030. Giles Dickson, CEO of WindEurope commented: "Land is not the issue. Finance is not the issue. Technology is not the issue. Public opinion is not the issue. It's the sheer complexity of the permitting procedures."

Energy commissioner Kadri Simson said: "On permitting, we know that we face one of the key challenges for project development in the EU. So we are doing everything we can to make sure that member states coordinate, streamline and facilitate the process." Furthermore, the EU executive plans to provide guidance on good practices this summer to address what she called "overly complex and excessively long administrative procedures".

The permitting process can be simplified by, for example, setting up single points of contact for developers and introducing time limits for issuing permits and authorisations.

However, the permit process should include local communities and should not



Wind farm construction in the North Sea.

come at the expense of protected areas. The report seeks to increase public support through "transparent and meaningful involvement of coastal communities" as well as "one-stop shops" to provide information on how to fund "breakthrough" demonstration projects.

In a statement published after the vote, rapporteur Morten Petersen (Danish Renew Europe lawmaker), said it was clear that MEPs "all understand the urgency of the matter and that we are putting offshore renewable energy front and centre in the fight against climate change".

Emilia Samuelsson

¹Read more in Acid News No.3 2021 "Material recovery opportunities from the clean energy sector".

²European Parliament demands quicker deployment of offshore renewable energy, Euractiv, 18 February, <https://www.euractiv.com/section/energy/news/european-parliament-demands-quicker-deployment-of-offshore-renewable-energy/>

Take part in the EU's public consultation to speed up the renewable energy permitting processes

When it comes to the bottleneck in speeding up the permitting process for renewable installations the EU Commission has promised to publish guidance to member states. While the 2018 Renewable Energy Directive introduced rules on the organisation (single contact points) and maximum duration of the permit-granting process, stakeholders have emphasised how additional guidance, such as the sharing

of good practice, would help provide further improvement on the ground.

The European Commission therefore opened two public consultations on 18 January 2022 as part of plans for a dramatic increase in solar and wind power capacity. The first consultation is on guidance for improving permitting and power purchase agreements, and the second focuses on solar energy. Both consultations will run until 12 April.



EU renewable heating manifesto: “We need to heat our homes, not the planet”

During the ongoing EU energy policy revision, a coalition of Europe’s biggest environmental groups has pushed for renewable energy and energy efficiency solutions as well as rejection of fossil fuel boilers.

The crisis in global energy prices has showed just how vulnerable Europe is to the fickle international gas markets, given its dependence on imports for 90 per cent of its fossil gas. It has never been clearer that we need renewable, affordable energy for all. Most of Europe’s imported is used for heating buildings “despite the fact that heating and cooling sectors are much easier to abate than other sectors”, as the manifesto states. Natural gas is still Europe’s main fuel for district heating, responsible for 37 per cent of heating, followed by coal at 25 per cent. Overall, buildings account for 40 per cent of the EU’s energy consumption.

When it comes to heating buildings, “solutions have been around for a long time”, according to Davide Sabbadin of the European Environmental Bureau (EEB). These take the form of renewable, non-emitting heating and cooling technologies that have been on the market for many years. The manifesto of Renewable Heat for All points out the importance of heat pumps, geothermal and district heating networks as substitutes for gas and oil boilers.

Green MEP Ciarán Cuffe, the rapporteur on the revised Energy Performance of Buildings Directive (EPBD), welcomed the manifesto, particularly in light of Russia’s invasion of Ukraine. “The events of the last few days are a reminder that we need

to move away from our overreliance on gas and oil and accelerate our EU energy transition.” He added: “Through the EPBD, I would like to see a phase-out of fossil fuel subsidies and replace them with subsidies for heat pumps. I want our homes to become zero-emitting homes that are powered by clean renewable energy which helps to lower energy bills for vulnerable households. The decarbonisation of the heating sector can be achieved if we stay ambitious.”

Member states have the right to decide on their own energy mixes, and their ambition levels differ greatly. For example, the Netherlands and Flanders are proposing gas boiler bans in the next decade. Renewable energy’s share of heating and cooling in the EU was 23 per cent in 2021. The levels vary greatly, for example Sweden has reported a 66 per cent share, while Ireland merely 6.3 per cent.

The manifesto is published during the revisions to the bloc’s energy policies, such as the Energy Performance of Buildings Directive, Energy Efficiency Directive and the Renewable Energy Directive. “We do not yet see a consistent strategy across all of these files to achieve a higher share of renewables in time to meet climate commitments,” said Jörg Mühlenhoff, CAN Europe’s energy transition policy coordinator. “There are too many doors

left open for fossil gas.” The rewards are not only seen when it comes to the climate aspect but also for public health. Fossil fuels in people’s homes contribute to damaging indoor air quality and urban air pollution.

