### Increasing renewable energy targets for the EU

The next European Commission needs to sprint towards climate action to be in line with the Paris Agreement.

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### Achieving a sustainable food future

Feeding the world while staying below 1.5°C by 2050 will require increased productivity, shifts in consumption, new technology and massive reforestation, according to a new report

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## **Environmental impacts of ship scrubbers**

Untreated wash water from open-loop scrubbers contains heavy metals, aromatic hydrocarbons and soot particles, and scientific tests have shown harmful effects on marine organisms.

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### 6 countries still breach air pollution limits

In 2017, the national emission ceilings for ammonia were still violated by five member states and total emissions have now increased by more than three per cent over the last four years.

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### Global SO₂ air pollution hotspots mapped

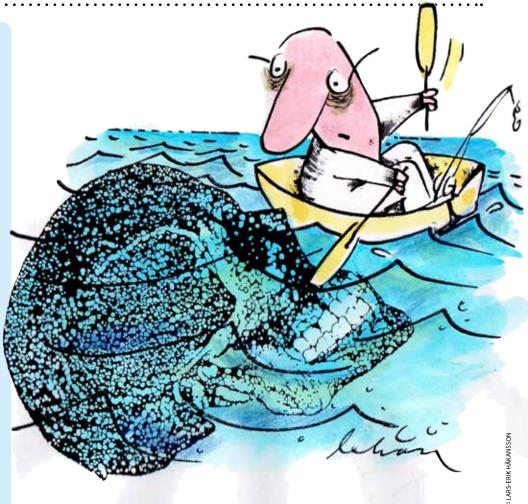
The Norilsk smelter complex in Russia continues to be the largest sulphur dioxide emission hotspot in the world.

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### **Hydrogen choices**

Hydrogen has for several decades been touted as the fuel of the future. It is in fact a big commodity today, and heading for fast growth in a low-carbon future.

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# Not even 1.5°C is good enough

The international community is still far from agreeing on a clearly defined maximum limit for global warming. Yet, parts of marine ecosystems face catastrophic risks already at current levels of warming.

The special report on "Impacts of 1.5°C of Global Warming on Natural and Human Systems" (SR 1.5)¹, which was published by the International Panel on Climate Change (IPCC) in October last year, very clearly highlights the tremendous difference in effects at 1.5°C compared to those at 2°C. The Paris Agreement from

2016 states that the warming should be kept "well below 2 degrees Celsius", whilst pursuing "efforts to limit the temperature increase even further to 1.5 degrees Celsius". Evidently, the IPCC special report shows that the latter of these statements should be taken more seriously than ever,

#### **Acid News**

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

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

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

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#### The Air Pollution and Climate Secretariat

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

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

In furtherance of these aims, the Secretariat:

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



**The IPCC's Special** Report on The Ocean and Cryosphere in a Changing Climate (SROCC)<sup>1</sup> and its summary for policymakers (SPM) provide scary reading about ongoing changes and risks, as well as pro-

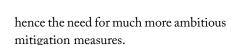
jected risks. Whereas the special report on global warming of 1.5°C (see front page) continually deserves and needs to be cited for shifting the focus from scenarios with a higher level of mean global warming to drastically more ambitious levels, the SROCC reinforces the findings in the 1.5°C report and other previous reports. This reinforcement

specifically concerns the ocean and the cryosphere, but also highlights the importance of these systems for the entire globe and its human populations.

These deeper insights cover a number of factors, such as the interconnections between the cryosphere and the ocean, and their global effects (e.g. sea level rise and the Atlantic meridional overturning circulation), as well as the dramatic global consequences for human living conditions and livelihoods.

The SROCC hopefully serves as a final alarm bell to demonstrate the globally diverse risks of climate change, and even to persuade those countries and individuals who have thus far taken lightly on effects of climate change in their back (or front) yards.

To this end, one particular concern is ocean acidification, which operates irrespective of local temperature or climate conditions (although there can be interactions), because waters everywhere significantly absorb CO<sub>2</sub>, resulting in decreased pH values across the globe. Indeed, even climate sceptics tend not to dispute the increase of CO<sub>2</sub>, but rather its connection to observed temperature rise. It is – or should be – becoming harder and harder for anyone to overlook the effects of greenhouse gas emissions, and



In this context it is sad that one sentence, which stated that the present assessment reinforces<sup>2</sup> findings in the IPCC Special

"the best prize

of all would

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1.5°C target"

Report on 1.5°C, was reportedly<sub>3</sub> omitted from the approved and accepted SPM, due to the demands of Saudi Arabia. An oilrich country (albeit largely surrounded by ocean) has its major economic interests elsewhere, but the SROCC is a powerful diplomatic asset for exerting political and economic pressure on countries that are not willing to embrace

**AirClim** 

the 1.5°C target. A logical framework for such a policy would be a sharpening of the Paris Agreement (see Editorial in AN 1/2018).

The authors of the SROCC and the chairpersons of the IPCC's 51st session deserve huge respect not only for finalizing the report and the SPM, but also for their patience and skill in negotiating a scientifically sound and powerful product, which in the end was accepted and approved by all nations. Their patience and skill were, on top of everything, often needed at ungodly hours and involved several days of continuous work virtually around the clock.

In fact, the key persons not only deserve respect – they deserve many prestigious prizes. But at the end of the day, the best prize of all would probably be a translation of their work into rapid action to reach the 1.5°C target, and save everything that can be saved for the oceans and the cryosphere, as well as the entire biosphere.

Marko Reinikainen

<sup>&</sup>lt;sup>1</sup> Approved and accepted on the IPCC:s 51st session, 20–23 September 2019

<sup>&</sup>lt;sup>2</sup> Italics added by present author

<sup>&</sup>lt;sup>3</sup> See e.g. https://phys.org/news/2019-09-arabia-blocking-oceans.html

## Capacity is no longer a reason for subsidies to fossil power

Check the national regulation regarding extreme power shortage situations, and educate either the regulator or the balance responsible power companies. Do not accept capacity arguments for subsidies to fossil fuels.

**Electricity market regulation** introduced in recent decades in many countries to facilitate competition varies remarkably between countries, even within the European Union.

Experience has shown that simple regulation is the most efficient approach. Exceptions and exemptions introduced into regulations – with good intentions to solve problems – often create more problems. Worse, complicated regulations make it difficult for actors to understand enough to behave rationally.

The fundamental rule for any competitive electricity market is that actors who want to trade electricity via the grid must have a party that assumes responsibility for economic balance. This party tries to achieve physical balance, using a day -ahead spot market often combined with intraday trading until the last hour before delivery. During the final minutes or seconds the System Operator (sometimes called Transmission System Operator) will ensure real-time balance in the system as a whole using a balancing market - a market that always involves power producers and sometimes also consumers willing to adjust consumption.

After managing the system balance at some cost, the System Operator checks measured production and consumption data, and invoices those balance responsible parties that have failed to achieve physical balance. Usually the marginal cost of balancing is low, and balance market prices are close to the spot-market prices, often a day-ahead market that decides which power generators can provide the lowest-cost power during the day.

This is also the case when there is a lot of solar and wind power in the system, as generation can be predicted with the same precision as the prediction of consumption. Instances when the balancing market shows prices well beyond the spot market occur when unexpected events require the System Operator to make large corrections in the balancing market, typically failures of large thermal power plants or extreme weather conditions that raise consumption.

Those who do not understand the importance of this balance responsibility and talk about the need for a "capacity market" in addition to the regulation described above are dangerous if they have influence on the market. They do not understand that they are already required to provide capacity to match the

possible power demand they have granted their customers the right to use.

However there may be shortcomings in the regulations that allow them to escape their responsibility if they create damage. If a lot of thermal power is shut down, there is a possible scenario in which there is little wind, no sunlight, and low temperatures that raise power demand to the extent that the System Operator cannot find generating capacity or voluntary demand reduction in the balancing market. Instead the System Operator has to disconnect unwilling customers in order to maintain balance in the system.

**Several countries have** regulations that do not define how balance responsible parties who fail to achieve physical balance in such a situation should be treated. Electricity companies may believe they can get away with promising their customers to deliver power under any condition without having the means to supply it.

When properly regulated, there is a predefined "disconnection price". In Sweden it is €5,000/MWh. This is high enough for any actor to understand there is value in having capacity available, or



With a high enough "disconnection price" power companies will ensure they have the capicty to avoid power system failures.

other less costly options such as voluntary demand-side opportunities, to avoid ending up off-balance during extreme situations. Some companies in Sweden have learned that a failure can eat up total net assets in hours or days.

With this complete balancing responsibility defined, there is no reason to call the market an "energy only" market, as capacity is valued as well. As a result there will not be an uneconomically high risk for power system failure.

Regarding the economic consequences of such real market regulation it is worth noting that the largest economic risk appears to be the failure of large thermal power plants and high-capacity power lines. The risk of thermal power creating balance problems makes the idea that large old thermal power plants deserve subsidies for capacity reasons even less convincing.

So check the national regulations regarding extreme power shortage situations, and educate either the regulator or the balance responsible power companies. Do not accept capacity arguments for subsidies to fossil fuels!

Tomas Kåberger

### Not even 1.5°C is good enough

Continued from front page

especially as 1.5°C already is predicted to cause severe damage to nature and human societies (and indeed damage is already observed at present warming of 1°C).

This is especially true for marine ecosystems, and whereas 1.5°C is already a politically highly ambitious aim, it is also evident for these systems that serious effects will be observed in oceans around the world even if this goal is achieved.

Ocean ecosystems were specifically analysed in chapter 3.4.4 of the SR 1.5, of these factors interact, and effects are in many cases strengthened by other human induced disturbances, such as coastal infrastructure, habitat destruction, overfishing, etc.

followed by further in depth analysis in the very recent Summary for Policy Makers of the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SPM SROCC)2. Based on these reports, ocean ecosystems are expected to experience (or are already experiencing) effects caused by, for instance, physical disturbance (e.g. storms, rising water levels), changes in ocean physics (e.g. currents, stratification), rising seawater temperatures, and acidification. Many

face temperature, SST) in the SR 1.5 are expected to experience at least moderate effects already at warming below 1.5°C SST (Figure)3.

The highest risks are for warm water corals, which are already heavily impacted at current levels of warming, as evidenced by large scale mortalities. As also other human impacts have heavily affected warm water coral reefs, they have declined substantially over the last three decades. As stated in Box 3.4 of the SR 1.5 (on Tropical coral reefs): "Even with warming until today [...], a substantial portion of coral-reefs have experienced large-scale mortalities that have led to much reduced coral populations". In recent years, climate effects have become more and more prominent factors. In, for instance, the Great Barrier Reef a loss of 50% has been observed following elevated temperatures and bleaching of corals in 2016 - 2017. Adding to this, a very recent study4 that has been published after the special report, shows that recovery is hampered by a severe crash in recruitment (production of new corals), as evidenced by an 89% loss of new corals. Even if the

world succeeds in achieving the 1.5°C aim, the estimated prediction for warm water corals is an additional loss of 70-90%. With 2°C warming, the estimated effect approaches a total loss.

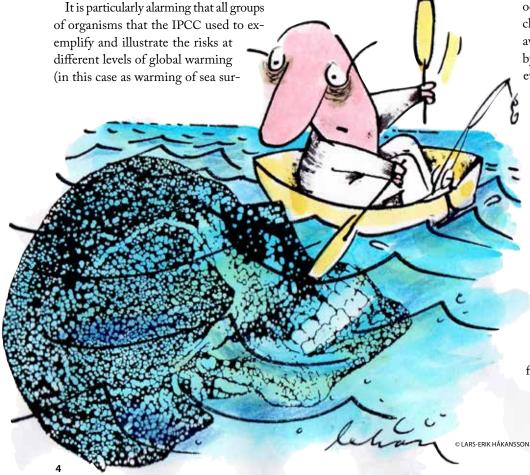
Mid latitude bivalves and high latitude, Pteropods (tiny, free-swimming sea snails) are the example-groups of organisms that next to warm water corals are the most sensitive to conditions at present day warming and higher. These organisms are vulnerable to acidification, which disrupts their shell formation, and they can also be directly affected by the increased temperatures. Both groups constitute highly important parts of the foodwebs of the oceans, and declines in their populations are a serious threat to the functioning of these, and to fish and other animals that depend on them as food.

