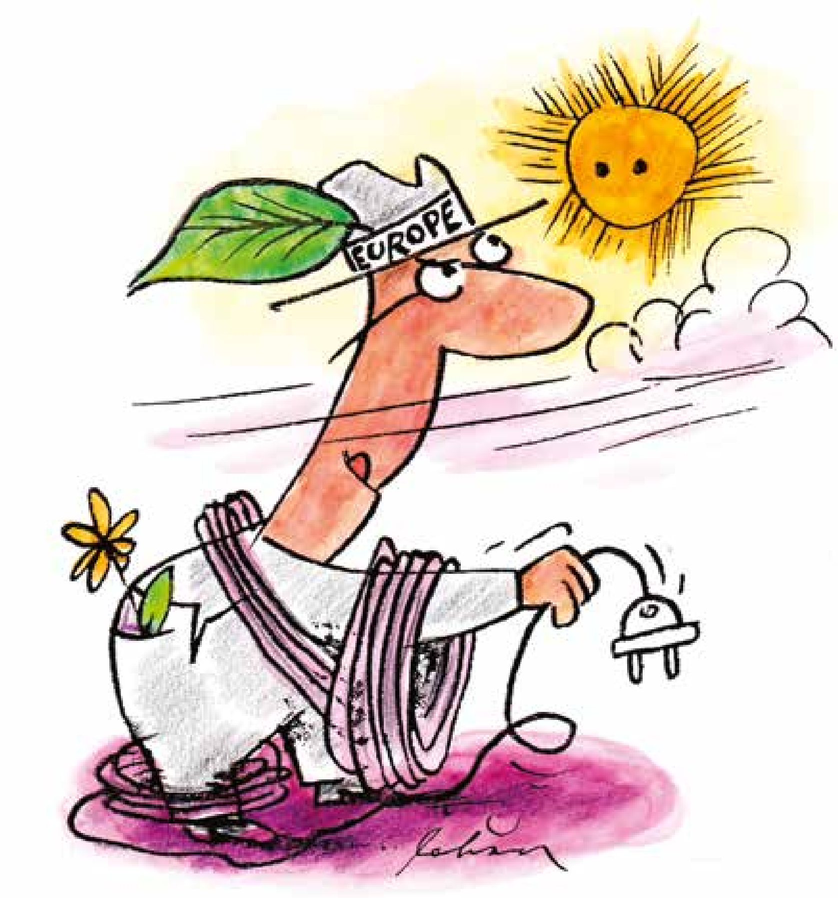
NO.2, MAY 2020

Acid News



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Europe can be climate neutral by 2040 with solar and wind power

According to a new study, conducted by Finland's LUT University and SolarPower Europe, Europe's energy system could be fully renewable by 2040 in a "leadership scenario", or by 2050 in a "moderate scenario".

Paula Abreu Marques, senior official at the European Commission's energy directorate, claimed that the report will give "food for thought" to the commission modellers currently examining the effects of raising the EU's climate targets for 2030. The study also highlights the importance of solar power and states that more than 60% of the energy mix would be generated by solar panels (in all scenarios except Laggard).

The report is entitled *100% Renewable Europe – How To Make Europe's Energy System Climate-Neutral Before 2050*, and was published on 15 April. The study explores Europe's energy transition by modelling three scenarios with the boundary conditions and main results shown in the figure below. The Laggard scenario reflects a slower transition and generates a 62% renewable energy share, 90% greenhouse gas emission reductions and misses the European Commission's climate neutrality and Paris Agreement

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Acid News

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

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

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

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The Air Pollution and Climate Secretariat

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

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

In furtherance of these aims, the Secretariat:

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

AirClim

Editorial

The offshore wind industry has developed rapidly over the last 10 years. The technology has never had such a high output capacity, lower prices or a higher coexistence potential. The European Commission is to present a new strategy on offshore renewable energy which will be published in October as part of the European Green Deal.

The European Green Deal reflects the significance of this progress. It states that "Increasing offshore wind production will be essential, building on regional cooperation between Member States"[1]. To deliver the objectives of the Green Deal and decarbonise the energy system, Europe needs between 230 and 450 GW of offshore wind by 2050[2]. Today, Europe has 22 GW of wind capacity installed[3]. To make this growth possible, the EU's offshore wind strategy needs to address multiple challenges.

Giles Dickson, CEO of WindEurope, highlights these challenges when he states that the strategy needs to "map out clearly how to mobilise the investments needed", and adds: "Crucially, it should provide a masterplan (a) to develop the offshore and onshore grid connections and (b) to get the maritime spatial planning right."[4]

When it comes to grid connections, advanced offshore infrastructures are needed to integrate offshore wind power in the most efficient way. A suggested change to optimise the grid development is meshed grids[5, 6]. Meshed offshore grids refer to integrated offshore infrastructure in which offshore wind energy hubs are connected to several nations. This is an efficient solution to meet energy demands, in contrast to traditional radial connections which link offshore wind to single countries and markets.

There are many uncertainties when it comes to interconnected grids and wind power projects, such as how to share the costs between countries. The strategy needs to push legislative measures for international wind farms and encourage EU member states to focus more on transnational spatial planning. It is vital to consider these aspects well in advance of the coming expansion, as lock-in effects of an inefficient grid design could be challenging or even impossible to correct in the future.

"This perspective is short"

When it comes to offshore wind projects and their permits, the strategy needs to add a long-term perspective that can guide nations now. The new Maritime Spatial Planning Directive requires that member states set out plans for the next six years. This perspective is short and makes it difficult to factor in the goal of 450GW by 2050. Finally, research has found that lack of cooperation and misalignments between national regulatory frameworks are the main obstacles to integrated offshore network investments[7]. Deployment of offshore wind power should be accompanied by purposeful coordination between the countries and stakeholders involved, and the strategy set out by the European Commission needs to support this.

Emilia Samuelsson

Based on:

https://www.euractiv.com/section/energy-environment/news/european-commission-to-present-offshore-wind-strategy-in-october/

https://www.euractiv.com/section/energy/news/offshore-wind-boom-not-enough-to-reach-eu-climate-goals/

1. European Commission, Communication The European Green Deal, COM/2019/640 final, Brussels, 11.12.2019

2. https://ec.europa.eu/energy/topics/renewable-energy/onshore-and-offshore-wind_en

3. Wind Europe (2020) Offshore Wind in Europe–key trends and statistics 2019, Brussels.

4. Simon, F. (2020, February 6). Offshore wind boom 'not enough' to reach EU climate goals. Retrieved from https://www.euractiv.com/section/energy/news/offshore-wind-boom-not-enough-to-reach-eu-climate-goals/

5. Dàmir Belltheus Avdic & Pierre Ståhl. (2019) Baltic InteGrid review: towards a meshed offshore grid in the Baltic Sea

6. Sunila, Kanerva, et al. "A supra-national TSO to enhance offshore wind power development in the Baltic Sea? A legal and regulatory analysis". Energy policy 128 (2019): 775-782.

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targets. The Moderate scenario includes a medium-pace energy transition towards 100% renewables by 2050 and meets the climate neutrality and 2˚C Paris Agreement targets. The Leadership scenario applies a rapid transition over the next two decades and achieves the 100% renewable energy target, zero greenhouse gas emissions by 2040, as well as the 1.5˚C Paris Agreement target.

The bottom-line of the study is that it is possible for Europe to become fully climate neutral by 2040 by merely going completely renewable, without measures such as carbon sinks. According to the modelling the total cost of reaching 100% by 2050, in the moderate scenario, is 6% lower than the cost of inadequate action in the Laggard scenario. The study's modelling of a cost-optimal energy transition generates several additional key findings.

The European energy system is currently based on 85% fossil fuels and nuclear power. A high electrification rate is vital for a 100% renewable energy system to become reality. Despite an overall increase in demand for energy services, the primary energy demand decreases due to increased efficacy, and the Leadership scenario results in the highest electrification share, at 86%. This development would enhance sectoral integration and create significant efficiency gains for the energy system, thus lowering the cost of transition.

According to the study, the two main pillars of the energy transition will be solar and wind. Wind power has higher capacity factors and will provide the highest shares of electricity generation up to 2030. However, according to this study solar will become the main source of electricity from 2030 onwards (in both the moderate and leadership scenarios). This is partly due to the fact that solar panels are capable of being installed in any size for distributed and centralised applications and partly due to the cost-competitiveness of solar.

Another crucial technology for the transition is electrolysers for hydrogen production. The study states that renewable hydrogen will become Europe's second key energy carrier. From 2030, renewable hydrogen will be able to contribute to the full decarbonisation of the transport and heat sectors. At present, the transport sector, with 8% share of renewables, has the farthest to go to reach 100% renewables. Europe could become an exporter of a product of hydrogen – synthetic fuels – (in the leadership scenario). This product will be vital especially for marine and aviation to become carbon neutral.

FIGURE 0.1 SCENARIO OVERVIEW

	LAGGARD	MODERATE	LEADERSHIP
RE energy share	62% by 2050	100% by 2050	100% by 2040
Paris Agreement	⊗	Achieved 2.0°C	Achieved 1.5°C
GHG emissions in the energy system	-90% in 2050	-100% in 2050	-100% in 2040
Fossil fuels phaseout	⊗	Achieved in 2050	Achieved in 2040
Nuclear phaseout	⊗	⊗	Achieved in 2040

Source: SolarPower Europe. © SOLARPOWER EUROPE 2020

When it comes to the heating sector another vital development presented in the study is that heat pumps will emerge as a core part of the energy system. By 2050 over 60% of the heat generation capacity will be covered by heat pumps.

At least 7.7 TW of solar and 1.7 TW of wind are needed by 2050, according to the report (Moderate scenario). Today there is 150 GW of installed solar power capacity. For these changes to take place the report introduces several recommendations.

One recommendation was to establish an implementation body for clean energy, as inappropriate regulatory and administrative frameworks are the main barrier to the deployment of solar in Europe. This could also address the constraints of limited grid and land access as well as lengthy permitting requirements.

To unlock the full potential, it is likewise important to promote involvement in solar installations and support "citizen-energy" concepts in which communities get involved in utility-scale solar installations. This will provide valuable grid services and drive the cost-efficient achievement of a climate-neutral Europe.

The EU has highlighted the need for a renovation wave, by developing a solar rooftop programme that exploits the 90% of European rooftops that are currently unused. This could contribute to the energy volume needed. Regulations need to encourage all new and renovated commercial, industrial and residential buildings to include solar panels.

Investments need to be made in expanding and modernising electricity grids. To address the demand for smart, distributed infrastructure, the concept of Projects of Common Interest requires further development. These key cross-border infrastructure projects will link energy systems of the EU countries.

The deployment of decentralised flexibility resources such as EV charging stations, heat pump and battery storage support needs to accelerate. It is also important to optimise the utilisation of local renewable assets to make energy systems more flexible and efficient.

A final recommendation is to develop the competence to unlock the potential of solar jobs. The shortage of an EU workforce with the necessary skills in clean energy technologies has become a challenge. In Europe, solar could deliver over 4 million jobs by 2050. Measures such as training programmes can eliminate this bottleneck. It is also important to push for the required technologies to be developed in Europe to ensure energy security in a long-term perspective.

In discussions about solar and wind power a common insecurity is the intermittent and erratic nature of the power source. The study concludes that existing technology can handle this variability. Energy exports, electrolysers, batteries and heat storage will provide the system with the flexibility needed when it comes nighttime and wintertime support.