The manifesto also highlights the financial obstacles that need to be addressed. The costs of retrofitting and switching to renewable heating technology mean that not everyone can access them. The EU and national governments must ensure all households can take advantage of these solutions by scaling up support programmes. A transformation of the role of fossil fuels in the energy market is needed, decommissioning large parts of the current gas grid, stopping new residential connections, facilitating access to domestic renewables and district heating, and ending the sale of gas boilers. Governments must protect consumers from gas and gas grid costs as well as from misinformation on the sustainability of fossil fuels and on the future decarbonisation of the gas grid. Consumers should have the right to participate actively in this transition of their homes and cities.

The manifesto underlines important actions to make the transition possible:

- **Embrace energy savings & sufficiency:** The cleanest, cheapest form of energy is energy that is not used;



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The cleanest, cheapest form of energy is energy that is not used; everyone should be able to get their homes renovated.

everyone should be able to get their homes renovated.

- **Reject false solutions:** Replace fossil-fuelled heating with renewables; the technology is there and the decarbonisation of heating and cooling can now rely fully on renewable, sustainable, non-emitting mature technologies.
- **Protect vulnerable consumers:** Divert fossil fuel subsidies to renewable energy solutions; despite their maturity, competitiveness and abundant potential, the barriers preventing millions of households from benefiting from renewable heating and cooling technologies remain too high.

The need to transition the energy system of the EU has never been so prominent. The crisis in global energy prices has shown just how vulnerable Europe is to the international gas markets. The new IPCC report highlighting the dire state of the climate crisis and the acceleration of the energy transition is vital. It is essential to grab the low-hanging renewable heat fruit now.

Emilia Samuelsson

Based on "Renewable Heat For All – A civil society manifesto for the future of heating and cooling in Europe", which can be found here: <https://eeb.org/wp-content/uploads/2022/02/RenewableHeatForAll-Manifesto.pdf>

Honeycomb-shaped floating wind farm may be cheaper to operate

The mooring design is based on the traditional technologies from the mooring of oil & gas floating structures. Once a turbine is installed on a floater, it is anchored to the mooring system to ensure the platform stays in its original target position while limiting motion. With floating wind turbines connected in a "honeycomb" network, the solution enables new ways of applying well-proven mooring technology in new and more effective anchor-sharing configuration. It is believed that the solution could make marine operations more efficient and less costly and with lower environmental impact. This is partly due to lower pretension and line weight in the mooring system, opening the possibility of using



Concept image from Semar of a "honeycomb" network.

smaller, less expensive vessels for marine operations and because the anchors are shared there is less impact on the seabed.

Source: Offshore wind 15 February 2022, <https://www.offshorewind.biz/2022/02/15/honeycomb-inspired-floating-wind-solution-attracts-major-backer/>

Green certificates a Swedish success

By 2002, wind power in Sweden and Norway was less than 0.5 TWh, far behind Denmark's 4.4 TWh. In 2003, green certificates were introduced, first in Sweden and later also in Norway. A growing percentage of electricity was required to be new and green, paid for by electricity consumers. This created a steady income for wind power.

When the certificate system was introduced, environmental NGOs often compared it unfavourably to the German feed-in tariffs, which give a much greater incentive for technological development of wind and solar. The Swedish-Norwegian system has demonstrated another advantage: to get high volumes of green power at a low cost.

The system was a political compromise



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A political compromise proved to deliver high volumes of green power at a low cost.

and produced windfalls for biopower and even peat.

But after a few years wind power was the main way to get certificates. Wind power took off: 1 TWh in 2006; 7 TWh in 2013; 18 TWh in 2017; and 28 TWh in 2020 in Sweden, and 10 in Norway. Wind now covers some 20 per cent of electric consumption.

The certificate prices were initially high, at about €30/MWh. Then prices fell, and in 2019 they crashed to

near zero.

The system has done its job and is no longer needed.

Wind power keeps growing fast, with 47 TWh projected for Sweden in 2024. Solar is also growing, but due to different policies.

Fredrik Lundberg

A saltier world is to be expected

Sealevel rise and increased evaporation due to climate change cause salinisation of freshwater. Salinisation of wetlands may also lead to higher emissions of greenhouse gases.

Freshwater salinisation – a process in which these water bodies become saltier – occurs because of a number of human activities. These include agriculture, resource extraction (the withdrawal of materials from nature), use of road salt etc. Climate change can also drive salinisation or interact with salinisation caused by other factors.