Finfish and krill are also already at moderate risk at present day warming, and expected to experience or approach high risks at 1.5°C. Like for most other groups, the mechanisms behind these risks are complex. For finfish, these could involve changes in net primary productivity, upwelling conditions, stratification, ocean circulation etc., and any associated changes in foodweb structure and food availability. Finfish can also be affected by ocean acidification, as for instance, evidenced by a recent study, demonstrat-

ing effects of elevated (end-of-century) CO2-levels on Atlantic cod larvae (in combination with food limitation)<sup>5</sup>.

As finfish are mobile, for many species observed or predicted effects could imply geographic redistributions of fish populations, for instance through expansions to high latitudes and at the cost of populations and fisheries at lower latitudes. In fact, and as the IPCC report states, with reference to low and mid latitudes, "Reduced ocean upwelling has implications for millions of people and industries that depend on fisheries for food and livelihood".

Seagrasses (mid latitude) and mangroves finally make up the two example groups where risks are expected to remain moderate at warming up to 1.5°C (but reach a high level for



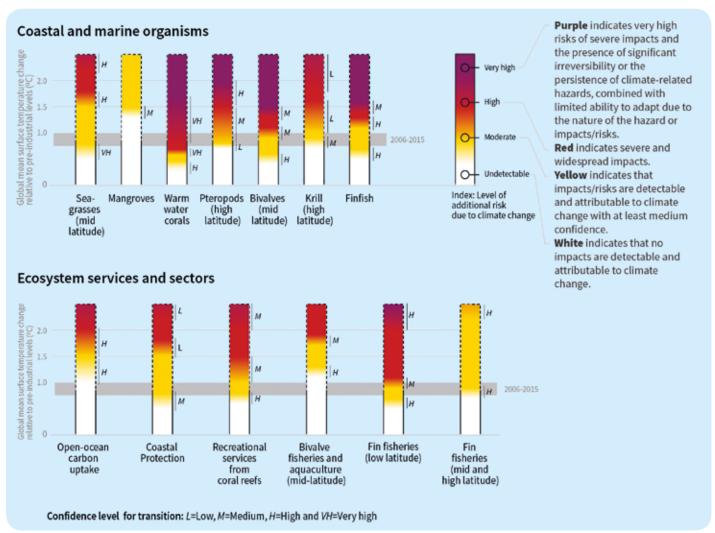


Figure. Risks for specific marine and coastal organisms, ecosystems and sectors. The key elements are presented here as a function of the risk level assessed between 1.5 and 2°C (Average global sea surface temperature).

seagrasses between 1.5 - 2°C). Seagrasses are predicted to suffer in particular from temperature extremes, but also from indirect effects of turbidity. Mangroves are affected not only temperature extremes, but most notably also illustrate effects of sea level changes in combination with human activities. Sea level changes are crucial as mangroves are specialized to the conditions that prevail in the transition zone between the coast and adjacent terrestrial areas. Mangroves could gradually shift shorewards as a consequence of changes in sea level. However, the occurrence of shoreward refugia is seriously limited by coastal infrastructure, positioning mangrove communities in what is referred to as a "coastal squeeze" in the IPCC special report. Human activities furthermore reduce available areas for mangroves by negatively impacting sediment supply.

Given all these serious effects on organisms and ecosystems that have been observed already, or are predicted with further warming and acidification, it is not surprising that the IPCC special report also highlights the risks of these effects translating into severe implications for ecosystem services. These risks, which are summarized in the lower panel of Figure, contain both direct negative effects on specific livelihoods (e.g. fisheries, tourism) and inhibition of large scale, global services such as carbon uptake and net primary production. In addition, coastal protection for human conditions against e.g. intensifying storms, rising sea level and larger waves is impeded by the loss of structures such as coral reefs and mangroves.

Overall, a general conclusion that can be drawn from the IPCC special report is a great concern for the risks associated already with a 1.5°C global temperature rise. This fact stresses the urgency to limit greenhouse gas emissions rapidly and with a global commitment. It also underlines the need to act now to help human communities, many of which are in countries in economic transition, to

adapt to ecosystem effects that are sadly already happening, and continue to be at serious risk even if the currently most ambitious aims could be met.

#### Marko Reinikainen

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<sup>1</sup>Temperature rise refers to comparison with preindustrial Global Mean Surface Temperature (GMST)

<sup>2</sup> See e.g. Figure SPM3. and Box B3 in the SPM SROCC

<sup>3</sup>The SR 1.5 Figure 3.18 is used here to illustrate effects of climate change as it incorporates coastal and marine organisms as well as ecosystem services and sectors (as opposed to the similar Figure SPM3. of the SPM SROCC, which, however, contains additional ecosystems and organisms). The SPM SROCC is commented on in the Editorial of this number of Acid News.

 $^4$ Hughes et al. 2019. Nature vol. 568, pp. 387–390

<sup>5</sup>Stiasny et al. 2018. Global Change Biology vol. 25, pp 839-849.

# Increasing renewable energy targets for the EU

The new European Commission needs to sprint towards climate action to be in line with the Paris Agreement. There is growing support for at least 55% emission reductions by 2030.

**The climate crisis** is one of the biggest challenges the EU and the world are facing today. The EU's current energy and climate targets are alarmingly inadequate and need to be increased substantially to allow for an adequate response to the threat of climate change.

In October 2014, the EU leaders on the European Council agreed on the level of ambition for the EU 2030 climate and energy targets. A binding EU target of at least 40 per cent domestic reduction in greenhouse gas emissions by 2030 (compared to 1990) was adopted. For renewables, a target of at least 27 per cent was agreed. They also agreed on an energy efficiency target of 27 per cent (compared to projections of future energy consumption) with the possibility to increase the target to 30 percent after a review in 2020.

In November 2016, the European Commission proposed a package of

legislation, called the "Clean Energy for All package", which elaborated on the review of existing renewable energy and energy efficiency legislation to fit the agreed 2030 climate and energy policy framework. The package included proposals for a renewable energy EU target of at least 27 per cent and an energy efficiency EU target of 30 per cent for 2030. The European Parliament, which was underwhelmed by the level of ambition proposed, asked to increase both EU 2030 energy targets to at least 35 per cent.

After intensive negotiations between the European Commission, the European Parliament and the Council of the European Union, in June 2018 the compromise reached was to set the EU renewable

energy target to at least 32 per cent and the energy efficiency target to at least 32.5 per cent. The reviewed renewables and energy efficiency legislation, including these targets, was brought into force in December 2018.

Even though the 2030 EU energy targets were to some extent increased, the current ambition levels are far from sufficient. Through the Paris Agreement, in 2015 the world agreed to pursue efforts to limit temperature rise to 1.5°C. However, there is a serious gap between what countries, including the EU, promised under the Paris Agreement on the one hand and what they have so far committed to do on the other hand. This is also what EU citizens are demanding now. Over the past year, hundreds of thousands of people, led by young people, have been taking to the streets to demand immediate and effective action to face the climate emergency. In addition, a recent poll shows that 93

per cent of Europeans believe that climate change is a "seri-

ous problem", while 79 per cent see it as a "very serious problem" and 92 per cent demand that national governments step up their

own targets for energy efficiency and renewable energy<sup>1</sup>.

Faced with the existential threat of devastating climate change impacts, the EU, its institutions

and all member states need to prioritise urgent action addressing the climate emergency with the aim of implementing

the Paris Agreement's ambition to limit temperature rise to 1.5°C. This will in particular need a substantial increase in climate action in the short term, with the aim of reducing greenhouse gas emissions

SHUTTERSTOCK - ALEXANDROS MICHAILIDIS

Ursula von der Leyen

increase in climate

called for a substantial

ambition in a bid to get

approval as European

Commission president.

to almost zero and substantially increasing the removal capacity of natural sinks within two decades.

This means that the current EU climate target – for a 40 per cent reduction in greenhouse gas emissions – needs to be considerably increased. In order to contribute in an equitable way to the effort of meeting the Paris Agreement goals, the EU should achieve at least a 65 per cent reduction in greenhouse gas emissions by 2030. And with a more ambitious climate target, the 2030 energy targets also need to be raised.

At EU level, support is growing for a more ambitious 2030 EU climate target. The massive youth protests are urging governments to ramp up climate action, backed by growing political support to translate their hopes into concrete and immediate action. Over the last year the European Parliament and some member states have been calling for the EU's 2030 climate target to be increased to at least 55 per cent. In July, President-elect of the European Commission Ursula von der Leven also called for a substantial increase of ambition in a bid to get approval as European Commission president. And more recently, the German chancellor also stated that she favours a 55 per cent reduction in greenhouse gases in the EU by 2030, alongside other member states and the European Parliament. The EU will need to increase its climate target well before the end of 2020 in order to meaningfully influence the discussions that are happening at the international level and within the process of the UN negotiations.

It is also vital that the EU not only increases its climate target but upscales its 2030 energy targets. The renewable energy and energy efficiency legislation agreed in 2018 already offers a starting

6



Member states should step up and go beyond the bare minimum needed to reach the current 2030 targets for renewables and energy efficiency.

point for raising ambition. Based on this legislation, member states are required to develop ten-year National Energy and Climate Plans (NECPs). These plans are an important basis for discussing and further elaborating on climate and energy targets and measures for 2030 and beyond. Member states should seize this opportunity to go beyond the bare minimum needed to reach the current 2030 targets and considerably increase the ambition of their plans, both in terms of targets and policies, in order to allow the EU to stick to its commitment under the Paris Agreement to limit temperature rise to 1.5°C. This will prepare the ground for the swifter implementation of the increased level of ambition of the 2030 energy targets that will come to match the scale of climate action needed, also underpinned by the updating of all relevant climate and energy legislation.

Currently, the legislation states that the European Commission is to submit a legislative proposal by 2023 to revise the energy targets in the event that it is needed to meet the Union's international commitments for decarbonisation. However, this proposal should come much faster

considering the urgent action needed. The EU long-term budget, currently under negotiation, should support member states in achieving higher ambition. To that end, member states need to show the political will and take the decision to put EU funds where they can catalyse the transition.

At the same time, Europe will need to act on its commitments to phase out fossil fuel subsidies. Member states will have to come up with plans for how they will implement this at the national level, while the Commission will have to make proposals for the reform of all fiscal policies to be aligned with the Paris Agreement goals. Currently the fossil fuel industry benefits from unfair tax breaks and other subsidies that are in conflict with the achievement of climate objectives.

Finally, investing in new fossil fuel infrastructure risks creating lock-in effects and stranded infrastructure assets. Investments in maintaining existing fossil fuel infrastructure also bar the way to a system switch towards energy savings and renewable energy sources. The EU's energy infrastructure planning and financing must become Paris-compatible, thereby

ensuring that this sector adequately contributes to the overall ambition to have a 100 per cent renewables-based energy system and achieve net-zero greenhouse gas emissions by 2040.

When unveiling the structure of the next European Commission, Ursula von der Leyen put climate policy up front as a top priority. There is little time left for the EU to fulfil its commitments made in the Paris Agreement. So it is high time for the EU to act and to take the lead on climate change. Increasing climate ambition will be the first and most important step of the next European Commission.

Veerle Dossche Theodora Petroula Wendel Trio

(Veerle Dossche and Theodora Petroula are energy policy experts and Wendel Trio is director of Climate Action Network Europe)

<sup>1</sup> Special Eurobarometer 490 on Climate Change (publication date September 2019) with member-state-specific factsheets and Special Eurobarometer 492 on Energy (publication date September 2019) with member-state-specific factsheets.

ACID NEWS NO.3, OCTOBER 2019



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## Bulgaria & Spain face EU Court over air pollution

On 25 July, the European Commission sent Bulgaria and Spain to court for repeatedly breaching EU air quality standards and failing to guarantee citizens' right to clean air.