Smart sector integration is a crucial component for the Green Deal and the EU's post-pandemic recovery plan. It is not merely about creating an energy system that is clean, but one that is also efficient. "Energy efficiency always has to come first," Marques stated. She continues: "But it is not only energy efficiency first at the end-use, it's across the system, the whole chain." It is vital to view the transition from a holistic and long-term perspective. Energy minister of Luxembourg, Claude Turmes, states: "This study comes at an important point in time and will spark useful conversations on the ongoing European climate negotiations and recovery plans."

In conclusion, the potential of solar energy and the benefits of accelerating the energy transition are highly beneficial. They are of great importance when it comes to setting the pathway to becoming the world's first climate neutral continent by 2050 or sooner.

Emilia Samuelsson

Based on:

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

https://www.solarpowereurope.org/wp-content/uploads/2020/04/LUT-100-Renewable-Europe-150420-3.pdf?cf_id=10749

Air pollution impacts fall as a result of Corona-related measures

The improvement in air quality as a result of the coronavirus lockdown led to 11,000 fewer deaths from pollution in western and central Europe in April.

An assessment by the Centre for Research on Energy and Clean Air (CREA) has estimated that measures introduced to combat the coronavirus have resulted in an approximately 40 per cent reduction in average levels of nitrogen dioxide (NO_2) pollution and 10 per cent reduction in average levels of particulate matter ($PM_{2.5}$) pollution during the month of April.

The improved air quality resulted in approximately 11,000 avoided deaths from air pollution in some 20 countries in western and central Europe during April. This effect came as power generation from coal had fallen 37 per cent and oil consumption by an estimated one third. Coal and oil burning are the main sources of NO_2 pollution and key sources of particulate matter pollution across Europe.

The highest number of avoided pollution deaths occurred in Germany (2,083), followed by the UK (1,752), Italy (1,490), France (1,230) and Spain (1,083). In terms of disease, almost 40 per cent of the fatality reductions were related to heart failure, 17 per cent from lung ailments such as bronchitis and emphysema, and 13 per cent each from strokes and cancer. The others were infections and diabetes.

Other avoided health impacts include 1.3 million fewer days of work absence, 6,000 fewer new cases of asthma in children, 1,900 avoided emergency room visits due to asthma attacks and 600 fewer preterm births. Most of these health impacts are linked to chronic air pollution exposure and will be realised over coming months and years.

Worldwide, the number of avoided air pollution deaths will be significantly higher because this study focuses only on some 20 countries in one continent and one month.

According to the lead author of the analysis, Lauri Myllyvirta, this health impact analysis also highlights how, regardless of improved air quality, air pollution is contributing to the load on the healthcare system at the time of the epidemic. Because of air pollution there are more people suffering from pre-existing conditions that make them more vulnerable to the disease, and more people requiring treatment for everything from asthma to stroke and diabetes while the system is overburdened.

Air pollution is the largest environmental health threat in Europe, with the average life expectancy in the European Union shortened by an estimated eight months due to pollution exposure. In 2016, 374,000 deaths in the EU were attributed to $PM_{2.5}$, and 68,000 deaths to NO_2, according to the European Environment Agency.

CREA notes that the measures to combat the COVID-19 pandemic have resulted in unprecedentedly dramatic reductions in coal and oil burning and associated air pollution in Europe. This reduction in pollution impacts has helped alleviate pressure on the health care system during the crisis. Furthermore, the analysis highlights the tremendous benefits for public health and quality of life that could be achieved by rapidly reducing fossil fuels in a sustained and sustainable way.

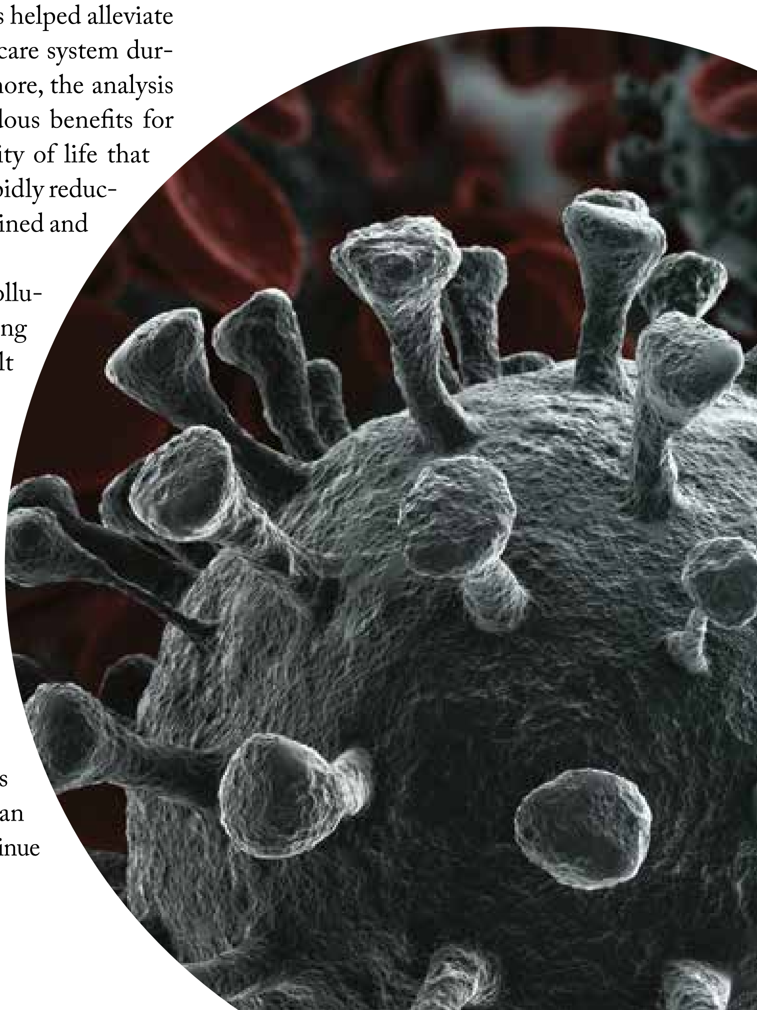
As noted above, air pollution levels are plummeting as an unintended result of measures against the virus. According to Lauri Myllyvirta, this should not be seen as a "silver lining", but it does show how normalised the massive death toll from air pollution has become, and points to what can be achieved if we shift to clean energy. When restrictions are fully lifted, European decision-makers can continue to implement policies to green electricity grids and transport systems in order to clear up our skies so we don't return to heavy pollution.

Myllyvirta concludes: "As we are all anxious for life and business to return to normal, no one is looking forward to the return of fossil fuel pollution. It is vital for European decision-makers to prioritise clean air, clean energy and clean transport as a part of the plans for recovering from the crisis."

Christer Ågren

Source: Blog by Lauri Myllyvirta, 30 April 2020.

The study "11,000 air pollution-related deaths avoided in Europe as coal, oil consumption plummet", by L. Myllyvirta and H. Thieriot, CREA. Available at: https://energyandcleanair.org/wp/wp-content/uploads/2020/04/CREA-Europe-COVID-impacts.pdf



Climate change threatens biodiversity in the Tropical Andes hotspot

A new report compiles evidence on how global warming can exacerbate biodiversity loss in one of the most important and severely threatened natural areas globally.

The climate crisis and the biodiversity crisis are two sides of the same coin: ongoing climate change is already affecting biodiversity and ecosystem function globally, while accelerating biodiversity loss compromises our ability to successfully mitigate and adapt to climate change. What's more, climate change is likely to become one of the most significant drivers of biodiversity loss by the end of this century. An ambitious and coordinated approach is therefore urgently needed to address these problems.

Wildlife in tropical montane areas is particularly at risk since mountains are

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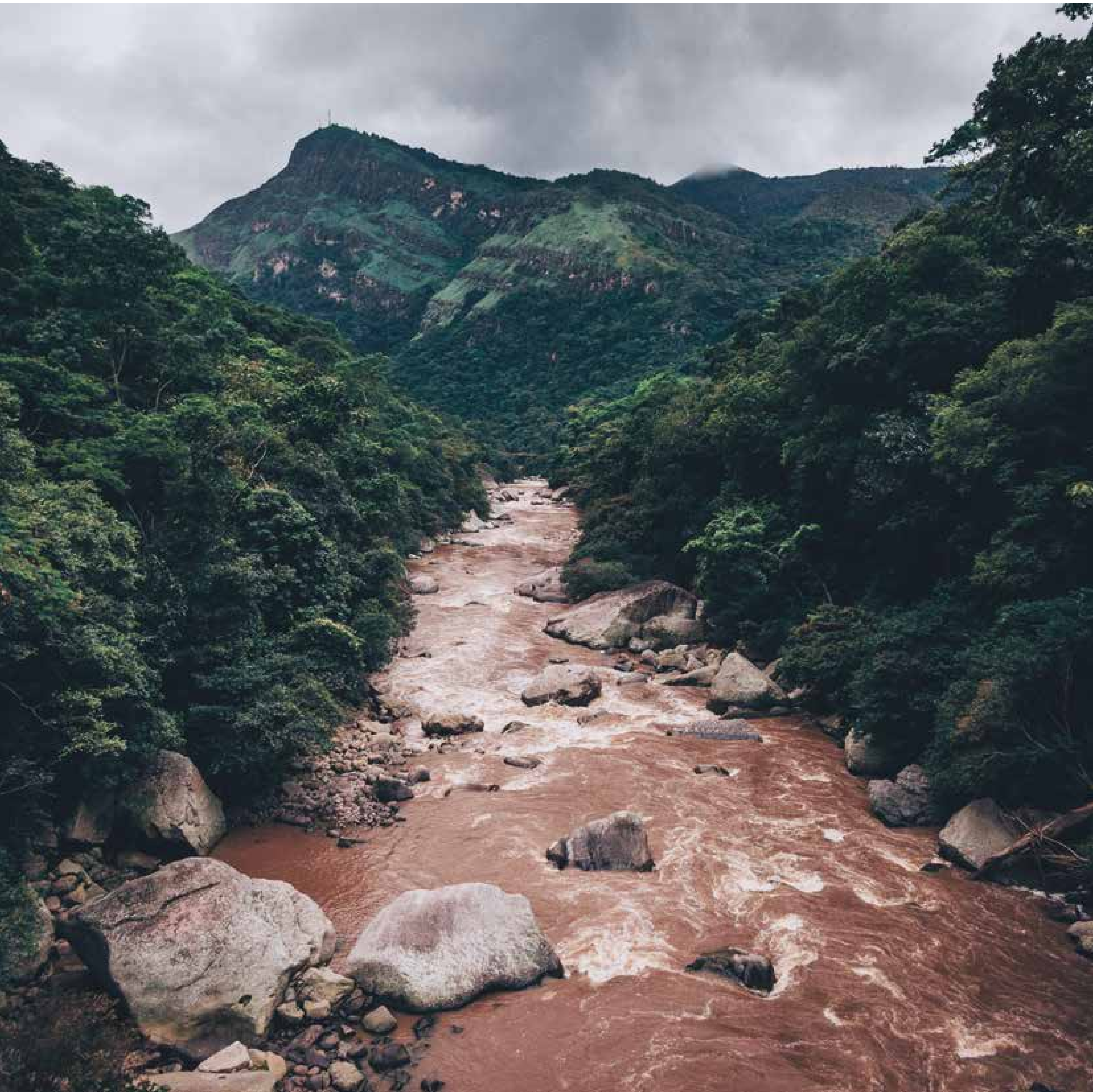

heating up faster than lowland areas. Additionally, many of the species living there are adapted to very specific – often extreme – conditions and encounter several barriers that limit their capacity to escape to more suitable habitats amid environmental changes.

Such is the case of the Tropical Andes, a region extending from western Venezuela to the north of Argentina and covering large portions of Colombia, Ecuador, Peru and Bolivia. These mountains are arguably one of the world's leading biodiversity hotspots. They support an exceptional number of species – many endemic – including 15 percent of all known plant species and 12 percent of all vertebrate species known to date, in a region covering only 1 percent of Earth's land surface.