Salinity is one of the main factors that regulate the distribution of species and hence also the species composition in water bodies. The functioning of animals, plants and microbes is affected by the equilibrium of ions in internal fluids and those in the surrounding waters. If the salinity in the environment changes, so will the salinity in the internal fluids, unless the organism is able to regulate its internal concentration of ions. Although some organisms have this capacity, it comes with an energetic cost that can affect the performance of the organism. Some organisms can conform to salinity changes and are to some extent tolerant to changes in their internal salinity.

Nevertheless, as the ability to cope with salinity changes varies between species, a saltier world leads to a world where the species composition and distribution of species change. Ultimately, this can change entire ecosystems, and affect the services that these ecosystems provide.

Salinisation as a result of climate change was a recurring topic in the contribution to the fifth assessment report of Working Group II of the IPCC (<https://www.ipcc.ch/report/ar5/wg2/>), and this is also the

case for the recently published final draft of the contribution to the sixth assessment report (<https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>).

Climate change increases the risk of saltwater intrusions from the sea due to sea level rise and a rising occurrence of floods and storms. Another process that can lead to salinisation is increased evaporation. The problem of salinisation is also related to water scarcity – another threat from climate change (and a growing global population). As pointed out by Michelle van Vliet and co-workers in a commentary in *Nature Geoscience*, “Sustainable management of water resources for different uses will not only need to account for demand in water quantity, but also for water temperature and salinity, nutrient levels and other pollutants”¹.

As mentioned, climate change can interact with other factors that drive salinisation. In a study on rivers and streams in the USA the projected impact of land use changes and climate change was investigated². The study showed that in this case land use was the main driver of salinisation. However, climate change interacted with land use and the greatest increase in salinity was predicted when these factors were combined.

Climate change not only relates to salinisation as one of the drivers – in fact salinisation can also be a driver for greenhouse gas (GHG) dynamics! This was, for instance, shown in an mesocosm experiment in lakes on the Qinghai-Tibetan plateau, where it was found that salinisa-

tion increased methane formation due to microbial processes³ (Mesocosms are enclosures that contain a part of nature and can be experimentally manipulated.) In another study⁴, salinisation related to drought in wetlands in California was investigated. The study led the authors to suggest that “...salinization may increase GHG emissions from estuarine freshwater wetlands”.

There is a scarcity of studies on salinisation in many parts of the world, including in South America, Africa, and Asia. Many of the regions where salinity studies are lacking also experience huge challenges due to climate change. To improve the geographic coverage of salinisation studies, and to address several other knowledge gaps, a group of researchers recently suggested a new “research agenda for a saltier world”⁵.