For Bulgaria, the Commission noted "persisting non-compliance" with hourly and daily limit values for sulphur dioxide ( $SO_2$ ), in the south-east zone, where the four largest coal-fired power plants in Bulgaria are located. In 2017, Bulgaria was referred to the court over poor air quality for breaching limit values for particulate matter ( $PM_{10}$ ).

In the case of Spain, there have been systematic breaches of nitrogen dioxide (NO<sub>2</sub>) limits. The decision to refer Spain to the court concerns the urban areas of Madrid, Barcelona and Vallès-Baix Llobregat, where the legal limits for NO<sub>2</sub> have been persistently breached.

Source: EEB and Commission press releases, 25 July 2019.

## Thousands of childhood asthma cases preventable by tackling air pollution

If the 18 countries covered by a recent study were to meet the World Health Organization (WHO) guideline for PM<sub>2.5</sub>, 67,000 new cases of childhood asthma, accounting for 11 per cent of new diagnoses, could be prevented every year.

Even greater effects were found when the scientists set air pollution levels to the lowest ever values reported in studies – a sort of "background level", which were recorded in Germany for  $PM_{2.5}$  and in Norway for  $NO_2$ . The estimates suggest a third of new childhood asthma cases – around 190,000 a year – would be prevented if  $PM_{2.5}$  fell to such levels

across the 18 countries, and 23 per cent of cases would be prevented if NO<sub>2</sub> was reduced to its lowest recorded levels.

The current WHO guideline for PM<sub>2.5</sub>, which was adopted in 2007, is set at 10  $\mu$ g/m³ as an annual mean, whereas the EU's limit value is set much higher, at 25  $\mu$ g/m³.

The 18 European countries covered in the study are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the UK.

Sources: Air Quality News and the Guardian, 8 August 2019.



### **Amended Gothenburg Protocol now in force**

The amended Gothenburg Protocol under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) came into force on 7 October, after the eighteenth ratification, by Luxem-

bourg in July. All in all, there are now nineteen parties to the protocol: Bulgaria, Canada, Croatia, Cyprus, Czech Republic, European Union, Finland, Germany, Latvia, Luxembourg, Netherlands, Portugal, Romania, Slovakia, Spain,

Sweden, Switzerland, United Kingdom, and the United States of America.

The original protocol dates back to 1999. After an update and revision, an amended protocol was signed

in Gothenburg, Sweden, in 2012, and it sets binding country-by-country emission reduction commitments for five air pollutants – sulphur dioxide, nitrogen oxides, volatile organic compounds,

ammonia and fine particulate matter – to be achieved by 2020.

The entry-into-force opens the way for a review and possible revision of the protocol – an issue that will be debated at the next meeting of the Convention's Executive Body on 9–13 December in Geneva. On 11–12 December, the meeting will also hold a special session to celebrate the Convention's 40-year anniversary.

Further information: http://www.unece.org/env/ Irtap/welcome.html.html

The protocol enters into force just as the LRTAP convention celebrates its 40-year anniversary.

### **Climate impact from seafood**

Pelagic species such as sprat, herring and mackerel are preferable choices from a nutritional and climate perspective, according to a recent Swedish study. The researchers ranked 37 types of seafood that are commonly consumed in Sweden by their climate impact and nutritional value. At the other end, with low nutrient density and high climate impact, were northern prawn, pangasius and plaice.

The wide variability in production methods among seafood was reflected in the greenhouse gas emissions. Small pelagic species such as herring and mackerel were among the top performers. Crustaceans, flatfish, scallops and oysters had the highest climate impact, due to a combination of resource-intensive production technologies and/or low edible yield.

Most seafoods scored higher in the combined nutrient-climate metric than land-based meat, such as pork, beef and chicken.

The authors stress that this type of evaluation should be combined with other sustainability criteria such as stock exploitation, eutrophication, biological risks, spread of antimicrobial resistance etc.





## RWE to close coal-fired power plant in Wales

The German energy company RWE has announced the closure of its 1.56 gigawatt Aberthaw B power plant in Wales, UK, due to challenging market conditions for coal-fired power capacity in Britain. Under the plans, the plant will close on 31 March 2020, nearly 50 years after it started operations, leaving just four remaining coal-fired plants in the UK.

Source: Reuters, 1 August 2019

### MENA region one of the most threatened by climate heating

Droughts, sandstorms and flash flooding: In the southern Moroccan oasis M'Hamid El Ghizlane, the effects that global warming is likely to have on the Mediterranean region can already be observed today. People are experiencing the consequences of climate change across the Middle East and North Africa (MENA region), from floods in Jeddah to rising sea levels in the Mediterranean that are putting many coastal cities at risk, says the World Economic Forum on the Middle East and North Africa. Alexandria, on the Mediterranean coast of Egypt, has the opposite problem. As sea levels rise, the city of five million people is sinking. High water levels are flooding the basements of buildings near Alexandria's waterfront.

The World Bank declared in 2016 that the MENA region is among the most vulnerable places on earth to rising sea levels. Forecasting a 0.5-metre rise by 2099, its report warned that "low-lying coastal areas in Tunisia, Qatar, Libya, UAE, Kuwait and particularly Egypt are at particular risk".

Temperature records have been repeatedly broken in the MENA region in recent years. The highest recorded temperature in the region to date was 54°C at Mitribah,

Kuwait in 2016. In the same week, Basra in Iraq recorded 53.9°C. In June 2017, Sweihan, Abu Dhabi reached a record high of 50.4°C.

The region has been subject to an almost continuous drought since 1998, according to NASA, which says the current dry period is the worst for 900 years. The World Bank, which is spending \$1.5 billion to fight climate change in the region, estimates that 80–100 million people will be exposed to water stress by 2025.

By 2050, temperatures in the MENA region will be 4°C higher, according to Germany's Max Planck Institute. By the end of the century, daytime highs could reach 50°C, with 200 days of exceptional heat every year. And without urgent action to curb global emissions, according to research, cities in the region may become uninhabitable before 2100.

Over two million Muslim travellers attend the annual religious pilgrimage to Mecca, Saudi Arabia, travelling during some of the country's hottest weather. A new study projecting future summer temperatures in the region around Mecca finds that as early as 2020, summer days in Saudi Arabia could surpass the United States National Weather Service's extreme

danger heat-stress threshold, at a wetbulb temperature of 29.1°C (84.3 degrees Fahrenheit). Wet-bulb temperature is a measurement combining temperature with the amount of moisture in the air. At the extreme danger threshold defined by the National Weather Service, sweat no longer evaporates efficiently, so the human body cannot cool itself and overheats. Exposure to these conditions for long periods of time, such as during Hajj, could cause heat stroke and possibly death. Their projections estimate heat and humidity levels during Hajj will exceed the extreme danger threshold six percent of the time by 2020, 20 percent of the time from 2045 and 2053, and 42 percent of the time between 2079 and 2086.

Saudi Arabia is also facing some of the worst risks from soaring temperatures. This summer, the temperature in Al Majmaah, a city in central Saudi Arabia, reached 55°C (131 degrees Fahrenheit), while rapid desertification was reported throughout the Arabian peninsula.

Compiled by Reinhold Pape

Sources:

https://www.spiegel.de/international/world/a-moroccan-oasis-struggles-with-climate-change-a-1271836.html

https://www.sciencedaily.com/releas-es/2019/08/190822103834.htm

https://www.weforum.org/agenda/2019/04/middle-east-front-lines-climate-change-mena/

Climbing Mount Arafat as part of the Muslim pilgrimage will be more challenging in a warmer future.

## EU law instrumental for cleaning up power plants

The EU Large Combustion Plants Directive was the main driver behind the significant air pollutant emission cuts in this sector from 2004 to 2015, according to a new EEA report.

In response primarily to the problems of transboundary air pollution – with impacts such as widespread forest dieback and freshwater acidification – the first EU regulation aimed at controlling air pollutant emissions from this sector, namely the Large Combustion Plant Directive (LCPD), was adopted in 1988.

LCPs are plants with an installed capacity greater than 50 megawatts of thermal energy (MWth) that generate heat and/or electricity.

With more than 3400 LCPs in operation in the EU in 2015, they are a common feature in the electricity and heat supply sectors,

in oil refineries, in chemical industries and in iron and steel production, etc.

In the 1990s, increasing attention was turned to the significant health damage caused by air pollutants, which triggered several new initiatives to bring down emissions, including the adoption of a revised and strengthened LCPD in 2001.

As of 1 January 2016, the LCPD has been fully repealed by the 2010 Industrial Emissions Directive, which integrates within a single regulation elements of the 2001 LCPD and the 2008 Integrated Pollution Prevention and Control Directive (IPPCD).

The new study by the European Environment Agency (EEA) covers emissions of sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NOx) and dust from large combustion plants in all EU member states (EU28) between 2004 and 2015.

It was found that during this time period, emissions from large combustion plants of SO<sub>2</sub> decreased by 81 per cent, those of NOx by 49 per cent, and dust by 77 per cent, and that the LCPD accounted for most of these emission reductions.

In response to more stringent industrial emissions legislation, especially the LCPD and the IPPCD, as well as broader policies and measures adopted in the context of the National Emission Ceilings Directive, LCPs have been equipped with abatement technologies to lower their emissions of air pollutants.

Moreover, old,

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or less efficient, plants may be shut down. As a result of these factors, the mass of air pollutants emitted per unit of fuel burned by LCPs – i.e. the specific emission factors – will change.

The EEA assessment shows that the LCPD has played an important role in harmonising the sector's environmental performance across the EU. In 2004, emission factors varied strikingly among EU countries, but the analysis shows that member states with the highest emission factors in 2004 improved their environmental performance most, leading to much smaller differences between countries in 2015.

It was also shown that the LCP emission factors decreased significantly between 2004 and 2015 for all air pollutants, and especially between 2007 and 2008, when existing LCPs had to become compliant with the stricter emission limit values set under the LCPD.

A comparison was carried out to illustrate the benefits of implementing the LCPD in relation to a hypothetical "no-progress" scenario. Another scenario estimated how much more substantial the benefits could have been if a stricter implementation of the two legal instruments – the LCPD and the IPPCD – had been achieved in practice. The latter used emissions corresponding to the so-called lower BAT-AELs in the 2006 reference document on best available techniques (BREF) for LCPs.

If all LCPs in the EU had operated exactly in accordance with the lower BAT-AELs, total LCP emissions would have fallen more significantly by 2015 than they actually did, by 98 per cent for SO<sub>2</sub>, 82 per cent for NOx, and 93 per cent for dust. In contrast, had the environmental performance (the implied emission factors) of plants not improved

over the period, LCP emissions across the EU would have decreased by only 27 per cent for SO<sub>2</sub>, 29 per cent for NOx, and 41 per cent for dust.

Within the time period investigated, two main phases could be identified: 2004–2007 and 2008–2015. During the first period (2004–2007), the effects of the LCPD were predominant over those of other related policies. In this first period, the LCPD affected air pollutant emissions in two key ways: 1) Through the installation of abatement technologies so that plants could comply with the LCPD emission limit values by 2008; and 2) Through the closure of inefficient LCPs that were unable to meet the LCPD emission limit values.

In the second period (2008–2015), the LCPD increasingly overlapped with a number of climate and energy policies, such as the Emission Trading System (ETS), the Renewable Energy Directive (RED) and the Energy Efficiency Directive (EED).

The EEA concludes that: "The emission reductions in large combustion plants provide a clear success story to build upon and many elements of the policy can be useful to implement the new rules and design regulation in other sectors. At the same time, the report notes aspects of the directive that could have been even more ambitious. This knowledge is valuable for the energy sector to meet its current targets for decarbonisation and cutting pollutant emissions."

Christer Ågren

The report: "Assessing the effectiveness of EU policy on large combustion plants in reducing air pollutant emissions." EEA Report No 07/2019. Link: https://www.eea.europa.eu/publications/effectiveness-of-eu-policy-on/

### Russia formally joins Paris climate agreement

The world's fourth largest emitter, Russia, has formally adopted the Paris Agreement.