Yet, during the last century human activities have transformed a significant portion of this natural landscape, leading to severe habitat degradation, biodiversity loss and disruption of ecosystem functions. Estimates point out that only a quarter of its original natural habitats remain intact. In addition to this significant land-use change pressure, Andean ecosystems are highly sensitive to climate change.

Today, over 100 million people depend on the ecosystem services the Tropical Andes provide, including freshwater, food and fibre supply, energy production, and many other goods and services. Understanding the potential impacts of climate change in this natural area is therefore critical, as ongoing human-driven biodiversity loss could become further exacerbated by this phenomenon during the next decades.

With the collaboration and support of AirClim, the Environment and Natural Resources Foundation (FARN, Argentina) has developed a comprehensive scientific overview of climate change impacts on Tropical Andean biodiversity, drawing attention to the importance of these ecosystems for the success of climate action.

The report highlights that ongoing changes in temperature and rainfall patterns are already disrupting a wide range of natural processes in the Tropical Andes, putting biodiversity and the key services it supports at risk. Due to its complex topography, climate and its extraordinary variety of habitats, different species and biomes are expected to respond divergently to global warming.

Climate change is shifting plant communities towards warm-adapted species – a process termed "thermophilisation" – and pushing forests to migrate upwards. Glaciers are melting at alarming rates, presenting many high-altitude species with rapidly changing habitats. One of the Andes most unique and important ecosystems, the páramos, could potentially shrink in area by around 31 percent by 2050 according to some studies.

Moreover, many species are heading uphill to keep pace with climate change. Shifts in the ranges of species and new environmental conditions are altering the ecological processes that result from species interactions and may also facilitate the spread of invasive species and diseases into new areas. These changes can ultimately lead to population declines and local extinctions.

Local extinction risk is higher for mountaintop species. As temperature rises, the suitable climate ranges for many species shift upslope and gradually start shrinking. When cool-adapted summit species cannot shift further, as they have nowhere left to go, mountaintop extinctions occur.

Failing to limit global warming to 1.5°C above pre-industrial levels would have devastating and irreversible consequences for biodiversity and ecosystem function, not only in the Tropical Andes, but worldwide. Biodiversity is essential to maximising the resilience and adaptive capacity of societies and ecosystems. At the same time, natural ecosystems play a fundamental role in climate change mitigation as they sequester carbon in long-lived and relatively stable pools.

Halting biodiversity loss and protecting the remaining primary and carbon-rich ecosystems in the Tropical Andes is therefore the most important and most urgent priority for regional climate change and biodiversity cooperation.

Catalina Gonda

The full report is available both in Spanish and English at:

Climate change and biodiversity in the Tropical Andes publication: https://farn.org.ar/archives/27623

International Day of Clean Air

The United Nations General Assembly has designated 7 September as the International Day of Clean Air for blue skies. 2020 is the first year for this event, introduced to build on the "increasing interest of the international community in clean air, and to emphasise the need to make further efforts to improve air quality, including reducing air pollution, to protect human health".

More information at: www.un.org/en/observances/clean-air-day

EEA Air Quality Viewer

The European Environment Agency (EEA) published on 4 April an online viewer that tracks the weekly average concentrations of nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). This is in response to the COVID-19 pandemic and has been developed to assess how it has affected concentrations of air pollution.

The EEA viewer, along with information on the methodology used, can be found at:

www.eea.europa.eu/themes/air/air-quality-and-covid19.

CCS is not needed – new production methods can reduce industrial greenhouse gas emissions

The real issue is not technology nor economics, but creating incentives to make industry green without using CCS.

The Swedish Hybrit project to replace coal with hydrogen in steel production was launched in 2016. It was the first of its kind. Now, the three biggest steel companies in the world are following suit, or overtaking.

Carbon-free aluminium is now being produced, and lower carbon cement is on the market.

Just a few years ago the climate strategy of heavy industry around the world could be summarised in three letters: CCS. Or rather in six letters "Say CCS", as nothing much happened. After almost 20 years of hyped-up talk, no CO_2 has been captured anywhere in the world from the production of steel, cement, glass, aluminium or paper pulp. The big EU project ULCOS (ultra-low-CO_2 steelmaking), which began in 2004, eventually sank without a trace. Its main message was to keep blast furnaces, keep coal and coke, but add CCS.

Only months after the Paris climate agreement, in April 2016, Swedish steelmaker SSAB, iron ore miner LKAB and power producer Vattenfall launched a new decarbonisation strategy: to produce hydrogen with renewables and use the hydrogen to reduce iron oxide ore pellets to sponge iron. This was a bolt out of the blue, a radical departure from the previous strategy.

This is no small matter. The steel industry generates between 7 and 9 percent of direct emissions from the global use of fossil fuel, according to worldsteel.org

ArcelorMittal is the biggest steel producer in the world. It does the same thing as SSAB and is also trying another very different no-carbon tech. The company states that it is:

"exploring iron ore reduction technologies using hydrogen and electrolysis, both of which could deliver significant carbon reductions if powered with clean electricity. In March 2019, we launched a €65 million pilot project in Hamburg, Germany to test hydrogen steelmaking on an industrial scale, with an annual production of 100,000 tonnes of steel. At the same time, we have been exploring direct iron ore reduction using electrolysis for a number of years. We lead the EU-funded Siderwin project, which is now constructing an industrial cell to pilot the technology."

The world's second biggest steel producer, Chinese Baowu, has a hydrogen partnership with Linde, a global industrial gases company "with the aim of beating the Swedish steel maker SSAB to commercialising clean steel production", according to an article in the Australian Financial Review, which considers this as potentially bad news for exports of Australian coking coal.

The third biggest steel producer, NS-SMC (Nippon Steel), is also working with hydrogen (as well as CCS) and also boasts a new steel for hydrogen infrastructure.

It is too early to say "problem solved" for steel CO_2, but it surely looks as if hydrogen can do the job, whereas CCS is going nowhere.

Hydrogen is getting much more attention for reasons aside from steel production, such as seasonal term storage to balance wind and solar or for ships, trucks and buses. The implication is that hydrogen will be produced by electrolysis using renewable electricity, abundant and cheap wind and solar. If there is a business case for hydrogen in the steel industry, fossil power is doomed, which is exactly what most of the NGOs have been saying for a number of years.

As of spring 2020, the era of cheap renewables has moved considerably closer. Nuclear power and fossil power are running well below capacity, while renewables are growing in absolute numbers and increasing their market share, at least in Europe, North America, China and India. Coal power backed down globally in 2019 and will surely lose still more ground in 2020.

The growing availability of green electricity also opens up the possibility to cut CO_2 from heating, either by replacing fossil gas with electric heating or replacing fossil gas with hydrogen.

The biggest outstanding industrial CO_2 issue is cement production. Its CO_2 emissions are on the same scale as steel, upwards of 8 percent of global fossil emissions, and are generated from limestone and the fuels used to heat it.

Cement is not a hi-tech product. You heat limestone from a nearby quarry, grind it to make cement and sell it to construction companies that mix the cement with sand and pebbles to form concrete.

The cement industry in Europe gets free allocations for all its ETS emissions. This practice is justified by what is known as carbon leakage, meaning that if the industry had to pay for any of its emissions, Europe would be overwhelmed with even dirtier imported cement. The evidence is scant, as cement is a cheap and bulky product which is not commonly traded across the globe. So they have not worried overmuch either.

The construction companies have not seen CO_2 from cement as their problem, as they don't emit it. Much of the construction industry deserves top marks for green-washing and CB (corporate bullshit). But not all.

This is beginning to change. In 2019, Skanska, a Swedish international construction company launched "green concrete", which "emits up to 50 percent less carbon than regular concrete because some of the cement has been replaced with slag".

The attitude shift can be seen in a more subtle way. Skanska's annual report specifies not just its own emissions (GRI Scope 1) but also Scope 3: indirect greenhouse gas emissions from sources not owned or directly controlled by the organisation.

Scope 1 emissions were 213 kilotons of CO_2 in 2019, and dropping at a good pace. But Scope 3 emissions are 693 kilotons, mainly from cement. Counting emissions in this way increases Skanska's footprint by a factor of more than 3, and including this in its report is the opposite of green-washing.

So why is it there? Customers, at least, take an interest in such figures. It may also become a requirement of environmental building certification systems. Financing with green bonds is also important for Skanska, and gives more access to long-term capital, such as from pension funds.

Slag cannot replace a very large part of world cement, but a market transformation has to start somewhere. Thomas Concrete, a much smaller but still international Swedish company, has set a target to use more than 50 percent of alternative binders by 2025. It states in its Sustainability Report 2019 that:

"Today alternative binders are the most efficient way to achieve an immediate reduction. Furthermore, a comprehensive review of our cement suppliers, including evaluations of their facilities and production techniques, allows us to better calculate our environmental impact. We see a challenge in the future for the availability of slag and fly-ash, our today most used alternative binders. There is a higher demand and limited access for these products in all markets. Therefore, Team Thomas is focused on research to find other types of alternative binders."

It is not a huge technical challenge to find alternative binders, in other words non-lime materials that can glue together sand and pebbles to make concrete. There are several candidates that are either good enough or improvable. Obviously the economy is of some importance, but cement is not a big part of the cost of a building.

The real issue is not technology or economics. CCS is at least as complex, expensive and time-consuming as alternative binders; after all Skanska has been able to achieve a 50 per cent reduction in a single stroke.

The real issue is to create incentives to make all concrete green, preferably greener than Skanska's. This takes some political resolve.

Other heavy industries are minor compared to cement and steel, but the picture is much the same. If the aluminium industry were required to produce green aluminium, inert anodes would replace traditional carbon anodes in aluminium production within a few years, to produce aluminium with no CO_2 and no F-gas emissions.

The first batch of such aluminium was in fact produced in December 2019 by Alcoa in Pittsburgh, using technology developed by Elysis in Canada, a joint venture between Alcoa and Rio Tinto. It was delivered to Apple for use in its laptops. Apple also helped to finance the development. The Canadian and Quebec governments contributed 60 million Canadian dollars each. This was enough to overturn the environmentally disastrous Hall-Héroult process, which has produced all the aluminium in the world since 1886.

Fredrik Lundberg

Trump weakens US air pollution control

Over a period of only three weeks, the Trump administration has eroded the basis for air pollution control in coal-fired power plants, declined to strengthen air quality standards, and finalised a rollback of vehicle fuel efficiency standards.

The Trump administration announced on 14 April that it rejected a recommendation from staff scientists at the US Environmental Protection Agency (EPA) to tighten air quality regulations for particulate matter (PM), arguing the current standards are adequate to protect human health.

According to the Clean Air Act, the EPA is required to set national air quality standards (NAAQS) for particulate matter and five other pollutants considered harmful to public health and the environment (the other pollutants are ozone, nitrogen oxides, carbon monoxide, sulphur dioxide and lead).

The law also requires EPA to review the standards every five years to ensure that they provide adequate health and environmental protection, and to update those standards as necessary. Primary standards are designed to protect human health at a level sufficient to provide a margin of safety, while secondary standards are designed to protect the environment.

The current primary standard for fine particles ($PM_{2.5}$) were adopted in 2012 and set a limit of 12 micrograms per cubic metre of air (μg/m^3) as an annual average. In its draft Policy Assessment, published in September 2019, EPA staff recommended tightening the primary annual limit to a level between 8 and 12 μg/m^3, while leaving the remaining suite of PM standards unchanged for both $PM_{2.5}$ and coarse particulate matter (PM_{10}).