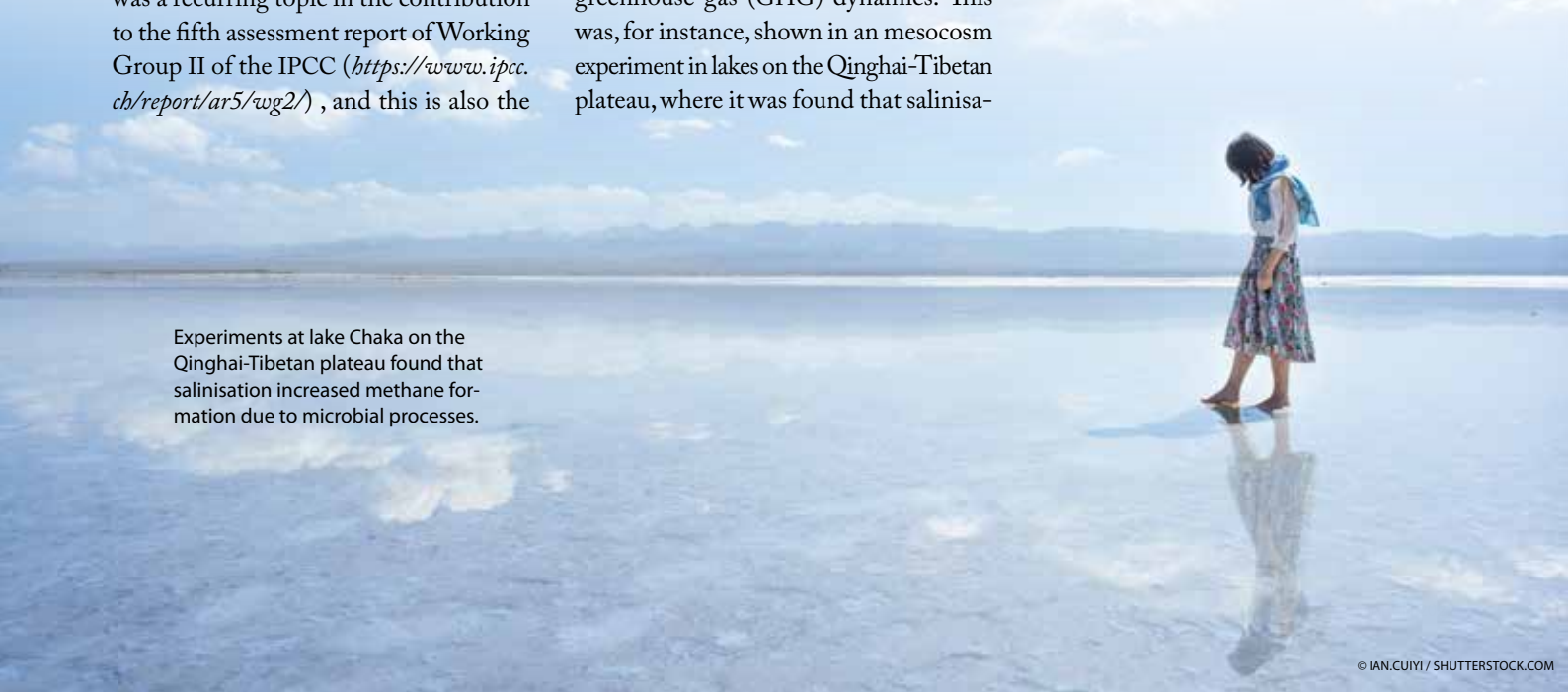
Marko Reinikainen

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- ² Olson, 2019. *Phil. Trans. R. Soc. B* 374: 20180005
- ³ Huang et al., 2020. *Front. Microbiol.* 11: 1772
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- ⁵ Cunillera-Montcusi et al. 2022. DOI: <https://doi.org/10.1016/j.tree.2021.12.005>

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Experiments at lake Chaka on the Qinghai-Tibetan plateau found that salinisation increased methane formation due to microbial processes.





Changing Ocean Asia documentary

Liz Courtney, who is an award-winning maker of films and documentaries, has directed and written the documentary series Changing Ocean Asia. The series focuses on how climate change is already affecting marine waters and the low-lying areas of Southeast Asia.

The documentary comes in four parts, namely:

1. Sinking Cities of Asia
2. Extreme Weather. Powerful Tsunamis
3. Urban Oceans. Super Corals
4. Sea Level Rise. Engineering Solutions

The documentary series is narrated by Dr Sylvia Earle, who is a globally renowned marine scientist.

Changing Ocean Asia is available on several platforms, which can be found here: <https://earthobservatory.sg/news/eos-launches-changing-ocean-asia-documentary-series>

Accurate monitoring of marine heatwaves needed for the Indian Ocean

A recent study shows that marine heatwaves in the Indian Ocean affect the Indian summer monsoon rainfall. The incidence of marine heatwaves (events with extremely high temperatures) has increased because of climate change. According to the study, marine heatwaves in the western Indian Ocean and the north Bay of Bengal are coupled with a reduction in monsoon rainfall over the central Indian subcontinent. Monsoon rainfall over southwest India is increasing, however, due to marine heatwaves that occur in the Bay of Bengal.

At present, a deeper understanding of the relationship between marine heatwaves (and between other factors) and rainfall is hampered by a lack of necessary monitoring data. Such data could be also used for forecasting marine heatwaves in the Indian Ocean.

A roadmap known as InDOOS, comprising four primary improvements to the current observation system, has been proposed. These improvements concern

the upscaling of biological and chemical measurements, expanding monitoring to the western tropics, higher resolution for upper ocean processes, and developments regarding key coastal regions as well as the deep ocean.

Sources:

<https://india.mongabay.com/2022/02/broaden-understanding-of-marine-heatwaves-in-the-indian-ocean-experts/>

<https://doi.org/10.1029/2021JC017427>

<https://journals.ametsoc.org/view/journals/bams/101/11/bamsD190209.xml>



Marine heatwaves in the Bay of Bengal cause heavier monsoon rains.

International Ocean Acidification Action Week

Ocean Acidification (OA) caused by carbon dioxide from the burning of fossil fuels puts our seas at danger. Corals, cod, salmon, shrimps and shellfish are among the organisms at peril, together with whole ecosystems. The threats to nature are also a great concern for humans and affect everyone who benefits from nature and the sea – for work, for leisure, and for inspiration.