"The Russian Federation has accepted the Paris Agreement and is becoming a full-fledged participant of this international instrument," Ruslan Edelgeriev, the president's climate advisor, told the United Nations Climate Action Summit in New York. Observers of the country's climate policy welcomed the decision.

"It's a really important signal for Russian society, for regional governors, for business, for NGOs, that Russia is onboard with global efforts," commented Alexey Kokorin, WWF Russia climate programme director. "That Russia recognises the importance of the climate problem, and that Russia does not oppose the anthropogenic impact of climate change, which is already really important."

"The adoption of the Paris Agreement increases the chances of preventing a global climate catastrophe, but this chance must be utilised correctly and, most importantly, taken quickly – there is no time left for compromises and at-



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Four years after the creatation of the Paris agreement, Russia is onboard.

tempts to maintain the status quo of a fossil power," said Greenpeace climate officer Vasily Yablokov. "Russia's actions in this matter are of great importance: our country has enormous potential to reduce greenhouse emissions."

Source: Climate Change News 29 September 2019, https://www.climatechangenews.com/2019/09/23/ russia-formally-joins-paris-climate-agreement/

## Action needed to cut PM from tyres and brakes

A recent report from the UK Air Quality Expert Group (AQEG) warns about the increasing importance of non-exhaust emissions (NEE) from road traffic. NEE refers to tiny particles released into the air from brake wear, tyre wear, road surface wear and resuspension of road dust when vehicles are driving on roads. No legislation is currently in place to specifically limit or reduce these particles.

It is estimated that NEE particles currently constitute 60 and 73 per cent (by mass), respectively, of primary PM<sub>2.5</sub> and PM<sub>10</sub> emissions from road transport in the UK (7.4 and 8.5 per cent of all UK primary PM<sub>2.5</sub> and PM<sub>10</sub> emissions), and will become more dominant in the future. Achieving further improvements in PM<sub>2.5</sub> and PM<sub>10</sub> air quality in relation to road transport

No legislation is currently in place to specifically limit or reduce particles from tyres.

sources will also require reductions in non-exhaust emissions, rather than simply focussing on lowering exhaust emissions, said the AQEG.

The report "Non-exhaust emissions from road traffic" published by Defra, 11 July 2019.

Link: https://uk-air.defra.gov.uk/library/reports?report\_id=992





**In July, the** World Resource Institute published the report "Creating a Sustainable Food Future", in which it takes a broad look at how we can sustainably feed nearly ten billion people on Earth by 2050. The report recognizes three "gaps" that must be closed by 2050 to achieve this:

- A 56-percent "food gap" between what was produced in 2010 and the food that will be needed in 2050;
- A nearly 600-million-hectare "land gap" (an area nearly twice the size of India) between global agricultural land area in 2010 and expected agricultural expansion by 2050; and
- An 11-gigaton "greenhouse gas mitigation gap" between expected emissions from agriculture in 2050 and the level needed to meet the Paris Agreement.

These targets assume a baseline from which crop productivity continues to grow at the same rate as during the period 1961–2010. With no production gains after 2010 the agricultural area would expand by 3.2 billion hectares, which according to the report would mean the elimination of "the majority of the world's remaining forests and woody savannas".

The bridge to a sustainable food system is presented in the form of 22 "menu items".

They cover diverse areas of action ranging from reduced food waste, dietary shifts, limited fertility rates, increased carbon sequestration, further improvements in productivity and new technologies that inhibit enteric fermentation. The potential of each menu item is assessed quantitatively and based on what would be required in the form of institutional coordination and technical breakthroughs.

Only the most ambitious scenario (see figure) will be enough to hold global warming below 1.5°C, that includes the full implementation of all items on the list, plus reforesting more than 585 million hectares (an area greater than the European Union) made available by these demand- and supply-side efficiency gains.

"Millions of farmers, companies, consumers and every government on the planet will have to make changes to meet the global food challenge. At every level, the food system must be linked to climate strategies as well as ecosystem protection and economic prosperity," said Andrew Steer, President and CEO of the World Resources Institute.

Historical productivity gains have been achieved through the introduction of artificial fertilizers, pesticides and irrigation, e.g. the green revolution in Asia in the 1960s. To do this everywhere is no longer possible or consistent with environmental goals. The authors instead believe that "advances in molecular biology and related breeding technologies offer great potential for boosting productivity above trend lines". They also stress the need to improve the productivity of pastureland: "every hectare of global pasture that is capable of and appropriate for sustainable intensification must be fully exploited to realize its potential to increase milk or meat output several times over".

On the demand side, dietary shift is the menu item with most effect on greenhouse gas emissions. Reducing the consumption of ruminant meat by 30 percent globally, compared to the 2050 baseline, would reduce emissions by more than 5 Gt. Targeting ruminant meat is also considered to be effective as "relatively few people eat large quantities of ruminant meat, there are highly attractive alternatives to ruminant meat, and people in the United States and Europe have already reduced per capita beef consumption by one-third from peak levels in the 1970s".

Action to reduce food loss and waste is also important to curb demand, though

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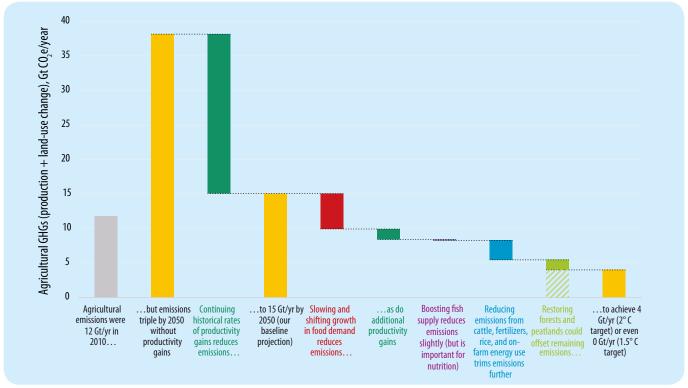


Figure. The emissions mitigation gap can be bridged by the most ambitious scenario.

Note: "Restore forests and peatlands" item includes full reforestation of at least 80 million hectares of liberated agricultural land, in order to reach the 4 Gt CO<sub>2</sub>e/year target by 2050 for limiting global temperature rise to 2°C. As an even more ambitious option, in order to limit warming to 1.5°C, full reforestation of at least 585 million hectares of liberated agricultural land could offset global agricultural production emissions for many years.

challenging. There are not many successful examples that have achieved reductions on a larger scale to learn from. The report explains a dilemma "as countries' economies develop, waste near the consumption side of the food supply chain tends to grow even as food loss near the production side decreases". The share of food that is lost or wasted tends to stay the same although the sources of the loss and waste shift downstream.

**Limiting population growth** is another key to limit demand on agricultural products. The aim is to achieve replacement level fertility rates globally - typically around 2.1 children per woman. North America and Europe are already below replacement level. Asia, Latin America, and Oceania are just above. North Africa's fertility rate is expected to drop to 2.4 children per woman by 2050. The exception is sub-Saharan Africa, where fertility rates are expected to drop from 5.1 to around 3.2 children per woman by 2050, in other words well over replacement level. The authors of the report believe that with targeted and coordinated efforts in the region, such as increased educational opportunities for girls, increased access to reproductive health services, and reduced infant and child mortality, it would be

possible to reach replacement levels by 2050. Especially since this has been done in other regions over a similar time period.

Productivity gains and reduced demand that will limit agricultural expansion must also be accompanied by the protection of forests, savannas and wetlands. Restoring peatlands is identified as an especially promising mitigation opportunity since "emissions of more than 1 Gt CO<sub>2</sub>e per year result from only 26 million ha, half of which has limited agricultural use". To reduce agricultural emissions to 4 Gt by 2050, which is in accordance with achieving the Paris agreement, reforestation of at least 80 million ha would be necessary. Though, as mentioned previously, to limit global warming to below 1.5°C a further 505 million ha would need to be reforested.

The report also includes technical measures to reduce greenhouse gas emissions from farming. Recent progress in feed additives suggests the potential for 30 per cent reductions in methane emissions from cattle. At present this does however require that cattle that can be fed additives daily, excluding most grazing cattle. For rice cultivation there are alternative management practices and new strains that reduce methane emissions from the sector by 10 per cent. A combination of better general nitrogen management,

technologies such as nitrogen inhibitors and crop breeding to enhance nitrogen use efficiency, could possibly increase global nitrogen use efficiency by 67 per cent. This would lead to reduced nitrous oxide emissions and lowered demand for artificial nitrogen fertilizers. The most ambitious scenario includes technologies that have not yet been developed, but where the authors have assessed that breakthroughs would be possible if the right types of investments are made.

Despite the challenges the report paints, Achim Steiner, Administrator of UN Development Programme, holds on to an optimistic perspective "It's possible to produce more food on the same amount of agricultural land as today, protect ecosystems, and do this in a manner that ensures farmers and others can prosper. Creating a sustainable food future won't be easy – but it can be done."

Kajsa Pira

"Creating a Sustainable Food Future", published by the World Resource Institute in July 2019, https://wrr-food.wri.org/sites/default/files/2019-07/ WRR\_Food\_Full\_Report\_0.pdf

Press release 16 July 2019, https://www.wri.org/ news/2019/07/release-new-research-outlines-5-course-menu-solutions-achieve-sustainablefood-future

## Prompt climate action needed to ensure food supplies

IPCC report says that climate change increases pressure on land, meanwhile land use causes almost a quarter of global greenhouse gas emissions.

**On 8 August** the Intergovernmental Panel on Climate Change (IPCC) published a special report on Climate Change and Land. The report is summarised by three basic statements:

- Land is under growing human pressure
- Land is a part of the solution
- But land can't do it all

"Agriculture, forestry and other types of land use account for 23% of human greenhouse gas emissions. At the same time natural land processes absorb carbon dioxide equivalent to almost a third of carbon dioxide emissions from fossil fuels and industry," said Jim Skea, Co-Chair of IPCC Working Group III. When emissions from pre- and post-production are included, the global food system alone is estimated to cause 21–37 per cent of global emissions.

To say that land is important for human livelihoods is an understatement. Between a quarter and one third of all ice-free land

is used for primary production of food, feed, fibre, timber and energy. And more than 70 per cent of the global, ice-free land surface is directly affected by human activities that include infrastructure (1%), cropland (12%), pastures (37%), plantations and managed forests (22%).

Climate change aggravates the situation. Surface-temperatures over land have increased by almost double (1.53°C) the global average temperature rise (0.87°C). There has been an increase in weather events such as heatwaves, droughts and heavy rainfall. In some regions, including Sub-Saharan Africa, parts of East and Central Asia, and Australia there has been an increase in desertification. Droughts, heavy rainfall, permafrost thaw and sea level rise also exacerbate land degradation. Climate change is already affecting food security in drylands, particularly those in Africa, and high mountain regions of Asia and South America.

"The choices we make about sustainable land management can help reduce and in some cases reverse these adverse impacts," said Kiyoto Tanabe, Co-Chair of the Task Force on National Greenhouse Gas Inventories.

When exploring possible futures, the IPCC use different Shared Socioeconomic Pathways (SSPs) in which population growth, consumption levels, equality, technological advancement and global trade regimes vary.

In all projected greenhouse gas scenarios, impact on land is expected to increase, though there will be a lot of variation between regions. Not only will the different SSPs will result in different levels of greenhouse gas emissions, but the capacity to adapt to a changing climate will also vary. When comparing the pathway named SSP1—"a world with low population growth, high income and reduced inequalities, food produced

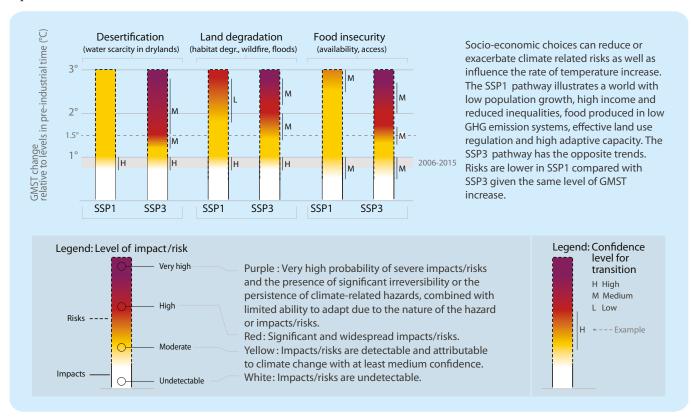


Figure. Different socioeconomic pathways affect levels of climate-related risks.