In their comments from December 2019 to the EPA's Policy Assessment, three leading US environmental organisations (Clean Air Task Force, Environmental Defense Fund, and Natural Resources Defense Council) stated that "the draft Integrated Science Assessment (ISA) includes robust evidence of mortality risks at levels as low as 8 μg/m^3," and that "additional studies of the $PM_{2.5}$-mortality relationship conducted outside of the US and Canada support this finding." They concluded that "an annual exposure level of 12 μg/m^3 is not adequately protective of public health."

Research noted in the EPA's own Policy Assessment found that maintaining the $PM_{2.5}$ standard at its current level could allow as many as 52,000 premature deaths a year in just 47 urban areas.

Strengthening the primary $PM_{2.5}$ standard by just 1 microgram, from 12 to 11 μg/m^3, could save about 12,000 lives per year, according to a 2017 study by the Harvard T.H. Chan School of Public Health.

In early April, the Harvard T.H. Chan School of Public Health also published new research indicating that the coronavirus causes a higher death toll among patients in parts of the country with increased levels of fine particulate pollution.

"It's especially egregious that EPA is making this announcement in the thick of the COVID-19 pandemic – a public health crisis that evidence increasingly suggests is dangerous to people living in areas with higher air pollution levels," said Gretchen Goldman, research director at the Union of Concerned Scientists.

Mercury rule undermined

On 16 April, the Trump administration's EPA finalised a rule that undermines federal standards for mercury, lead and other toxic air pollution from power plants. The rule leaves the 2011 Mercury and Air Toxic Standards (MATS) in place for now, but could pave the way for lawsuits and prevent similar regulations from being implemented in the future.

Mercury, lead and other airborne poisons from power plants can damage children's developing nervous systems and reduce their ability to think and learn. Other hazardous air pollutants cause numerous health hazards, including cancer, heart attacks, strokes and various respiratory illnesses.

According to the Natural Resources Defense Council (NRDC), the MATS rule is saving more than 10,000 lives per year, and annually avoiding 130,000 asthma attacks and nearly 5,000 heart attacks. In 2016, EPA projected that the monetised benefits for clean air and health in the US from MATS would be as much as USD 90 billion per year, including 540,000 days when Americans will not miss work or school. The annual compliance costs to industry were projected to be less than USD 10 billion, and actual implementation has shown compliance costs to be even lower. Virtually all US power plants that burn coal or oil have been complying with the standards since 2015–2016.

The new EPA rule creates an alternative method of calculating the costs and benefits of curbing mercury pollution that risks undermining the legal underpinnings of controls on mercury and many other pollutants. By restricting and reducing the positive health effects of regulations on paper and raising their economic costs, the new method could be used to justify loosening restrictions on any pollutant.

Previously, the EPA tallied not just the benefits of reducing mercury but also co-benefits like cuts in sulphur dioxide, fine particulate matter and other pollutants that were also curbed by the emission abatement equipment. However, under the

new rule, such co-benefits will no longer be included in the cost-benefit analyses, but only direct benefits.

In a press release by the Natural Resources Defense Council, former EPA administrator Gina McCarthy, who is now head of the NRDC, said: “This is an absolute abomination. This final rule will increase the risk of more kids with asthma and brain damage, and more people with cancer. If these standards are overturned, there would be nothing to prevent power plants from immediately emitting a range of toxic pollutants—and you can bet they will.”

“On top of that, utilities already are complying with the mercury standards and oppose this rollback. As a result, we’ve seen a nearly 90 per cent reduction in the brain-damaging and life-threatening impacts of mercury that has improved health outcomes for millions of kids. And it was accomplished without threatening electricity reliability or consumer prices. The only ones who benefit from this are powerful polluters – at the expense of our health, and our children’s health. We can do better, we must do better, and we are going to fight this in court to make sure we do.”

Fuel efficiency rollback

On 31 March, the Trump administration completed a rollback of US vehicle fuel efficiency and carbon dioxide emissions standards adopted in 2012. Under the 2012 rules, automakers were to have averaged about 5 per cent annual increases in fuel efficiency from 2021 to 2026, but the new requirements lower this to 1.5 per cent per year, meaning that by 2026 the US vehicle fleet of cars will average only 40 miles per gallon (approximately 5.9 litres/100 km) instead of the 54 mpg (4.3 litres/100 km) expected to be achieved under the 2012 rule.

Less efficient vehicles mean that more fossil fuel will be burned, resulting in significantly higher emissions of the major greenhouse gas, carbon dioxide. Lower fuel efficiency will also increase harmful emissions into the air, resulting in higher healthcare costs.

House of Representatives Speaker Nancy Pelosi (Democrat), said to Reuters that the decision will harm public health and endanger US economic security. “The Trump administration’s anti-science decision to gut fuel standards will unleash massive amounts of pollution into the air at the worst possible time,” Pelosi said, alluding to the coronavirus pandemic.

Enforcement suspended

The Hill reported that on 26 March the US EPA issued a sweeping suspension of its enforcement of environmental laws, telling companies they would not need to meet environmental standards during the coronavirus outbreak.

The temporary policy, for which the EPA has set no end date, would allow any number of industries to skirt environmental laws, with the EPA saying it will not “seek penalties for non-compliance with routine monitoring and reporting obligations.”

In a written comment to The Hill, Cynthia Giles, who headed the EPA’s Office of Enforcement during the Obama administration, called it a moratorium on enforcing the nation's environmental laws and an abdication of the agency’s duty.

The move comes after the EPA has been under pressure from a number of industries, including the oil industry, to suspend enforcement of a number of environmental regulations due to the coronavirus pandemic.

Christer Ågren

Sources: The Hill, 26 March 2020; Financial Times and Reuters, 31 March 2020; The Guardian and Reuters, 14 April 2020; New York Times, Reuters and NRDC, 16 April 2020.

Link to US EPA NAAQS website: https://www.epa.gov/naaqs

Citizen science for air quality monitoring

Air pollution is the biggest environmental health threat in Europe and more and more people are taking action to claim their right to clean air.

People's awareness of air pollution and the associated risks to their health has grown significantly over recent years, often informed by local or national campaigns led by non-governmental organisations (NGOs) as well as by media coverage. In some countries, groups of concerned citizens, often supported by NGOs, have taken authorities to court over air quality issues, and the courts have ruled in favour of the right to clean air in several instances.

A new European Environment Agency (EEA) report provides an overview of low-cost devices that citizens and NGOs can use to measure local air quality. The report presents successful examples of projects using simple low-cost devices to measure local air pollution levels, such as:

CurieuzeNeuzen Vlaanderen (Curious Noses Flanders), which was set up in 2018, has been labelled "the largest citizen science project on air quality to date". The aim of the initiative was to provide a detailed map of nitrogen dioxide (NO_2) concentrations in Flanders (the northern region of Belgium), both in cities and in the countryside.

EEA CleanAir@School, a joint initiative of the European Network of the Heads of Environmental Protection Agencies and the EEA that ran from 2018 to early 2020, in which participants monitored air quality around schools across Europe.

The Health and Environment Alliance (HEAL), as part of their "Healthy air, healthier children campaign", ran a monitoring project using passive samplers and involving schoolchildren at 50 schools in Berlin, London, Madrid, Paris, Sofia and Warsaw. The results were published in 2019.

The EEA report also briefly explains how the different air quality monitoring devices work, summarises their reliability, and highlights the potential of such devices to address questions about air quality.

According to the EEA, this type of citizen science initiative can produce useful additional information about local air quality, and such information can be used, for example, to improve official air quality models that are used to estimate pollution levels. Results from monitoring can also help to identify suitable actions and measures to improve air quality.

Moreover, air quality monitoring projects often help to raise public awareness of air quality problems, which in turn – through public pressure – may result in local, regional or national decisions to introduce stronger measures to reduce air pollution. Increased public awareness can also incentivise changes in personal behaviour, such as switching from driving private cars to walking, cycling or using public transport.

The EEA points out, however, that various types of measuring devices each have different benefits and disadvantages, and users should be aware of their limitations. Although some devices are relatively reliable, low-cost sensors can for example, be sensitive to weather conditions or lack the capacity to measure very high or very low pollutant concentrations.

In the near future, the increasing number of citizen science initiatives focused on air pollution, coupled with new data digitalisation approaches, may represent a paradigm shift in the way that air quality is monitored, the EEA report states. A large network of low-cost sensors, combined with statistical analysis or machine learning, could complement the quality of the current official data and provide new pathways to obtain accurate, real-time information.

Christer Ågren

Source: EEA News, 12 March 2020

The EEA report "Assessing air quality through citizen science" can be downloaded at: https://www.eea.europa.eu/publications/assessing-air-quality-through-citizen-science

Types of instruments for measuring air quality

A **passive air pollutant sampler** (or "diffusion tube") exposes a surface known as a "plate" to the air for a set period and collects air pollutants that settle on the plate. After the exposure period, the plate is collected and analysed in a laboratory. The amount of air pollution collected reflects the average concentration of the pollutant in the air over the sampling period.

A **low-cost air pollution sensor** is a device that measures certain pollutants in ambient air. Gas or particle concentrations are typically monitored as electrical signals. The signals are then converted by software or data acquisition into a concentration value.

An **air pollution sensor** system is the combination of one or several sensors with a power source within an enclosed structure. In some cases, it may include a processor or amplifier to convert the electrical or optical signals into concentration units, as well as data storage and transmission systems. The user can deploy them individually or in groups.

An **air pollution reference instrument** for measuring air pollutants is a monitoring device that has been certified by an official regulating body and is normally operated by a public authority. Such instruments are typically used in official air quality monitoring networks for purposes such as regulatory compliance checking. The cost of such devices is typically high, and they require regular on-site maintenance and calibration.

Source: EEA report (based on CEN (2019) and Lewis et al. (2018)).

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EU governments agree to do more to improve air quality

Environment ministers acknowledge that action taken at local, national and EU level has not been sufficient to meet the EU air quality standards.

At the EU Environment Council on 5 March, environment ministers agreed that the current air quality rules are fit for purpose, but that more needs to be done to ensure the air quality standards are met across the EU. The conclusions represent the official position of EU governments following a nearly two years long assessment of EU air quality rules as part of a so-called "Fitness Check" procedure (see AN 1/20, p. 26).

The Fitness Check showed among other things that many EU countries have for several years failed to meet existing binding limits on air pollutants, and member states acknowledged that "action taken at local, national and EU level has not always been sufficient to meet air quality standards", and that "there is scope for improvements to the existing framework to ensure that good air quality is achieved across the EU."

In line with the Commission's conclusion from the Fitness Check that limit values have been more effective in facilitating downward trends than other types of air quality standards, the Council agreed that it is "essential to keep using limit values in order to protect the health of citizens."

Some of the EU air quality limits are significantly less strict than the guidelines issued by the World Health Organization (WHO), and ministers said they "look forward" to the European Commission's proposal for a revised air quality directive which includes a "possible closer alignment of the EU air quality standards with the WHO air quality guidelines, which are currently being reviewed and updated."

The Council noted that the main air pollution sources in the EU are transport, both road and non-road; the commercial, institutional and household sector, including residential heating; energy production and distribution; energy use in industry; industrial processes and product use; agriculture and waste.

Specifically for agriculture, the Council said that "ammonia emissions, which are a precursor for particulate matter, have decreased considerably less than other emissions in the past decade inter alia due to a lack of specific source legislation." Moreover, that "measures to mitigate such emissions are already available and technically and economically viable" and the Council "encourages a wider application of those measures."

More generally, the Council emphasised "the need for the necessary investments to support the reduction of air pollution as the benefits of air quality policies greatly exceed their implementation cost."