The threat from OA is in general poorly recognised in the governance of marine waters. To raise awareness about OA, AirClim encourages other NGOs and

all those concerned about our seas to take action to highlight OA – a phenomenon that is still not well known to everyone. We hope that creative contacts with, for example, fishers, schools, artists, museums, and journalists can be established so that information on OA will be widely spread in societies globally. The week following UN World Environmental Day on 5 June and UN World Ocean



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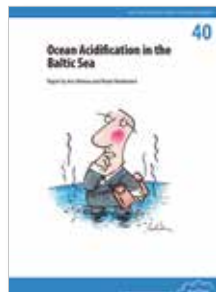
Day on 8 June provides a good opportunity to raise the problems of OA before the UN Oceans Conference, to be held in Portugal at the end of June 2022. Here a strong action program against OA should be decided.

Materials on OA are available under the heading "Ocean Acidification Working Group" at www.airclim.org.

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Recent publications from the Secretariat

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



Ocean Acidification in the Baltic Sea (April 2021). By Anu Vehmaa & Marko Reinikainen. The Baltic sea is especially vulnerable because of its low total alkalinity.



1.5°C to survive. Evidence from the IPCC Special Reports (May, 2021). By Susanne Baur, Alexander Nauels & Carl-Friedrich Schleussner.



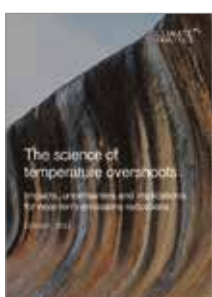
Nordic Food Transition – Low emission opportunities in agriculture (June 2021). By Annika Lund Gade et al. Eight case studies and forty policy recommendations.



Overview briefing on the IPCC Special Report on Global Warming of the 1.5°C (May 2021). By Carl-Friedrich Schleussner et al.



Phasing out fossil gas power stations in Europe by 2030 (February 2021). By Fredrik Lundberg. A list of 142 gas-fired power stations that should be closed or not commissioned.



The science of temperature overshoots (October 2021). By Susanne Baur, Alexander Nauels, Uta Klönne & Carl-Friedrich Schleussner.



Analysing marine geoengineering technologies (February 2021). By Fredrik Lundberg.



1.5°C Pathways for Europe: Achieving the highest plausible climate ambition (October 2021). By Ryan Wilson, Lara Welder, Alexandre Delfosse et al.

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Coming events

The second – and final – stakeholder meeting for the revision of EU AAQD, online & Brussels, 4 April 2022

IMO PPR 8 (Sub-Committee on Pollution Prevention and Response). London, UK, 4 – 8 April, 2022. Information: www.imo.org

CLRTAP TASK FORCE ON INTEGRATED ASSESSMENT MODELLING (TFIAM) 6-8 April 2022 Information: www.unece.org/env/lrtap/welcome.html

CLRTAP Working Group on Strategies and Review. Geneva, Switzerland, 11 – 14 April 2022. Information: www.unece.org/env/lrtap/welcome.html

Health Effect Institute Annual Conference. Washington DC, US 24-26 April 2022 Information: <https://www.healtheffects.org/annual-conference>

Stockholm+50: a healthy planet for the prosperity of all – our responsibility, our opportunity. Stockholm, Sweden, 2 – 3 June 2022. Information: <https://www.stockholm50.global>

IMO Marine Environment Protection Committee (MEPC 78). London, UK, 6 – 10 June 2022. Information: www.imo.org

Ocean Acidification Action Week. 6-10 June 2022. Information: www.airclim.org

Climate Change Conference. Bonn, Germany, 6-16 June Information: <https://unfccc.int/SB56>

International Conference on Air Quality – Science and Application, Hybrid format, 27 June – 1 July 2022 <https://www.herts.ac.uk/airqualityconference>

UN Oceans Conference. Lisbon, Portugal, 27 June – 1 July 2022. Information: <https://www.un.org/en/conferences/ocean2022>

EU Environment Council. Brussels, Belgium, 28 June 2022. Information: <https://www.consilium.europa.eu/en/meetings/calendar/>

International aerosol conference. Athens Greece, 4-9 September 2022. Information: <https://iac2022.gr/>

CLRTAP EMEP Steering Body + Working Group on Effects. Geneva, Switzerland, 12 – 16 September 2022. Information: www.unece.org/env/lrtap/welcome.html

ISEE 2022 34th Annual conference of the International Society for Environmental Epidemiology. 18-22 September 2022, Athens, Greece. Information: <https://www.viethconsulting.com/Calendar/moreinfo.php?eventid=66101>

UNFCCC COP 27. Sharm El-Sheikh, Egypt. 7-18 November 2022. Information: <https://unfccc.int/>

IMO Marine Environment Protection Committee (MEPC 79). London, UK, 12 – 16 December 2022. Information: www.imo.org