Sustainable food production, soil organic carbon management, ecosystem conservation and land restoration were identified as land-related actions that will contribute to both climate mitigation and adaption.

in low GHG emission systems, effective land use regulation and high adaptive capacity" – with pathway SSP3, which represents the opposite trends, the impact on desertification, land degradation and food security will remain less under SSP1, even at higher temperatures (figure). In short, pathways that reduce demand for food, feed and water in combination with improvements in technology will result in less water scarcity, land degradation and food insecurity.

Many of the possible land-related actions that contribute to mitigation and adaptation have multiple benefits in other areas, such as combating desertification and land degradation, and enhancing food security. Actions the IPCC have identified to deliver across all these areas include: sustainable food production, improved and sustainable forest management, soil organic carbon management, ecosystem conservation and land restoration, reduced deforestation and degradation, and reduced food loss and waste. The benefits of sustainable food choices are also highlighted in the report. "Balanced diets featuring plant-based foods, such as

coarse grains, legumes, fruits and vegetables, and animal-sourced food produced sustainably in low greenhouse gas emission systems, present major opportunities for adaptation to and limiting climate change," said Debra Roberts, Co-Chair of IPCC Working Group II.

The IPCC distinguish between actions that do not increase or even decrease competition for land and actions that will intensify land demand. The latter group include afforestation, reforestation and the use of land to provide feedstock for bioenergy. If these types of land-dependent actions are carried out on a wide scale there is a risk for increased desertification and land degradation as well as a threat to food security.

On the other hand, if actions are taken that reduce demand on land at an early stage, such as increased productivity, improved land management, dietary changes and reduced food waste, there will be more space – literally, to grow bio-energy crops without risking food security.

"Policies that support sustainable land management, ensure the supply of food for vulnerable populations, and keep carbon in the ground while reducing greenhouse gas emissions are important," said Eduardo Calvo, Co-Chair of the Task Force on National Greenhouse Gas Inventories.

Finally, the report stresses the importance of acting now instead of later across all sectors, not only land: "Delaying climate mitigation and adaptation responses across sectors would lead to increasingly negative impacts on land and reduce the prospect of sustainable development".

The publication of the report is timely, as it arrives just before the Conference of the Parties of the UN Convention to Combat Desertification (COP14) in New Delhi, India, in September, and the UN Framework Convention on Climate Change Conference (COP25) in Santiago, Chile, in December.

Kajsa Pira

IPCC Press release 8 August 2019 https://www.ipcc.ch/2019/08/08/land-is-a-critical-resource\_srccl/

IPCC Special Report on Climate Change and Land https://www.ipcc.ch/report/srccl/

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## **Environmental impacts of ship scrubbers**

Untreated wash water from open-loop scrubbers contains heavy metals, aromatic hydrocarbons and soot particles, and scientific tests have shown harmful effects on marine organisms.

**The use of** exhaust gas cleaning systems, also known as scrubbers, on ships as an alternative to switching to cleaner low-sulphur fuel, has been a hotly debated issue since the stricter global ship fuel sulphur regulations were adopted by the International Maritime Organization (IMO) more than ten years ago.

Since 2015, all ships travelling in designated Sulphur Emission Control Areas (SECA) have to comply with a fuel sulphur limit of 0.10 per cent. The SECAs cover two northern European sea areas, the North Sea and the Baltic Sea, as well as the coastal waters (out to 200 nautical miles) of the United States and Canada.

As from 1 January 2020, the global sulphur limit will be reduced from 3.5 per cent to 0.50 per cent, and will apply to all ships in international trade.

Ship operators have different options available to achieve these sulphur limits. The most straightforward option is to switch to using a compliant lower-sulphur fuel oil, i.e. with a sulphur content less than the mandatory limit values. A second option is to switch to using an alternative low- or zero-sulphur fuel, such as liquefied natural gas (LNG), liquefied biogas (LBG) or methanol. And the third is to equip the ship with an exhaust gas cleaning system that reduces the emissions of sulphur dioxide (SO<sub>2</sub>) to levels that are lower than those resulting from using compliant fuels. Under this last option, ships are allowed to continue to burn residual high-sulphur heavy fuel oil (HFO).

There are primarily two types of scrubbers – open-loop and closed-loop, but there are also hybrid scrubbers that can switch between the open and closed modes. Open-loop scrubbers in particular have been subject to debate, as they use seawater as the "cleansing agent" and produce large amounts of wash water which is discharged into the sea, usually without any treatment. The closed system recirculates the scrubbing water and discharges a lesser volume after treatment.

It is expected that by the end of 2019 nearly 3000 ships will be equipped with scrubber systems, and the vast majority of these (around 80 per cent) are openloop scrubbers.

In an EU-funded study published this summer, researchers at the IVL Swedish Environmental Research Institute have analysed the environmental effects of both open and closed scrubbing systems.

In ecotoxicological tests, a number of marine organisms were exposed to varying concentrations of scrubbing water. The tests revealed negative effects on vital functions

Left: Most impacted were the copepods – a group of zooplankton that play a vital role in the food chain.

Below: In heavily trafficked waterways as well as in ports and estuaries environmental risks increase exponentially.





New ships built for UK waters should be able to sail without emitting GHGs.

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in several organisms. Most impacted were the copepods – a group of zooplankton that play a vital role in the food chain. Even low concentrations of untreated water from open-loop scrubber systems as well as treated scrubber water from closed-loop systems resulted in adverse effects on these organisms.

Wash water from both scrubber systems was found to be heavily contaminated with heavy metals, aromatic hydrocarbons and soot particles. Since the open systems discharge significantly higher volumes than the closed system, the discharges from open scrubbers all in all pose a greater risk to the marine environment than those from closed systems, according to the report. Also, the water from the closed system is treated before discharge and residues that are separated are taken ashore for disposal.

The researchers point out that individual ship passages do not impact the marine environment to any great extent, but in heavily trafficked waterways as well as in ports and estuaries environmental risks increase exponentially.

"Several of these pollutants break down relatively quickly but are at the same time acutely toxic. When the marine environment is continuously exposed to scrubbing water from vessels, this acute toxicity becomes permanent. In my opinion scrubbing is a real threat to biodiversity," says Kerstin Magnusson, marine ecotoxicologist at IVL and one of the authors of the report.

"If we permit the discharge of scrubbed exhaust gases into the sea, we expose marine ecosystems to yet another source of pollution, in addition to all those they are already subject to. That conflicts with the UN global environmental goals, which require us to prevent or at least significantly reduce all kinds of pollution in the sea by 2025," she continued.

"The new sulphur legislation is important as it reduces the impact of shipping on air quality, but unfortunately it ignores the consequences for the marine environment. If vessels continue to run on dirty bunker oil, the pollutants will instead end up in the sea where they will adversely impact the

marine ecosystem," said Hulda Winnes, project manager and researcher at IVL.

The study consists of several parts, including cost-benefit and life-cycle analyses. From an environmental risk perspective, it was concluded that: "The use of a low-sulphur fuel oil as marine fuel is favourable compared to the use of heavy fuel oil in combination with an exhaust gas scrubber. This statement is valid for closed-loop scrubbers and open-loop scrubbers and mainly based on the studies performed on eco-toxicity of effluent water."

When analysing external costs of the different options it was concluded that: "The low-sulphur fuel option is less costly than the two scrubber options. The use of scrubbers on the vessels increased health and environmental costs from emissions compared to the case when they used low-sulphur fuel oil."

"Creating new environmental problems in this way, by giving a green light to scrubbing technology is wrong from a sustainability perspective. All we do when we fit exhaust gas systems, especially open-loop scrubbers, is move pollutants somewhere else," said Hulda Winnes.

#### Christer Ågren

Source: IVL reports and press release, 1 July 2019. Link: https://www.ivl.se/english/startpage/top-menu/pressroom/press-releases/press-releases---arkiv/2019-07-01-study-shows-the-environmental-effects-of-scrubbing-systems.html

Note: Several countries and/or ports have already either banned or flagged an upcoming ban on open-loop scrubbers, including California, Belgium (all ports), Germany (canals, rivers and ports located by rivers), Ireland (Dublin), Norway (five protected fjords), China (ports in ECAs), Singapore and Fujairah. Website with list of scrubber bans (North P&I): http://www.nepia.com/insights/industry-news/no-scrubs-more-ports-declare-banon-egcs-discharges-starupdatestar/

#### UK aims for zeroemission ships by 2025

By 2050, the UK shipping sector must be emission-free, and starting 2025, new ships built for UK waters should be able to sail without emitting any greenhouse gases, according to the Clean Maritime Plan from the British government, published on 11 July. The plan is also exploring the possibilities of subsidizing the transition toward a zero-emission shipping sector.

Link to the plan: https://www.gov.uk/government/publications/clean-maritime-plan-maritime-2050-environment-route-map

## Call for moratorium on ship scrubbers

In May, ten international non-govern-

mental organisations sent a letter to the IMO Secretary General Kitack Lim, calling for an immediate moratorium on the shipping industry's use of scrubber technology as an alternative compliance mechanism for current SOx Emissions Control Areas and the looming 2020 global fuel sulphur standards.



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In a letter to Secretary General Kitack Lim, ten NGOs urge IMO to impose a moratorium for scrubbers.

This follows the publication of alarming evidence in a US federal felony criminal case against Carnival Corporation that demonstrated how Exhaust Gas Cleaning Systems (EGCS) systems failed multiple times, leading to significant air and water pollution violations.

The letter was signed by Stand.earth, Pacific Environment, Transport & Environment, Seas at Risk, Ecodes, Circumpolar Conservation Union, NABU, Friends of the Earth US, Environmental Investigation Agency, and WWF Canada.

Source: https://www.stand.earth/latest/markets-vs-climate/carnivals-cruise-pollution/imo-scrubber

## Ship emissions debate continues

While slightly stricter energy efficiency targets for certain types of ships were agreed by the IMO in May, there was still no progress on introducing effective short-term measures to cut ships' carbon emissions.

In May, the Environment Protection Committee (MEPC) of the International Maritime Organization (IMO) spent most of two weeks of talks on considering what measures the global shipping sector should take to reduce its climate impact. The meeting was supposed to start delivering on last year's commitment to decarbonise the shipping sector (see AN 2/18, p. 14), but failed to make any significant progress.

Governments meeting at the IMO headquarters in London were expected to negotiate and agree a set of immediate measures to reduce emissions before 2023, but as discussions went on, it soon became clear that decisions on such measures will not happen until the next MEPC in April 2020, at the earliest. The 2018 IMO initial greenhouse gas (GHG) strategy refers to a range of candidate short-, mid- and long-term measures: Short-term measures could be finalised and agreed between 2018 and 2023; midterm measures, between 2023 and 2030; and long-term measures, beyond 2030.

One of the most important measures being considered to immediately reduce ships' GHG emissions is speed reduction – either as a standalone measure or as an element of a measure that sets a target for improving ship efficiency. It has been shown that speed reduction could meet the needed short-term carbon intensity goal as well as delivering fuel savings for industry (see AN 3/17, p. 16). While resisted by some Latin American countries and certain sections of industry, speed reduction was explicitly supported by some EU countries (e.g. France and Greece) and

still remains on the IMO agenda.

The general enthusiasm for cutting greenhouse gas emissions from shipping.

Bill Hemmings, shipping director at Transport & Environment, said: "Shipping is the only sector not subject to binding climate regulation and its remaining climate budget is fast being used up. Speed regulation is the most effective measure on the table, fortunately it will go forward for discussion at the next session. We have no time to lose, IMO procrastination must stop."