Environmental organisations broadly welcomed the conclusions. Margherita Tolotto at the European Environmental Bureau (EEB), said: "Our governments must now take concrete actions to cut pollution at source. With toxic air causing 400,000 premature deaths every year in the EU and the solutions also boosting climate action, improving air quality should rank very high in their priority lists. Moreover, the European Commission must act now to ensure clean air, also using the tools announced via the European Green Deal, but without waiting for the promised zero-pollution action plan due in 2021."

ClientEarth lawyer Ugo Taddei said: "Dirty air is an ongoing health crisis in Europe. We have the laws to address it but they can, and should, be strengthened as soon as possible. While the European Commission starts to work on a proposal to align EU air quality standards with the WHO recommendations, it has the power to immediately adopt implementing acts and give clear guidelines to competent authorities to ensure better air quality monitoring and stronger plans to clean up the air."

"The European Commission must also not hesitate to take strong legal action against governments failing to meet their existing legal obligation to address illegal levels of air pollution. There is no reason why people in Europe should have to wait any longer to breathe clean, healthy air," Taddei said.

Christer Ågren

Source: Joint NGO press release by EEB, ClientEarth and AirClim, 6 March 2020

The Council conclusions can be found at: https://www.consilium.europa.eu/media/42875/st06650-en20.pdf

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

Climate, Nature and our 1.5°C Future

A new report, Climate, Nature and our 1.5°C Future – A synthesis of IPCC and IPBES reports, clearly points towards nature being part of the solution to the climate crisis.

The report outlines the urgent need for countries to work with cities and businesses towards a "just transition" in the face of increasing pressures from a warming world. But strong leadership and immediate action are required to limit global warming to 1.5°C to halt climate change in its tracks.

Published by WWF, the report is a synthesis of the findings from four major recent UN scientific reports, as follows.

Three special reports from the Intergovernmental Panel on Climate Change (IPCC) under its current 6th Assessment Cycle: Global Warming of 1.5°C (published in October 2018); Climate Change and Land (published in August 2019); and Ocean and Cryosphere in a Changing Climate (published in September 2019). Plus the Intergovernmental Panel on Biodiversity and Ecosystems Services (IPBES) Global Assessment on Biodiversity and Ecosystem Services (published in May 2019).

WWF's analysis shines a spotlight on the detailed picture of how nature – ecosystems and biodiversity – are being affected by the climate crisis, and how strong and healthy ecosystems enrich resilience and can help people adapt to climate impacts. It recognises the critical role that "nature-based solutions" play as part of the global response to the climate crisis because the necessary rapid and deep cuts to global fossil fuel emissions will not be enough.

The worldwide lack of ambition to tackle the climate and nature crises is alarming, and countries must take immediate action to ensure global warming stays below 1.5°C. Deep decarbonisation as well as nature-based solutions must be part of all countries' climate plans and there's good reason to do so – they can aid climate change mitigation, reduce associated climate risks for vulnerable communities, and help bring about a more sustainable future for all.

The report looks across the globe, at the Polar Regions, Oceans, Freshwater, Grasslands and Savannahs, Forests, and the Food sector. Each section provides a synthesis of the published evidence from the four UN reports, a case study from WWF and three short recommendations.

Protecting, restoring and managing ecosystems and biodiversity is a sustainable way to improve resilience against climate change risks and ensure that land and oceans can continue to provide food, water and other vital resources to people for years to come.

The report demonstrates how, by saving nature, we boost the chances of staying below 1.5°C and improve the effectiveness of adaptation while laying the foundations for lives that are happy, healthy, culturally enriched and socially connected.

The scientists have done their part. Over the past year the IPCC and IPBES have amassed findings that clearly demonstrate the need for limiting global warming to 1.5°C. Our political, community and business leaders must heed their warnings about the risks of exceeding 1.5°C and the irreversible change that will happen without greater ambition to cut emissions from fossil fuels and integrate nature-based solutions.

WWF provide recommendations to national policymakers:

- Make climate pledges consistent with the 1.5°C goal
- Make nature-based solutions part of their countries' climate commitments
- Coordinate climate, biodiversity and sustainable development policies
- Align (public) financial flows with the needed systems transformations
- Address the international impacts of domestic policies

And to non-state actors:

- Align with a 1.5°C and net-zero emissions world
- Advocate for governments to enact enabling policies
- Advance the science on nature-based solutions

Humans are currently causing an unprecedented loss of nature at the time when we need it most. Protecting and restoring nature isn't just a moral issue: nature underpins our societies and economies and is our greatest ally in combatting the climate crisis.

You can download the report from Climate, Nature and our 1.5°C Future - A synthesis of IPCC and IPBES reports using the link at the end of this article.

Stephen Cornelius

Stephen Cornelius is WWF's IPCC lead and Chief Adviser on Climate Change, and was editor in chief for the report. Follow him on twitter @SteveJCornelius

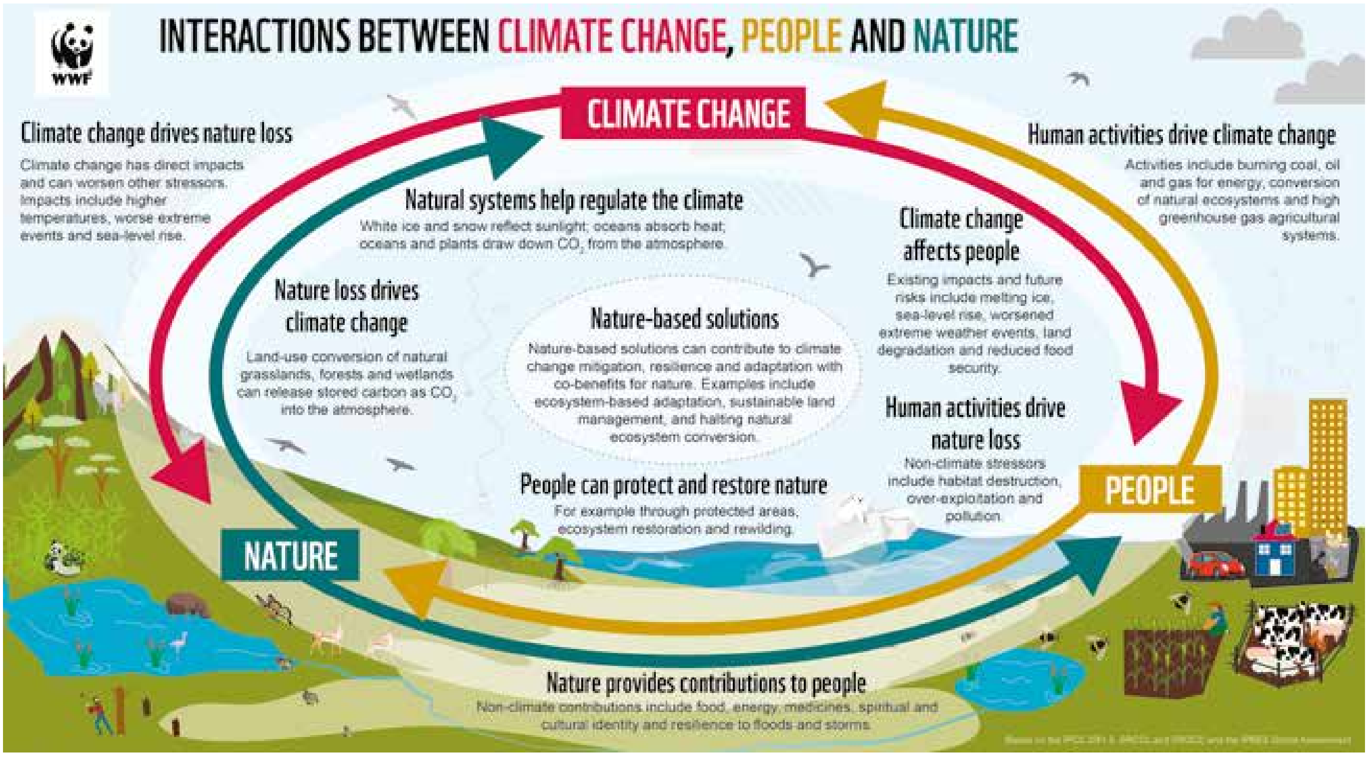
WWF Climate, Nature and our 1.5 C future: https://d2ouvy59p0dg6k.cloudfront.net/downloads/wwf_climate__nature_and_our_1_5c_future_report.pdf

IPCC Global Warming of 1.5 C: https://www.ipcc.ch/sr15/

IPCC Climate Change and Land: https://www.ipcc.ch/srccl/

IPCC Special Report on the Ocean and Cryosphere in a Changing Climate: https://www.ipcc.ch/srocc/

IPBES Global Assessment on Biodiversity and Ecosystem Services: https://ipbes.net/global-assessment



Air pollution shortens life by 3 years worldwide

By using a new method of modelling the effects of various sources of air pollution on death rates, a new study has estimated that globally air pollution caused an extra 8.8 million premature deaths a year in 2015. This represents an average shortening of life expectancy of nearly three years for all persons worldwide. It is the first study to show the effects of air pollution on deaths according to age, type of disease and its effect on life expectancy at the level of individual countries and regions.

The study distinguishes between avoidable, human-made air pollution and pollution from natural sources such as desert dust and wildfire emissions, which cannot be avoided, and shows that about two-thirds of premature deaths are attributable to human-made air pollution, mainly from fossil fuel use; this goes up to 80 per cent in high-income countries. This means that five and a half million deaths worldwide a year are potentially avoidable.

The researchers estimate that if air pollution was reduced by removing fossil fuel emissions, the average life expectancy worldwide would increase by just over a year, and by nearly two years if all human-made emissions were removed.

Source: Science Daily, 2 March 2020.

The study: "Loss of life expectancy from air pollution compared to other risk factors: a worldwide perspective", by Jos Lelieveld et al. Published in Cardiovascular Research. DOI: 10.1093/cvr/cvaa025

World's most polluted cities ranked

ISwiss monitoring firm IQAir has published its latest World Air Quality Report, which ranks the world's most polluted cities in terms of levels of particulate matter ($PM_{2.5}$) and reveals that climate change events are impacting on air pollution more than ever.

Using a weighted population average, Bangladesh is the most polluted country for $PM_{2.5}$ exposure. Pakistan, Mongolia, Afghanistan and India follow behind respectively, deviating from one another by less than 10 per cent.

Bosnia and Herzegovina is the highest-ranking country in Europe for $PM_{2.5}$ pollution, featuring as the 14th most polluted country globally, with only $4\mu g/m^3$ less than China's national $PM_{2.5}$ weighted average. Lukavac in Bosnia and Herzegovina, which has several chemicals factories, is Europe's most polluted city, with an average $PM_{2.5}$ level of $55 ug/m^3$.

The report also shows that climate change events, such as sandstorms and wildfires, elevated levels in countries and cities such as Singapore, Australia, Indonesia, Brazil, Kuala Lumpur, Bangkok, Chiang Mai, and Los Angeles, among numerous others.

Source: AirQualityNews, 26 February 2020.

More information: https://www.iqair.com/world-most-polluted-cities

Dutch measures to cut emissions after court ruling

By using a new method of modelling the effects of various sources of air pollution on death rates, a new study has estimated that globally air pollution caused an extra 8.8 million premature deaths a year in 2015. This represents an average shortening of life expectancy of nearly three years for all persons worldwide. It is the first study to show the effects of air pollution on deaths according to age, type of disease and its effect on life expectancy at the level of individual countries and regions.

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Sources: The Guardian, 24 April and Dutchnews.nl, 25 April 2020.

Urgenda's 54 actions to cut emissions: https://www.urgenda.nl/en/themas/climate-case/dutch-implementation-plan/

Domestic coal and wet wood to be banned

Sales of the two most polluting fuels, wet wood and house coal, burned in household stoves and open fires will be phased out in England from 2021 to 2023.

The pledge was a major part of the country's Clean Air Strategy, published a year ago, which stated that domestic burning of solid fuels accounts for around 39 per cent of all PM pollution in the UK. By comparison, industry and road transport contributes 16 and 12 per cent, respectively.

Source: The Guardian and AirQualityNews, 21 February 2020

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Electric cars emit less CO_2

Electric cars in the EU emit, on average, almost three times less CO_2 than equivalent petrol or diesel cars, according to a new online tool developed by Transport & Environment (T&E) that allows the public to compare the lifecycle emissions of an electric vehicle (EV) to fossil-fuelled vehicles.

Including the additional emissions created by manufacturing batteries, it takes about one to two years of driving an electric car to reach parity with diesel and gasoline, T&E notes. That time decreases to less than a year for vehicles powered by the cleanest grids, such as those in Sweden or France, using batteries produced with low-carbon electricity.

Even in the worst-case scenario, an electric car with a battery produced in China and driven in Poland still emits 22 per cent less CO_2 than diesel and 28 per cent less than petrol. In the best-case scenario, an electric car with a battery produced in Sweden and driven in Sweden can emit 80 per cent less CO_2 than diesel and 81 per cent less than petrol.

The tool draws on the most up-to-date data to allow users to compare the vehicles in several different scenarios based on vehicle segment, where the battery was produced, and in what country the car was driven. The tool also allows users to compare cars driven in 2020 and 2030, when the EU electricity grid will be even cleaner.

Source: T&E News, 21 April 2020.

Short-term benefits of coal phase-out outweigh costs

Shutting down coal power plants is necessary to halt global warming and would have net benefits even in the short term, once health and environmental impacts are factored in.

A recent study, published in Nature Climate Change, concludes that phasing out coal-fired power stations is a no-regret strategy for most world regions, and that this applies even without considering the impacts of global warming.

Coal combustion is not only the single largest human source of the major greenhouse gas carbon dioxide (CO_2), but also a major emitter of air pollutants that cause damage to public health and biodiversity. The new study by an international team of researchers led by the Potsdam Institute for Climate Impact Research (PIK) provides robust further economic arguments for why shutting down coal plants is worth the effort.

According to the authors of the study, their work shows that: 1) The world cannot stay below the 2 degrees limit if we continue to burn coal; 2) The benefits of phasing out coal clearly outweigh the costs; and 3) Those benefits occur mostly locally and short-term, which make them useful for policy makers.

"We find that, based on all countries' current climate pledges under the Paris Agreement, humanity is so far not on track to keep global warming below 2 degrees. Yet, if all countries would introduce coal exit policies, this would reduce the gap to fulfilling the goal by 50 per cent worldwide. For coal-heavy economies like China and India, quitting coal would even close the gap by 80–90 per cent by 2030," said Sebastian Rauner, lead author and researcher at the Potsdam Institute for Climate Impact Research.

The team of researchers developed a simulation framework which considers the full life cycle effects of phasing out coal, accounting not only for all impacts of coal combustion from mining to smokestack, but also how a coal exit would affect other energy sources and the energy sector as a whole. They also analysed monetised environmental and human health costs, thus enabling a comparison with mitigation costs.

"Benefits from reduced health and ecosystem impacts clearly overcompensate the direct economic costs of a coal exit. They amount to a net saving effect of about 1.5 per cent of global economic output in 2050, that is USD 370 for every human on Earth in 2050", said Gunnar Luderer, leader of the energy research group at PIK and professor at the Technical University of Berlin. "We see this effect already in the medium term. In particular, India and China could reap most of those benefits already by 2030."

In international climate negotiations, governments need to factor in that exiting coal is a cheap and necessary way to substantially reduce global greenhouse gas emissions and a measure that also has huge co-benefits at home. The study shows that national and global interests can go hand in hand.

Given the Paris Agreement's current requirement for updates to the Nationally Determined Contributions (NDCs), this paper is quite timely, commented Gunnar Luderer: "It underscores the benefits of a global coal exit – to the better of our planet and our health. Yet, importantly, ending coal is just the beginning. It must be flanked by further ambitious climate policies to avoid a lock-in to other fossil fuels, namely oil or natural gas."

Christer Ågren

Sources: Potsdam Institute for Climate Research (PIK) press release and Ends Europe Daily, 23 March 2020

The study "Coal-exit health and environmental damage reductions outweigh economic impacts" (DOI: 10.1038/s41558-020-0728-x), by S. Rauner, N. Bauer, A. Dirnaichner, R. Van Dingenen, C. Mutel, and G. Luderer is available at: https://www.nature.com/articles/s41558-020-0728-x

See also the article "Air quality co-benefits of ratcheting up the NDCs" (doi.org/10.1007/s10584-020-02699-1), by S. Rauner et al., and published in Climatic Change on 18 April 2020. Available at: https://link.springer.com/content/pdf/10.1007/s10584-020-02699-1.pdf

Offshore wind energy development in the Baltic sea must accelerate

One of the areas with high wind power potential but a low proportion of offshore wind farms is the Baltic Sea.

Untapped potential of offshore wind industry globally

Offshore wind potential has attracted increased attention in recent years, for good reasons. A comprehensive global study found that global offshore wind capacity is set to increase 15-fold and attract around $1 trillion of cumulative investment by 2040[1].

However, the full potential is far greater. The geospatial analysis of this report was limited to the best offshore wind sites and still found that the technical potential is 36,000 TWh per year. Current electricity demand is around 23,000 TWh. These installations would be in water less than 60 metres deep and within 60 km from shore. Adding the potential of floating turbines could unlock power to meet global demand 11 times over in 2040[1]. According to the International Energy Agency, offshore electricity could become the EU's leading energy source by the early 2040s1. During 2019 a record 3.6 GW of new offshore wind capacity was added across Europe[2].

A study by WindEurope concludes that 7 GW of new offshore wind capacity needs to be built each year, rising to 18 GW a year by 2050[3] in order to reach EU climate goals.

Europe currently has 22,072 MW of installed offshore wind capacity[2]. This corresponds to 5,047 wind turbines across 12 nations (ibid.). The country with the largest percentage of Europe's offshore wind power is the United Kingdom, with 45% of all installations. Germany has 34%, Denmark 8%, the Netherlands 7% and Belgium 6%[2]. These five nations thus account for 99% of total European capacity.

Even though the potential of offshore wind industry is undisputed, there are challenges to establish the industry in an inclusive way. The oceans are widely used, and maritime spatial planning needs to address the needs of diverse and sometimes conflicting interests. For expansion to be sustainable and have least impact on affected stakeholders the geographic locations of offshore windfarms need careful consideration. At present, the areas available for offshore wind are too limited, as large areas are excluded for military use or nature conservation, or earmarked for fishing. Unless more sea areas are made accessible in Europe, just 112 GW of offshore wind capacity would be possible, rather than 450[3].

The potential of the Baltic Sea

In Europe, the North Sea accounts for 77 percent of all cumulative off-shore wind capacity, the Irish Sea 13 percent, and the Baltic Sea 10 percent and the Atlantic Sea under 1 %. The Baltic Sea has 2 GW of installed offshore wind capacity. Denmark has 872 MW, Finland 68 MW, Germany 1,074 MW and Sweden 192 MW.

A report from WindEurope focusing on boosting the offshore wind power in the Baltic Sea[4] hows that by 2030, 9 GW could easily be deployed in this region. With the right government support and regional cooperation, this amount could be increased to over 14 GW. By 2050 the installed capacity could reach 85 GW, which would make the Baltic Sea the second largest basin for offshore wind power after the North Sea. However, the cumulative potential capacity in the Baltic Sea calculated by the European Commission is above 93 GW, with a generation capacity of 325 TWh/year[5].

In comparison with the North Sea, wind farms in the Baltic Sea are exposed to weaker tides, lower waves and shallower water depths – conditions which could make development easier. One of the few topographical hindrances that must be allowed for is seasonal ice in the north Baltic Sea. With such potential, why is the Baltic Sea lagging behind in the deployment of offshore wind farms? The main reason is the absence of clear policy reinforcement and market linkage. These factors have hindered development in Sweden, Finland, Estonia and Lithuania. Finland and Sweden have large shares of nuclear and hydro in their energy mixes, with additional biomass, gas and onshore wind. Due to cheap hydro power and existing nuclear, offshore wind deployment has not been prioritised here, as it is in Denmark and Germany. Areas earmarked for offshore wind establishment are scarce, due to conflicts of interest.

Action is needed now for future benefits

The electrification of the global energy system is increasing. Unfortunately, fossil fuels still account for nearly two-thirds of the world's electricity generation – the same proportion as two decades ago. Development must accelerate in order to have a chance of reaching the set energy and climate goals in time.

Apart from electricity, the high capacity and falling costs of offshore wind could be used to produce green hydrogen[6]. Green hydrogen is produced from water by renewables-powered electrolysis; it creates no carbon and can be sold or stored until needed. Thus, hydrogen could provide an important form of energy storage and balancing tool. Hydrogen can also be used as an energy source by industries that are the most difficult to decarbonise, such as steel and cement production. 250,000 homes could be heated with hydrogen fuel from 1 gigawatt of offshore wind (IEA 2019, p 14).

By promoting maritime spatial planning that defines suitable areas for offshore wind farms, development can be accelerated in the most suitable areas. An offshore wind farm takes about 10 years to build. Procedures for obtaining permits are slow, and resistance from local populations and other stakeholders can prolong development further. Maritime spatial planning that supports coexistence of offshore wind farms and other users, as well as increasing

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Can hydrogen replace ship fuel oil?

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Regular hydrogen-powered containership services on the transpacific could be a common sight by 2030, according to a new report from the International Council on Clean Transportation (ICCT).

The study found that 99 per cent of container ship voyages between China and the United States in 2015 can be powered by hydrogen with only minor changes to fuel capacity or operations – i.e. by replacing 5 per cent of cargo space with more hydrogen fuel or by adding one additional port of call to refuel. Moreover, 43 per cent of the 2015 voyages can be made without any such changes.

The results show that the bunkering needs of some of the largest ships in the world can be met with hydrogen with only minor changes to operations. Other potential alternative fuels, including ammonia and methanol, carry more energy per unit volume than hydrogen, and are thus promising areas for future research.

Source: Splash247.com, 2 March 2020.The study: https://theicct.org/publications/zero-emission-container-corridor-hydrogen-2020

the social acceptance, can improve and accelerate these practices.

Another important factor for boosting the deployment of offshore wind in the Baltic Sea is to look to EU funding. Different funding schemes allow governments and the private sector to support technological innovation, strengthen cooperation and knowledge sharing. Between 2014 and 2020 approximately €80bn was provided by the EU to fund research, mainly through the Horizon 2020 research programme. Together with the European Commission, member states should use the potential of EU funding for support in deploying cross-border projects.

States need to define clear climate and energy objectives to provide the foundation for expanding internal offshore markets and exploit the added value that the sector brings. When it comes to economic growth, offshore wind energy boosts imports and exports. It attracts international investments. Offshore wind energy enhances energy independence and security.

Governments need to provide clarity on future offshore volumes through suitable support mechanisms and by confirming new site allocations.

All the countries that surround the Baltic Sea basin would benefit from developing offshore wind. When it comes to jobs, wind energy creates careers in turbine manufacturing, electricity generation and other industries. Studies have shown that in the scenario of 32 GW of offshore wind by 2050 in the Baltic Sea, up to 10,000 annual full-time jobs would be created in planning and building wind farms. In addition, up to a further 29,000 full-time jobs would be created in operation and maintenance activities[5].