The meeting did agree to strengthen the phase 3 requirements of the Energy Efficiency Design Index (EEDI), e.g. by bringing forward the entry into effect date from 2025 to 2022 for certain ship types including gas carriers, general cargo ships and LNG carriers.

Terms of reference for the Fourth IMO GHG Study were also agreed (the third such study was published in 2014). A final report should be submitted to MEPC 76, to be held in autumn 2020, and will include among other things:

- An inventory of global emissions of GHGs and relevant substances (including black carbon) emitted from ships engaged in international voyages from 2012 to 2018.
- Estimates of carbon intensity (i.e. the world fleet's CO<sub>2</sub> emissions per transport work) from 2012 to 2018 and for the base year 2008.
- Scenarios for future international shipping emissions 2018–2050.

Some practicalities around the 2020 global 0.5 per cent limit on sulphur in fuel oil for ships were also discussed. Failure to comply with this regulation should result in fines or vessels being detained, and the actual

enforcement is supposed to be policed by flag states and port states. In October 2018, the sulphur rule was complemented by an amendment that prohibits the carriage of non-compliant fuel oil for combustion purposes for propulsion or operation on board a ship – unless that ship has an exhaust gas cleaning system ("scrubber") fitted. The use of scrubbers is accepted by the IMO as an alternative means to meet the sulphur limit requirement, and ships using scrubbers are allowed to burn fuel oil with up to 3.5 per cent sulphur (see AN 1/18, p.3).

But the use of scrubbers is not without controversy. In February, EU countries submitted a document to the IMO, expressing concerns that the potential toxicity of scrubber discharges could end up polluting the sea and impacting marine flora and fauna. And in May, ten environmental groups called on the IMO to impose an immediate moratorium on the use of scrubbers. They referred to the publication of alarming evidence in a US federal felony criminal case against Carnival Corporation that demonstrated how scrubber systems failed multiple times, leading to significant air and water pollution violations.

The MEPC meets next time on 30 March – 3 April 2020, and meetings of the Intersessional Working Group on Reduction of GHG emissions from ships are scheduled to be held on 11–15 November 2019 and 23–27 March 2020.

Christer Ågren

IMO meeting briefing, 20 May 2019: http://www.

imo.org/en/MediaCentre/ PressBriefings/Pages/11-MEPC-74-GHG.aspx

T&E press release, 17 May 2019: https://www.trans-portenvironment.org

NGO letter to IMO on a scrubber moratorium, 14 May 2019: https://www.stand. earth/sites/default/files/ Letter.to\_.Secretary\_General\_Scrubbers.pdf



CID NEWS NO. 3, OCTOBER 2019

### **REMPEC** considering a **Mediterranean ECA**

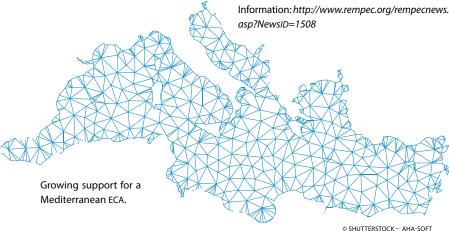
On 11-13 June, the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) met in Malta, to address negative effects on human health and ecosystems of maritime activities. The participants - representing among others 19 Mediterranean coastal states and the EU - were generally supportive of the goal to designate the Mediterranean Sea as a SOx Emission Control Area (ECA).

Linked to this topic, the meeting discussed the need for those countries

that have not yet ratified MARPOL Annex VI to do so; how to ensure the availability of low-sulphur fuels; the need for fair competition between all the ports in the Mediterranean Sea; and the potential economic impact in some areas heavily depending on maritime traffic.

In addition, at a meeting in Metz, France, on 6 May, the Italian Environment Minister Costa and his French counterpart De Rugy agreed to conduct a joint initiative to get a combined SOx and NOx ECA for the entire Mediterranean Sea.

Information: http://www.rempec.org/rempecnews. asp?NewsID=1508





Ellen is the world's largest all-electric ferry.

### The world's largest electric ferry

On 15 August, the world's largest allelectric ferry, Ellen, made its maiden voyage connecting the small island of Aerø to the port of Fynshav on Als in Denmark. The route is 22 nautical miles (40 km) long. Ellen is around 60 metres long and 13 metres wide, and can carry 30 vehicles and 200 passengers. The ship is powered by a battery system with an unprecedented capacity of 4.3 MWh, and has the capability to travel at speeds up to 15.5 knots. The operators estimate the electric ferry will annually prevent the release of 2000 tons of CO<sub>2</sub>, 42 tonnes of NOx, 2.5 tons of PM and 1.4 tons of SO<sub>2</sub> into the atmosphere.

Source: forbes.com, 18 August, 2019

Cruise ships poise

Carnival Corporation, the world's largest luxury cruise operator, emitted nearly 10 times more harmful sulphur dioxide (SO<sub>2</sub>) around European coasts than did all 260 million EU passenger cars in 2017, according to a new analysis by Transport & Environment. Royal Caribbean Cruises, the world's second largest cruise operator, emitted four times the SO2 of the EU car fleet.

In absolute terms, Spain, Italy and Greece, closely followed by France and Norway, are the countries most exposed to SO<sub>2</sub> air pollution from cruise vessels, while Barcelona, Palma de Mallorca and Venice are the most impacted European port cities, followed by Civitavecchia (Rome) and Southampton.

Emissions of nitrogen oxides (NOx) from cruise ships in European seas - equivalent to about 15 per cent of the NOx emitted by Europe's passenger car fleet in a year - also heavily impact some cities.

T&E recommends that the EU should implement a zero-emission port standard as soon as possible, and then extend it to other ship types. Emission control areas (ECAs), currently in place only in the North Sea and the Baltic Sea, should be extended to the rest of the European seas. NOx emissions from existing ships should also be regulated. Furthermore, the report recommends turning low-emission control areas into zero-emission control areas to equally address air pollution and GHG emissions.

T&E's shipping policy manager, Faig Abbasov, said: "There are enough mature technologies to clean up cruise ships. Shore-side electricity can help cut inport emissions, batteries are a solution for shorter distances and hydrogen technology can power even the biggest cruise ships. The cruise sector is apparently not willing to make the shift voluntarily, so we need governments to step in and mandate zero-emission standards."

Source: T&E press release, 4 June 2019.

Link to the report: https:// www.transportenvironment. org/publications/one-corporation-pollute-them-all

© SHUTTERSTOCK - JOACHIM AFFELD Cruise ships are responsible for significant emissions of SO<sub>2</sub> and NOx along

European coasts.

See also the "Cruise Ship Ranking" by the German Nature And Biodiversity Conservation Union (NABU) at: www.nabu.de/cruiseshipranking-2019

ACID NEWS NO.3, OCTOBER 2019

## Six countries still breach binding air pollution limits

In 2017, the national emission ceilings for ammonia were still violated by five member states and total emissions have now increased by more than three per cent over the last four years, preliminary data from the European Environment Agency (EEA) shows.

**As of 2010,** the EU's National Emission Ceilings (NEC) directive requires member states to meet national emission limits for their total emissions of four important air pollutants: nitrogen oxides (NOx), ammonia (NH<sub>3</sub>), sulphur dioxide (SO<sub>2</sub>) and non-methane volatile organic compounds (NMVOCs).

However, official emissions data for 2010–2017 shows that some countries consistently breached their limits for NH<sub>3</sub> and NMVOCs in all these years. The Netherlands has now breached its NMVOC ceilings for eight consecutive years, and Germany and Spain have breached their NH<sub>3</sub> ceilings for eight years running. Moreover, in 2017, Austria, Croatia, Ireland and the Netherlands were in non-compliance with their NH<sub>3</sub> limits.

According to the EEA, emissions from agriculture – mainly from the use of fertilisers and the handling of animal manure – were responsible for excessive NH<sub>3</sub> emissions. Emissions of ammonia reduce air quality by increasing the levels of health-damaging secondary particulate matter (PM<sub>2.5</sub>). Ammonia also disrupts land and water ecosystems through eutrophication – the oversupply of nitrogen nutrients with resulting impacts on biodiversity – which currently affects more than two-thirds of the total ecosystem area in the EU.

Between 2016 and 2017, ammonia emissions increased in 16 member states. For the EU as a whole they rose by 0.4 per cent, mainly due to increases in Spain and Poland, reported the EEA.

The emission limits were set in the 2001 NEC directive and are applicable from 2010 until 2019. In 2016, a revised

NEC directive was adopted that sets new national emission reduction commitments that are applicable in two steps, from 2020 and 2030, respectively (see AN 1/2017, p.7). Moreover, a fifth pollutant (particulate matter, PM<sub>2.5</sub>) was included in the revised directive.

With the adoption of the new NEC directive came a so-called flexibility mechanism that allows member states under certain circumstances to "adjust" downwards their reported emissions for compliance assessment with the national ceilings. This also includes retroactive adjustment of the ceilings for the 2010–2019 period. Following a review and possible approval of member states' applications by the European Commission, the number of countries deemed to exceed one or more emission ceilings could decrease.

The lack of ambition of the new NEC directive, especially regarding the 2020 reduction commitments, has been strongly criticised by environmental organisations. The EEA analysis now shows that in 2017, the aggregated EU emissions for both NMVOCs and SO<sub>2</sub> were already below their respective targets for 2020 (see figure). Moreover, emissions of PM<sub>2.5</sub>, NH<sub>3</sub>, and NOx are already very close to their respective 2020 targets. Only an additional reduction of respectively 1.3, 2.3 and 3.2 per cent is required compared to the 2017 levels.

As well as reporting past emissions, member states must also report projected emissions for future target years, in order to assess whether or not they are on track towards meeting their reduction commitments for 2020 and 2030. According to these projections, only twelve countries are

on track to meet their reduction commitments set for 2020 for all five pollutants, and only eight countries are on track to meet all their 2030 commitments.

Member states have to produce national air pollution control programmes (NAPCP) that set out the additional emission abatement measures needed to achieve their emission reduction commitments for 2020 and 2030. The first deadline for reporting NAPCPs was 1 April 2019.

Only a few countries delivered in time, however, and by the end of July, as many as ten countries – Bulgaria, Czechia, France, Greece, Hungary, Malta, Romania, Slovakia, Slovenia and Spain – had still not reported. Moreover, some of the reported NAPCPs are only draft versions. The Commission is required to examine the NACPs to ensure that they are fit for purpose, and the results of this examination will be made public.

Clearly, additional efforts are needed for all pollutants if the EU is to achieve its 2030 emission reduction commitments. The required percentage reductions from 2017 emissions are close to 40% for NOx; 36% for PM<sub>2.5</sub>; 33% for SO<sub>2</sub>; 15% for NH<sub>3</sub>; and 13% for NMVOCs.

Christer Ågren

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Source: EAA briefing on the NEC directive reporting status 2019 (28 June 2019). Link: https://www.eea. europa.eu/themes/air/national-emission-ceilings/nec-directive-reporting-status-2019

Note: More detailed emissions data are published by the EEA in the report "European Union emission inventory report 1990–2017 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)", EEA Report No. 8/2019, which is available at: https://www.eea.europa.eu/publications/european-union-emissions-inventory-report-2017



Table. EU member state progress in meeting 2010 NEC directive emission ceilings and 2020/2030 reduction commitments.

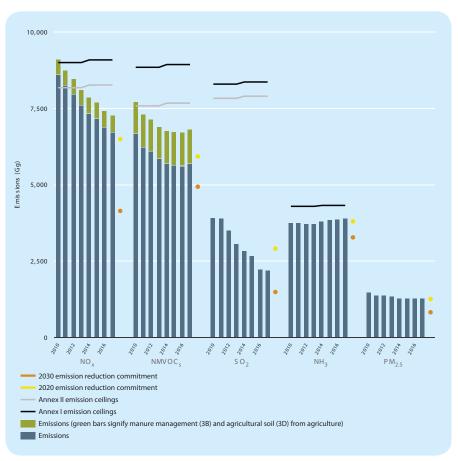
					N	Ox									NΜ\	/OCs									S	O <sub>2</sub>									NI	H <sub>3</sub>					PM	l <sub>2.5</sub>
Member state	2010	2011	2012	2013	2014	2015	2016	2017	2020	2030	2010	2011	2012	2013	2014	2015	2016	2017	2020	2030	2010	2011	2012	2013	2014	2015	2016	2017	2020	2030	2010	2011	2012	2013	2014	2015	2016	2017	2020	2030	2020	2030
Austria	X	Х	X	X	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	Х	Х	X	1	X
Belgium	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	✓	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	✓	X	1	1
Bulgaria	1	1	1	1	1	1	1	1	1	Х	1	1	1	1	1	1	1	1	X	Х	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	Х	X
Croatia					1	1	1	1	1	1					1	1	1	1	1	1					1	1	1	1	1	1					X	X	X	X	1	1	✓	1
Cyprus	1	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Czech Rep.	1	1	1	1	1	1	1	1	1	X	X	X	X	X	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	1	1
Denmark	Х	Х	Х	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	Х	Х	X	1	1	1	1	1	Х	Х	Х	X
Estonia	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	✓	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	X	1	1
Finland	Х	Х	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Х	Х	Х	Х	Х	1	1	1	1	1	1	1
France	X	X	X	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	X	X	1	X
Germany	Х	1	1	1	1	1	1	1	1	Х	Х	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Х	X	Х	Х	Х	X	Х	Х	Х	Х	X	1	X
Greece									X	X									X	X									1	1									1	1	1	1
Hungary	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	X	Х	1	1	1	1	1	1	1	1	1	Х	1	1	1	1	1	1	1	1	Х	Х	Х	X
Ireland	X	1	1	1	1	1	1	1	1	X	X	1	1	1	1	1	1	1	X	X	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	X	Х	X	X	✓	1
Italy	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	X	Х	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Х	1	X
Latvia	1	1	1	1	1	1	1	1	X	X	1	1	1	1	1	1	1	1	X	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	X	1	X
Lithuania	1	1	1	1	1	1	1	1	Х	X	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Х	Х	1	X
Luxembourg	X	X	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	X	1	X
Malta	Х	Х	Х	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Х	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Х	X	1	1
Netherlands	X	X	X	X	X	X	1	1	1	1	X	X	X	X	X	X	X	X	X	Х	1	1	1	1	1	1	1	1	1	1	X	X	1	1	X	Х	X	X	✓	1	1	1
Poland	Х	1	1	1	1	1	1	1	Х	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	Х	Х	1	1	1	1	1	1	1	1	1	X	1	X
Portugal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	X
Romania	1	1	1	1	1	1	1	1	Х	X	1	1	1	1	1	1	1	1	1	Х	1	1	1	1	1	1	1	1	1	Х	1	1	1	1	1	1	1	1	1	1	Х	X
Slovakia	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	✓	1
Slovenia	Х	Х	X	1	1	1	1	1	Х	1	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	Х	1	1	1	1	1	1	1	1	1	1	✓	X
Spain	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	X	X	X	X	X	X	X	X	X	1	X	X	X
Sweden	Х	X	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Х	X	1	1
UK	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	Х	X	X	X
✓	15	18	21	24	26	26	27	27	22	12	21	25	25	25	26	26	26	26	19	11	27	27	27	27	27	27	27	27	27	11	22	22	23	24	24	23	21	21	15	9	22	12
Х	12	9	6	3	1	1	0	0	6	16	6	2	2	2	1	1	1	1	9	17	0	0	0	0	0	0	0	0	1	17	6	6	5	4	4	4	6	6	13	19	6	16

Notes: '\(\sigma'\) indicates that the emission ceiling or reduction commitment has been, or is anticipated to be, attained. '\(\sigma'\) indicates that the ceiling or reduction commitment has not been, or is not anticipated to be, attained. The 2020 and 2030 columns represent projections calculated by member states on the basis of adopted policies and measures currently in place. The WM or "with measures" projection is calculated by member states on the basis of adopted policies and measures currently in place.

Figure. EU progress in meeting the 2010 emission ceilings and the 2020/2030 reduction commitments for the EU as a whole.

Notes: - Greece did not submit emission inventory data in 2019, which means that the EU totals are underestimated.

- Croatia joined the EU in mid-2013, so for the years 2010–2013 emissions and ceilings are not considered for this country.
- The distance to ceilings was calculated taking into account adjusted emissions as approved by 2018.
- To assess future attainment of 2020 and 2030 reduction commitments, emissions of NOx and NMVOCs from agricultural activities are not considered. The size of emissions from these sources is indicated by the top part of the NOx and NMVOC columns. Thus, only the lower part of the NOx and NMVOCs columns should be considered for comparison with the 2020 and 2030 reduction commitments.



ACID NEWS NO.3, OCTOBER 2019



## 10,000 EU staff call for coal phase-out by 2025

EU Staff 4 Climate is a bottom-up initiative led by EU staff in their individual/private capacity. It brings together colleagues from across the EU institutions who are deeply concerned about the climate, ecological and social crises facing our planet. The inititaive launched in March in solidarity with the global Youth for Climate movement. So far more than 10,000 staff have sigend the petition.

Link: https://eustaff4climate.info/

## CO<sub>2</sub> standards for trucks

On 13 June 2019, the Council adopted the EU's first-ever carbon dioxide emission standards for trucks and other heavy-duty vehicles. Under the new rules, which entered into force on 14 August, manufacturers will be required to cut CO<sub>2</sub> emissions from new trucks on average by 15 per cent from 2025 and by 30 per cent from 2030, compared with 2019 levels.

The targets are binding, and manufacturers that do not comply will have to pay a financial penalty. In addition, the availability of reliable data will be ensured through on-board devices which monitor the actual fuel and energy consumption.

Emissions from heavy-duty vehicles, including lorries, buses and coaches,

represent around six per cent of total EU CO<sub>2</sub> emissions and 27 per cent of total road transport emissions in the EU.

Source: AECC Newsletter, June and August 2019.

Link to EU regulation 2019/1242: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\_.2019.198.01.0202.01.ENG&toc=OJ:L:2019:198:TOC



### IMO and ICAO fail to implement the Paris Agreement

International shipping emissions are not included in national targets, and, like international aviation, are the responsibility of the specialised UN agencies IMO and ICAO. Known to be very slow due to industry lobbying and concerns and trade impacts, many NGOs think that the main decisions about emission reductions for these economic sectors should be taken by, for example, the UNFCCC and the EU instead. Climate Action Network demands that the shipping (IMO) and aviation sectors (ICAO) should cut emissions of greenhouse gases to near zero by 2050 to contribute to reaching the target of the Paris Agreement. ICAO and IMO, each with responsibility for around 2-3 percent of global greenhouse gas emissions, have failed to reach a decision on decarbonising the sectors in the next 20-30 years. IMO just plans to halve CO<sub>2</sub> emissions by 2050, while ICAO has not adopted a long-term emissions reduction target.

The lifetime of a modern vessel is about 25–30 years, so decisions have to be taken and measures must be implemented starting now if the Paris Agreement targets are to be reached. The most important measure is to introduce alternative fuels for all new ships that are built and to retrofit the existing shipping fleet. Europe

is just starting to take the first steps in electrifying shipping fleets, for example by electrifying coastal shipping along the Norwegian coast. Countries in the global South will need to get support to decarbonise shipping, say CAN and WWF. Islands in the Pacific are demanding 500 million US dollars in support to make ocean shipping zero carbon in the Pacific region.

WWF International has three key demands to IMO:

- 1. Commitment to strive for complete decarbonisation of the global shipping sector by 2050.
- 2. Immediate pursuit of ambitious actions and medium-term emission reduction targets that put the sector on the path to decarbonisation.
- 3. Consideration of measures to address demonstrable disproportionate impacts on developing countries, in particular least-developed countries and small island developing states, which do not undermine the ambition and environmental integrity of emission reduction targets and measures.

Mark Lutes from WWF says: "The technological solutions to decarbonizing the shipping sector are either currently available or visible on the horizon. The

challenge now is to close the price gap to sustainable alternative fuels, and accelerate the deployment of zero carbon technologies over the coming decade. There is a growing call in the shipping sector to strive for full decarbonisation of the sector by 2050, and once again the most vulnerable and isolated countries are leading the charge."

Many environmental NGOs are critical about ICAO decisions to develop a carbon offsetting scheme. Offsetting is widely considered a false solution because it does not lead to emission reductions but merely shifts emissions from one sector to another and at best it is a zero-sum game, they say.

Reinhold Pape

Sources

http://www.shippipedia.com/life-cycle-of-a-ship/

https://e360.yale.edu/features/europe-takes-firststeps-in-electrifying-worlds-shipping-fleets

https://www.theguardian.com/environment/2019/ sep/24/pacific-islands-seek-500m-ocean-shippingzero-carbon

https://redd-monitor.org/2016/04/04/more-than-80-ngos-oppose-aviation-sectors-carbon-offsetting-plans/

https://www.greenaironline.com/news.php?viewStory=2535



# Global SO<sub>2</sub> air pollution hotspots mapped

The Norilsk smelter complex in Russia continues to be the largest sulphur dioxide emission hotspot in the world.

Power plants and the industrial burning of coal and oil are responsible for two-thirds of the anthropogenic sulphur dioxide (SO<sub>2</sub>) emission hotspots tracked by satellite data from US space agency NASA, according to a recent study by Greenpeace India. Oil refineries and metals smelters are the other major sources.

Emissions of SO<sub>2</sub> contribute to human death and disease from air pollution across the planet. The health impacts come from both direct exposure to SO<sub>2</sub> and from exposure to fine particulate matter (PM<sub>2.5</sub>) that is formed when SO<sub>2</sub> reacts with other air pollutants to form tiny sulphate particles. SO<sub>2</sub> emissions also contribute to the acidification of soils and freshwater (with damage to ecosystems and biodiversity), and to the corrosion of materials and historic monuments.

In terms of individual hotspots, the Norilsk smelter complex in Russia continues to be the largest SO<sub>2</sub> emission hotspot in the world, with annual emissions of nearly two million tons. Number two on the list is the Kriel area in Mpumalanga province in South Africa. There are 12 coal-fired power stations in Mpumalanga province, making the province the largest SO<sub>2</sub> hotspot

in the world for emissions from power generation. The third biggest point source is a petrochemical complex in Zagroz in Iran. See Table.

Nornickel is the world's leading nickel- and palladium-producing company. According to Reuters, the company is implementing a massive programme to improve the ecology of the city of Norilsk and its surroundings. The first stage of the programme has already been completed, and the second phase will involve

a US\$ 2.5 billion project to help to reduce SO<sub>2</sub> emissions in and around Norilsk by 75 per cent by 2023, from 2015 levels.

Looking at individual countries, India is the world's top emitter of SO<sub>2</sub> from large point sources, having recently overtaken Russia and China, which now rank second and third, respectively. These are followed by Mexico, Iran, Saudi Arabia, South Africa, Ukraine, the United States, Turkey and Kazakhstan.

Three European countries appear in the list of the twenty largest SO<sub>2</sub> point source emitters in the world: Ukraine, Serbia and Bulgaria. Coal-fired power plants are the main source of high SO<sub>2</sub> emissions in all three countries.

It is pointed out that Australia still lacks any legal provisions to limit or reduce SO<sub>2</sub> emissions from its power plants, whilst the US, China and EU have had such regulation in place for many years and are continuing to gradually strengthen their emissions standards.

Greenpeace concludes that the ranking of global SO<sub>2</sub> emission hotspots demonstrates



Norilsk continues to be the largest SO<sub>2</sub> emission hotspot.

the need for stronger emission standards for power plants and industry, and a rapid transition away from fossil fuels.

"The burning of fossil fuels such as coal, oil and gas is the largest source of emissions of SO<sub>2</sub> resulting in disastrous air pollution and premature deaths. Clean energy could save billions of dollars in health costs and thousands of lives every year. It's fundamental that governments rapidly transition away from fossil fuels and set stronger emission standards as

> they shift over to sustainable alternatives," said Lauri Myllyvirta at Greenpeace Nordic.