In conclusion, the offshore wind industry in the Baltic Sea can become an important asset for Europe's transition to a renewable energy sector. Benefits would include competitive and clean energy, and increased local and international economic growth. However, development in the Baltic Sea has been slow to date, and needs to catch up in order to support the decarbonising of the energy sector.

Emilia Samuelsson

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3. Wind Europe (2019) Our energy, our future How offshore wind will help Europe go carbon-neutral, Brussels

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Recurring extreme climate events are devastating to coral reefs

In the last five years, there have been three severe marine heatwaves that have caused significant bleaching of corals at the Great Barrier Reef.

Climate change induces both gradual shifts, such as changes in mean temperature, and extreme climate events, such as heatwaves. Extreme climate events offer little or no opportunity for species to adapt or acclimatise to change. These events can be especially devastating for sessile species, such as corals, which do not have the option to move to cooler places and avoid unfavourable conditions.

In 2019, a group of Australian scientists published an article[1] that synthesised results from earlier studies with regards to the effects of repeated extreme climate events on marine habitat forming communities. The article included information on back-to-back marine heatwaves that struck the coral reef communities of the Great Barrier Reef in 2016–2017.

Marine heatwaves induce coral bleaching, since corals when under stress expel algae that normally live in their tissues. The authors state with regards to the 2016 event that "Bleaching of corals in 2016 was the most severe and extensive so far recorded". The event coincided with the warmest sea water temperatures ever recorded in parts of the Central Western Pacific. In parts of the Great Barrier Reef, more than 60 percent of the corals experienced bleaching.

Another tragic record was set in 2017, when for the first time there was a consecutive second year of bleaching. This event overlapped spatially with large areas of the previous event, and caused bleaching in approximately 50 percent of the remaining corals.

Since recovery times are years to decades, frequent bleaching events suggest a grim future for these corals. The authors suggest that such events are "changing ecosystems in profound ways that in some cases are unlikely to be reversible".

As extreme climate events already affect marine habitat forming communities (including not only corals, but also kelps, mangroves and seagrasses) along 45 per-


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cent of the Australian coast, the report on these events is truly alarming. The article consequently suggests that in addition to studying gradual shifts due to climate change, more attention should be given to extreme and abrupt events – also globally. The authors in their conclusions state that the impacts of extreme climate events on ecosystems "are likely to become more severe and extensive in the near future. Indeed, they are happening now, and based on this Australian analysis, may be more common globally than currently appreciated […]."

Unfortunately, the bad news for these corals has – in line with the scientists' conclusions above – continued during this Australian summer. In February 2020, the highest monthly sea surface temperatures on record were observed for the Great Barrier Reef.

Scientific studies that fully describe the impact of this latest extreme marine heat event are yet to come. Already, however, the reefs have been surveyed from the air and underwater by the ARC Centre of Excellence for Coral Reef Studies and the Great Barrier Reef Marine Park Authority. Results of the survey have since been reported and commented on in several newspapers, such as the New York Times[2]. According to the survey, the proportion of severely bleached corals was exceeded only during the event in 2016. Additionally, for the first time, severely bleached corals could be observed along the whole length of the reef.

This most recent bleaching event could be viewed as a confirmation of conclusions in the scientific article that synthesised information from earlier events. Indeed, the Director of the ARC Centre of Excellence for Coral Reef Studies, Professor Terry Hughes, told the New York Times that "the heat waves of recent years were creating a cumulative effect that was drastically altering the makeup of the reef". Professor Hughes also said "We're surprised by the pace of this acceleration in bleaching. We had a 14-year gap between 2002 and 2016, and now in five years we've had three severe events."

If the future is not only grim for these corals, but is already here, then corals will remain at risk even if strong measures are taken to mitigate greenhouse gases, such as those in line with the Paris Agreement (see also https://airclim.org/acidnews/not-even-15%C2%B0c-good-enough). The need for protection is urgent. For an environmentalist, it is very obvious that corals deserve protection in their own right. No species should be threatened by extinction. In the case of corals, however, the implications for biodiversity reach far beyond this group of species alone. In fact, coral reefs host more than 83,000 other species! Although not all species of corals are equally sensitive to extreme temperatures, changes in the species composition of corals will have effects on biodiversity.

According to the interview with Professor Hughes, the corals most likely to die are species of root and branch corals, which are particularly important habitats for fish. The sturdiest types are dome-like corals, which have other important functions (e.g. protection against erosion), but are less important for fish. On that note, Professor Hughes stated that "This is a transition from high diversity and lots of species, to lower diversity, with fewer tougher species."

The fate of coral reefs is an ecological and a biodiversity issue. In addition, it is to a large extent an issue with vast economic, social and political consequences, as entire ecosystems are dependent on them.

Ultimately, the key message for protecting species from extreme climate events (and ocean acidification, which also threatens coral reefs) is mitigation of greenhouse gases. Additionally, because the resilience of coral reefs is also compromised by factors such as construction, impaired water quality and overfishing, local protection and management measures remain vital.

Marko Reinikainen

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The role of soil carbon in mitigating climate change

Soil holds three times more carbon than the atmosphere. Building soil carbon is an appealing way to mitigate climate change in land-based systems. Apart from increasing carbon sinks and reducing further emissions from land use change, building soil carbon gives benefits to agriculture such as soil fertility, reduced erosion and enhanced resilience to climate change. A recent study that quantifies the role of soil carbon in (land-based) natural climate solutions (NCS) shows that soil carbon makes up 25% of the total potential of NCS, of which 60% is restoration of depleted stocks and the rest is protection of existing soil carbon. The study also shows that soil carbon makes up 47% of the climate mitigation potential of agriculture.

Source: https://www.nature.com/articles/s41893-020-0491-z

A 30-year-long study found organic farming to outperform conventional

The results of a 30-year trial that has compared organic and conventional agriculture side by side since 1981 were presented earlier this year. They show that the organic agriculture system in the study produced 40% less greenhouse gases, was more energy efficient, built soil carbon rather than depleted the soil and matched the yields of the conventional agriculture system. The organic agriculture system was also found to be more resistant to drought.

Source: https://rodaleinstitute.org/wp-content/uploads/fst-30-year-report.pdf

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A fair comparison of organic and conventional farming requires improved methods

The environmental impact of food and agriculture is intensively discussed. A common method to assess these environmental impacts, including climate change, is life cycle analysis (LCA). Several studies based on this method conclude that organic agriculture is worse for the climate than conventional agriculture, due to lower yield and hence greater land use per unit of food. This gives a faulty picture, according to three researchers who have analysed a wide range of LCA studies in a recent report. They found that LCA studies often give too narrow a view of agricultural systems and miss out on important benefits of organic agriculture. Previous studies have found that organic plantations host 30% greater biodiversity than conventional. Moreover, organic management promotes soil fertility due to crop rotation and nutrient recycling, and does not use any pesticides. These effects are not taken into account in many LCA studies, which results in an unbalanced picture of the environmental performance of different agricultural systems that may in turn result in bad political and societal decisions.

Another problematic aspect is when hypothetical "indirect effects" are included in the studies. As an example, it is often assumed in LCA studies that the total consumption of meat will remain unchanged if there is a shift to organic production. Thus, it is not taken into consideration that consumers that are motivated to buy organic meat for ethical and environmental reasons are likely to consume less meat. More knowledge of this kind of consumer behaviour is needed.

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Source: https://www.nature.com/articles/s41893-020-0489-6

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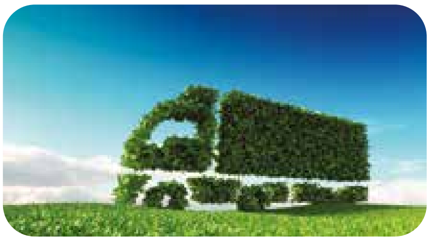

California moving towards zero-emission trucks

The California Air Resources Board (CARB) presented on 28 April amendments to its proposed Advanced Clean Trucks Regulation, including increasing the percentage of zero-emission vehicle (ZEV) sales in California across all vehicle groups from 2024 to 2030 and to increase the percentage requirements from 2030 to 2035. They also propose to include pickups in the ZEV sales requirement, beginning with the 2024 model year.

In combination, these changes would increase ZEV sales in all vehicle size categories. CARB says that this would provide a clear path towards achieving carbon neutrality by 2045. The proposals are open for consultation until 28 May 2020 and can be found at: ww3.arb.ca.gov/regact/2019/act2019/30daynotice.pdf.

Source: AECC Newsletter, April 2020.

Luxembourg first country to make public transport free

From 28 February, Luxembourg has abolished fares for trains, trams and buses in what the government said was a bid to tackle road congestion and pollution, as well as supporting low earners. This means that all standard-class journeys on public transport are now free of charge.

To cope with the increase in commuters, Luxembourg plans to invest €3.9 billion in railways between 2018 and 2028, upgrade the bus network and add more park-and-ride sites on the border.

Source: EurActiv, 2 March 2020.

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Switching from coal to fossil gas is not an option

The European Commission wants to finance 32 fossil gas infrastructure projects, but finds it increasingly hard to present this as compatible with Paris. And the Corona crisis demonstrates that Europe can manage with much more renewables and less of both coal and gas.

Projects of common interest, PCI, are "key cross-border infrastructure projects that link the energy systems of EU countries".

The latest list of such projects contains 149 projects: 100 in electricity transmission and storage, 6 in smart grid deployment, 32 gas, 6 oil and 5 cross-border carbon dioxide networks.

But it does not look like plain sailing through the Parliament.

"We cannot afford to be wasting any public money on fossil gas infrastructure that is destined to become stranded assets," said MEP Martin Hojsík, a member of the liberal Renew group, according to ENDS, on 20 January.

This wastage was specified as 29 billion euro by Luxembourg's energy minister, Claude Turmes.

The Commission is now considering three options, one of which is to stop gas investments, one to carry on as if nothing has happened, and a third more vague compromise.

One of the hard-liners in the Commission is trade commissioner Phil Hogan, who went to a think tank in Washington in January and said about the EU increasing imports of fracking LNG from the US:

"This increase in imports is good for US farmers and exporters – but also for energy diversification and agriculture in the EU. It is a great example of a win-win."

For at least 40 years natural gas has been touted as a "bridge" to a green clean future. The gas industry still says so. Norway is a leading supplier of gas to the EU and its lobby puts it this way:

"Reducing gas deliveries from Norway would not be beneficial for the climate. Natural gas is the solution for combating growth in coal consumption and achieving emission reductions. It is also the perfect partner for renewables, since these sources will jointly reduce coal emissions and provide stable energy supplies."[1]

One of the reasons why fossil gas has been a harder sell, politically, during the 2010s is that it is mostly imported, from Russia, Algeria, the US and Norway. The EU's own gas resources are small and dwindling.

Another reason for doubting the coal-to-gas prescription is that since 2007, before the 2008 recession, coal power has halved, while gas power also decreased. It was not gas that replaced coal, oil and nuclear power. It was wind, solar, and efficiency that did so[2].

Even more recent data from Ember[3] for April 2020 shows that the share of intermittent renewables has been pushed far higher than ever before. 23 percent of all generation came from solar and wind. Gas power fell 30 per cent compared to April 2019. Coal fell 42–43 percent, and nuclear 16 percent.

Dave Jones from Ember described this as a "postcard from the future".

The extraordinary spring of 2020 with all the lockdowns is not a picture of how anyone wants the European energy system to look. But it shows that it is easier to integrate a lot of wind and solar even without any preparation. Integration will be even easier with more electric vehicles, more battery storage and more power lines, all of which are surely coming. The current 23 percent from solar and wind is no way near the ceiling; this month, Denmark got 65 per cent of its electricity from solar and wind, but Poland only 12 percent and France 9 percent.

The 23 percent figure for wind and solar does not include existing hydro, which is a great resource in itself and for balancing solar and wind, and neither does it include biomass, some of which is sustainable and some of which can also balance solar and wind.

Nuclear power is now shrinking fast in Europe. Not only will it totally vanish in Germany by 2022. Two reactors closed in France and one in Sweden during 2020. In the next few years some reactors will also be phased out in Belgium and in the UK – which is already connected to the European grid. Nuclear power is not flexible, with a minor exception in France, so less nuclear means more room for wind and solar.

As solar and wind are now the cheapest form of power, they can also carry the cost of some extravagant flexibility. If there is too much wind or solar, it can be curtailed. On occasions it can also be operated "with headroom", that is at less than full capacity, so that output can be turned up when needed.

Such redundancy is acceptable if it just means a few percent lost. If it is more than that, it makes sense to use the power to produce hydrogen. Or to store excess electricity as heat. Or to build solar thermal power, as in Spain, which can supply power for hours without any sun. Or to program the charging of vehicles according to the demand on the power system.

The cheapest way to balance solar and wind over a few hours is demand-side management. It is a complex task to do this in a way that creates incentives for all parties, but the stakes are getting higher. Very low or even negative electricity prices are common with a high percentage of wind and solar, and this has been accentuated by the Corona crisis.

There are several technical and political ways to shoehorn in a lot more renewables, without gas to balance them, but such

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methods will not be exploited fully until they are needed.

To be fair, gas power did increase in 2019, after a reform of the EU emissions trading system increased prices for CO2 emissions. That is how the market works. When a coal power plant is turned off, something else will have to make up for the difference straight away. This something else is not wind or solar, because you cannot build a new plant in a second, and there is no unused capacity.

Over a longer period of several years, renewables and efficiency gains have replaced a lot of all fossil fuels. Compared to 2007, gas, coal, oil and nuclear have all lost out.

AirClim published a report about fossil gas in 2016 – **Phasing out fossil gas in Europe**[4]. Up till then some important NGOs saw a long-term role for natural gas, as a way to phase out coal and nuclear faster. Among them was BUND – Friends of the Earth Germany, and Greenpeace Germany. BUND soon changed tack completely[5], and Greenpeace also sees a way out from gas[6]. New anti-gas organisations have appeared, such as *https://www.gastivists.org/4-videos-fossil-gas-the-real-story/* (with nice animations to make their points.)

Since 2016, the case for gas looks even more tenuous.

There is precious little time left if the Paris agreement and recent IPCC reports are to be taken seriously. Investment in any fossil capacity assumes that it will be used for decades. With a 40 percent cut in greenhouse gas emissions from 1990, there might be some room for gas. With a 65 percent cut, as recently proposed by lead lawmaker Jytte Guteland (S&D, Sweden) in the European Parliament, switching from coal to gas is not an option.

Some 17 per cent of global warming – measured as radiative forcing – comes from methane, the main constituent of natural gas. But that may be an underestimate. Recent research[7] suggests that mankind has added 25–40 percent more methane since preindustrial times than previously thought.

This methane comes from natural gas leaks, from coal mines and oil wells, but not from rice paddies or ruminating cows. The latter can be identified separately, since methane that circulates in the biosphere contains carbon 14, but fossil methane does not.

Liquid Natural Gas, LNG from fracking, though praised by commissioner Hogan, is especially controversial, not just because of the fracking. Its liquefaction, transport and gasification incur great energy losses.

Fredrik Lundberg

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Air quality rules fit for purpose

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

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

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

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

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

In its Commission Staff Working Document, the Commission notes it currently (i.e. in October 2019) has thirty open infringement procedures against twenty member states for breaching limits on particulate matter (15 cases), nitrogen dioxide (14 cases) and sulphur dioxide (1 case). Two member states are also in breach of the directives' air quality monitoring requirements.

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

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

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

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

Environmentalist organisations were generally supportive of the Commission's conclusions.

ClientEarth lawyer Ugo Taddei said that the air quality directive and its enforcement, both by the Commission and civil society, have been essential to accelerate action to fight harmful air pollution and protect people's health across the EU. Nevertheless, he stressed that better implementation is key to addressing the ongoing health crisis, and that the Commission should immediately produce implementing acts to ensure better air quality monitoring, more harmonised modelling and stronger air quality plans.

Margherita Tolotto at the European Environmental Bureau (EEB) concluded that even though EU legislation has been the main driver to reduce air pollution over the last decade, much still needs to be done. Stressing the need for coherent policies to deliver clean air, she specifically pointed out the Common Agricultural Policy, and emphasised that full implementation of the National Emissions Ceilings Directive is key to delivering improved air quality.

Anne Stauffer at the Health and Environment Alliance (HEAL) welcomed the Commission's conclusions, which she said demonstrate that the legally enforceable air quality standards are a key instrument to protect the health of Europeans. She also urged the Commission to present new legislative proposals, including "putting forward a strong and ambitious Zero Pollution Strategy as part of the Green Deal, as well as presenting a timeline for the updating of the current standards to WHO's health-based recommendations".

Christer Ågren

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

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

Decarbonise shipping by 2034

Ships need to improve their CO_2 intensity by at least 80 per cent by 2030 and reach zero emissions by 2034, according to a new proposal to be discussed at the International Maritime Organization (IMO).The current IMO climate strategy has a target to improve CO_2-intensity by only 40 per cent from 2008 to 2030. But a much higher ambition level is required to reach the goals of the Paris Agreement, argue the two environmental NGOs behind the new proposal, Clean Shipping Coalition and Pacific Environment.

Their new goal-based approach aims to achieve Paris-compliant emission reductions, by prescribing linear carbon intensity improvements per ship of at least 80 per cent by 2030 compared to 2008.

According to their proposal, the cumulative emissions of greenhouse gas from 1 January 2018 onwards, should not exceed shipping's 1.5°C carbon budget of 9 Gt (2.22% of 420 Gt left to humanity if it is to keep global heating below 1.5°C). That means that both absolute emissions and the annual carbon intensity of the sector should be reduced linearly between now and 2034 to ensure that there is a smooth transition to carbon-free shipping. Anything less than that would mean an unacceptable risk of failing to keep global heating below 1.5°C.

A goal-based approach leaves it to individual ships to choose their method of compliance with the regulation's requirements. To improve their carbon intensity, ships can use the following approaches, individually or in combination:

- Reduced ship speed;
- Energy-saving technologies, including but not limited to wind-assistance; and
- A switch to zero-carbon fuels.

The new proposal was originally set to be discussed by IMO's Marine Environment Protection Committee in late March, but due to the Corona pandemic the meeting has been postponed and is now scheduled for October.

Source: "A proposal for and an initial impact assessment of a goal-based approach to realize the substantial speed-related GHG emission reductions that are urgently needed in the short-term and to provide a framework for the full decarbonization of shipping in the longer-term". IMO Document ISWG-GHG 7/12/12, 7 February 2020, submitted by Pacific Environment and Clean Shipping Coalition.

New policy instruments needed for shipping

A Swedish research project called "Carrots and whips in shipping to achieve environmental quality goals" has analysed which policy instruments and measures are most cost-effective to reduce ship emissions into the air.The study focussed on the impact of ship emissions on four of the Swedish environmental quality targets related to air pollution as well as on the IMO's climate goals. Analyses of new emission scenarios up to 2030 and 2045 showed that the environmental targets for shipping emissions will not be reached with current legislation. Even the most optimistic scenarios with relatively large changes in the shipping fuel mix are not expected to lead to the attainment of the climate targets.

In the case of greenhouse gas reduction, the researchers propose to include shipping in the EU's emissions trading system (ETS) or a similar global system. Speed reduction is another suggestion. To reduce NOx emissions, a (Northern) European NOx fund that provides incentives for investments is proposed. Using electricity for the propulsion of ships and for onshore power in ports can be societally profitable, according to the analysis.

"We also recommend more research and development on different types of renewable fuels as well as policy instruments to promote the production of such fuels," said lead author Inge Vierth, at the Swedish National Road and Transport Research Institute (VTI).

The main report "Policies and measures to reduce air emissions from shipping", VTI notat 24A-2019, is available at: www.vti.se/en/publications

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Shipping in the EU ETS?

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In February, the European Parliament's Environmental Committee backed a bill that aims to include the shipping industry under the EU's emissions trading scheme (ETS). Jutta Paulus, member of the Greens, has been in charge of formulating the parliament's proposal on how the so-called MRV legislation, which sets the rules for measuring ships' CO_2 emissions, should be updated.

The European Commission had previously announced that they think a new study needs to be conducted, and that they may present a proposal for including shipping in the ETS in 2021.

The Environmental Committee will vote on the issue in May, and the full parliament will vote in June. Once this is done, negotiations will commence on the final MRV legislation, involving the European Parliament, the EU Council and the European Commission.

Source: ShippingWatch, 20 February 2020.

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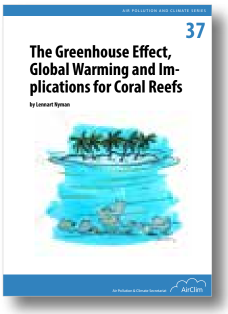

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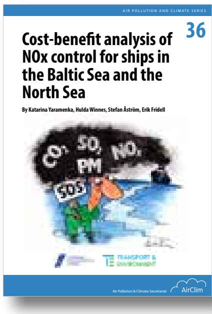

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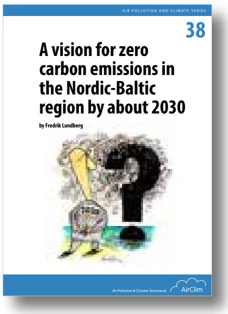

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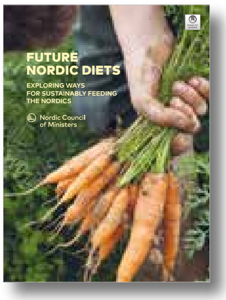

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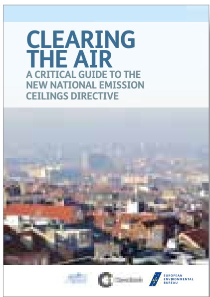

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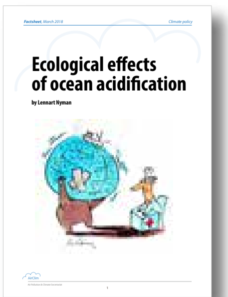

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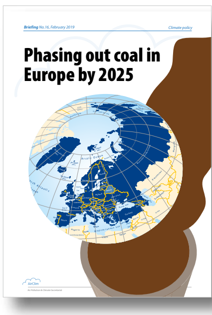

Phasing out coal in Europe by 2025 (Feb 2019). By Fredrik Lundberg. An updated list of coal power stations throughout Europe and a proposal of phasing out coal by 2025.

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Coming events

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

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

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

7th International Conference on Energy, Sustainability and Climate Change (ESCC 2020). Skiathos Island, Greece, 24 - 26 August 2020. Information: http://escc.uth.gr

International Day of Clean Air for Blue Skies 7 September 2020. UN international day for clean air. Information: www.un.org/en/observances/clean-air-day

Air Pollution threats to Plant Ecosystems Conference. Paphos, Cyprus, 7 - 11 September 2020. Information: http://www.ozoneand-plants2020.com

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

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

UN FCCC Bonn Climate Change Conference. Bonn, Germany, 4 - 12 October 2020. Information: http://unfccc.int/

IMO Intersessional Working Group on reduction of GHG emissions from ships. London, UK, 12 - 16 October 2020. Information: www.imo.org

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

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

CLRTAP joint meeting of Executive Body and Working Group on Strategies and Review. Geneva, Switzerland, 14 - 18 December 2020. Information: www.unece.org/env/lrtap/welcome.html