The report is accompanied by an online interactive map and a database of the world's biggest point sources of SO<sub>2</sub> pollution, which can both be accessed from the Greenpeace website (link below).

Christer Ågren

Sources: Greenpeace International and Reuters, 19 August 2019.

Link: https://www.greenpeace.org/ international/press-release/23819/ global-so2-air-pollution-hotspotsranked-by-greenpeace-analysis/

Table. Top twelve global SO<sub>2</sub> emission hotspots in 2018

	Name	Country	SO <sub>2</sub> emissions (kt/yr)	Туре
1	Norilsk	Russia	1898	Smelter
2	Kriel	South Africa	714	Coal power plants
3	Zagroz	Iran	614	Oil & gas
4	Rabigh	Saudi Arabia	515	Oil & gas
5	Singrauli	India	507	Coal power plants
6	Cantarell	Mexico	461	Oil & gas
7	Matimba	South Africa	412	Coal power plant
8	Reforma	Mexico	407	Oil & gas
9	Shaiba	Saudi Arabia	398	Oil & gas
10	Das Island	United Arab Emirates	397	Oil & gas
11	Neyveli	India	393	Coal power plant
12	Sarcheshmeh	Iran	384	Smelter

## Swedish refinery at crossroads: 2X fossil future contested

The Preem oil refinery in Sweden wants to expand, greatly increasing its CO<sub>2</sub> emissions and those of Sweden. It may wreck Sweden's climate target. It may also help the Norwegian fossil industry's effort to pitch CCS. What happens now is up to the government.

**Preemraff is Sweden's** largest oil refinery, located in Lysekil on the west coast close to Norway. Preem is owned by the Saudi citizen Mohammed Hussein Al Amoudi. It also has a refinery in Gothenburg.

In 2016, Preem set up a project called ROCC, Residue Oil Conversion Complex. It foresaw a shrinking market for residual oil, due to IMO sulphur limits that will take effect in 2020. ROCC would greatly expand the throughput of oil.

The project would also double the  $\rm CO_2$  emissions from around 1.7 to 3.4 million tonnes, jeopardizing the climate target for Sweden, which is net zero emissions of greenhouse gases by 2045. The "net zero" actually leaves some space for remaining emissions, to be compensated for by growing forests and CDM, so the real target is to cut territorial emissions by at least 85 percent from 1990, to 10.7 million tonnes of GHGs by 2045, including difficult areas such as methane and  $\rm N_2O$  from agriculture.

With ROCC added, Preemraff would emit 3.4 million tonnes.

But there is another side and another possible future for Preem. It has a substantial production of biofuels, mainly HVO diesel, and some gasoline from forestry etc. If Preem were to source all its production from renewables, it would be a major contributor to achieving the Swedish climate targets.

When the environmental court gave permission for the ROCC project in November 2018, the project sparked outrage from many groups, including the Swedish Society for Nature Conservation, because of the fossil lock-in and CO<sub>2</sub> emissions.

The lower court did not take CO<sub>2</sub> emissions into consideration, because of the ETS. Paragraph 26 of the 2003 EU Emission Trading Directive states that "the permit shall not include an emission limit value for direct emissions of" CO<sub>2</sub>.

If the ETS is seen as a closed system, a bubble, restrictions in one place will just result in more emissions somewhere else in Europe.

But that goes against the core of the Swedish environmental code:

"The purpose of this Code is to promote sustainable development which will assure a healthy and sound environment for present and future generations."

And the ETS was conceived as a means to cut climate emissions, not as a way to wreck national climate policy. Also, the history of the ETS shows that it is not a closed system. It has been revised repeatedly, as the initial targets were unambitious and the trading prices collapsed 2007, 2012 and almost again in 2017. The reforms of the ETS have repeatedly pushed up the  $CO_2$  price, and new political moves will do so again.

**An appeal to** the supreme environmental court was granted in June 2019.

Aside from the judicial process, the Swedish Society for Nature Conservation asked the government to step in and take over, which the environmental code allows for. The Environmental Protection Agency filed a similar request.

"We want to bring to the government's attention that this item may influence the possibility to reach Sweden's climate targets," the EPA wrote to the government on 27 June 2019. The government decided to do so in August.

So while the final outcome is uncertain, the project may possibly be stopped either by the government or by the higher court. It is also possible that Preem will decide not to proceed with the project.

The outcome is of strategic importance in two more respects: whether Sweden will use CCS (carbon capture and storage) as a climate measure and what kind of future there is for hydrogen.

CCS has so far played no role in emission reductions in Sweden, unlike Norway.

As a part of ROCC, Preem plans to send 5 million tonnes of  $CO_2$  for storage in Norway, by ship. This would be a first for Swedish CCS and a first for Norwegian CCS export, as well as a first for ship transport of  $CO_2$ .

Equinor and Shell are working together on a rather grand scheme called Northern Lights, to store carbon dioxide from several European countries in the Aurora field in the North Sea, west of Bergen. But the site has not yet been decided. Test drilling in the Aurora field will start in late 2019, and it is not sure that it will deliver positive results.

Preem does not seem very worried about the cost of transporting the CO<sub>2</sub>, by ship, and for storing it. Nor should they. CCS is pivotal for Norwegian efforts to reconcile a growing gas and oil industry with green credibility, and the Norwegian government is ready to pay a lot of money for it.

With ROCC, Preem would be hooked up with the Norwegian fossil industry in two ways: they would get the gas to produce hydrogen from Norway, and they would store some of their CO<sub>2</sub> in Norway.

Most of the ROCC project's CO<sub>2</sub> increase originates in hydrogen gas production from fossil gas. The hydrogen gas is used to crack the big hydrocarbon molecules and convert them into lighter, more hydrogen-rich compounds such as gasoline and diesel oil.

Preem aims to have the residue oil conversion complex working by 2025, which is now probably postponed by one or two years. Their bet on a future for oil and gas is for a longer term, at least throughout the 2030s, if not longer.

Given that time perspective, the choice of method to produce hydrogen is conspicuous. Another method is to split water

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with renewable electricity. The ore mining company LKAB and steel producer SSAB are working on a project to substitute coal and coke for electric hydrogen. The HYBRIT3 project was launched in 2016, in collaboration with the power company Vattenfall.

HYBRIT is a very big project, and will consume about 15 TWh of electricity – 10 percent of Sweden's production – and will produce much more hydrogen than ROCC.

The HYBRIT goal for full implementation is 2035. The prospects are getting better now than they were three years ago. At least 25 TWh of wind power will be added in 2018–2022 in Sweden and Norway.

HYBRIT and ROCC both target hydrogen but could not differ more in how and why. HYBRIT produces a renewable material (steel) with renewable energy. ROCC produces more fossil fuel (oil products) with more fossil fuel (gas).

Preem assumes that the global market for refined products will continue to grow for a long time. On that assumption, the war against climate change is lost.

The essence of the Paris treaty is a form of social control. Each nation is supposed to promise to do at least as much as its neighbours or peers and then keep its promises, or be named and shamed. This is not a zero-sum game. Sweden was a climate policy pioneer with its net-zero target, and is being followed by much bigger and more important nations, such as France and the UK. If Sweden backs down, it will make the whole Paris system weaker.

Another assumption behind ROCC is that the market for residue oil will drop sharply from 2020. This will not necessarily happen. On the supply side refineries can use more low-sulphur feed and less high-sulphur feed. On the demand side, there are alternative markets for residual oil, such as power plants or ships with desulphurization.

There are also alternative fuels: natural gas, biofuels, hydrogen and (for ferries) electricity. They may become important at the time ROCC would operate. There may not be a deluge of cheap surplus residue oil.

So ROCC may be a solution without much of a problem.

It should be noted that the ROCC project does not primarily aim to produce cleaner fuel for ships. The aim is to produce more petrol and more diesel, mainly for road traffic.

Preem had an earlier project (until about 2008) for squeezing out the last drops out

of the residue oil with petroleum coke as residue. This is the exact opposite of what they are planning to do now.

What will happen with the residual oil if Preem does not hydrogenate it?

Some of it may end up as asphalt in concrete, and in that way slightly reduce the very CO<sub>2</sub>-intensive production of Portland cement. Some of it may become fuel, as an alternative to coal. If there is no market it will have to be solidified and stored indefinitely, which should be less difficult than CCS.

There is no way to predict what the oil market will look like in the 2030s.

But if commitment to the 1.5–2 degree target is for real, all long-term investment in the fossil fuel sector will have to stop soon.

Fredrik Lundberg

#### Sources:

https://www.iva.se/globalassets/info-trycksaker/ vagval-for-klimatet/nr-5-per-sandberg-northernlights-for-iva-29-jan-2019.pdf

https://www.offshoreenergytoday.com/norways-oiland-gas-production-to-increase-from-2020-npdsays/

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## Hydrogen choices

Hydrogen has for several decades been touted as the fuel of the future. It is in fact a big commodity today, and heading for fast growth in a low-carbon future. If it is produced from fossil fuels, which is what Preem plans for, it is not part of the solution, but a big source of CO<sub>2</sub>.

Wind power and photovoltaic solar power now supply cheaper kilowatt-hours than new fossil power in most parts of the world. For a 100 per cent renewable-powered world, something has to balance the intermittent wind and sun. Part of that balance can be batteries, electric cars, demand-side management, bio-power, hydro, solar thermal (where the heat can be stored), but more is probably needed.

Many see hydrogen as the missing link, one of the few options for long-term, even seasonal storage.

Hydrogen is very versatile. It can be used for industrial or domestic heating, for electricity production on a small scale with fuel cells or on a big scale with gas turbines or steam turbines, as a reducing agent in the metallurgical and chemical industries, and as vehicle fuel. It can, to some extent substitute for natural (fossil) gas within the existing pipeline system. It can fuel cars such as the Toyota Mirai, possibly with a better range and lower cost than battery cars. It can fuel heavy vehicles and airplanes, for which batteries are not an option.

A recent report from the IEA¹ states: "There have been false starts for hydrogen in the past; this time could be different. The recent successes of solar PV, wind, batteries and electric vehicles have shown that policy and technology innovation have the power to build global clean energy industries."

Hydrogen is used in large quantities: 69 million tonnes per year, equivalent to almost 200 million tonnes of oil. It is now mainly used in the oil industry and for ammonia production.

Hydrogen use, storage and transport is a proven technology on an industrial scale. Many hundreds of kilometres of pipelines are in operation. Storage is so far on a more modest scale (a thousand tonnes) but geological storage of natural gas is huge, and hydrogen could be stored in the same way, at the same sites.

Hydrogen is clean at the point of combustion, often not emitting anything more than water vapour. But most hydrogen is produced from steam reformation of natural gas, some from coal. CO<sub>2</sub> emissions from hydrogen production are about 830 million tonnes per year.

Less than one per cent of the hydrogen is actually produced by the electrolysis of water.

CO<sub>2</sub>-free hydrogen could be produced by several methods:

- 1. Electrolysis of water from nuclear power. Comment: Nuclear power is not considered clean by everybody. It is stagnant, at best, in most of the world. New nuclear is expensive.
- 2. High-temperature processes for splitting water, using heat and electricity supplied by nuclear power of new kinds. Comment: High-temperature helium-cooled nuclear reactors were developed in the 1950s to 1988 with poor results in the US, UK and Germany. The concept was revived in 2001 as part of Generation IV by the new Bush administration, but nothing much happened. A long shot.
- 3. Methane splitting. Natural gas consists mainly of methane, and if the four hydrogen atoms are separated from the single carbon atom, in an electrically heated plasma, the result is graphite or "carbon black" and hydrogen. Comment: Annual global demand for carbon black, used in tires, rubber, printers and plastics is 12 million tonnes, which could be produced in association with the production of 4 million tonnes of hydrogen. Even if economically viable, it is of marginal importance.
- 4. Fossil hydrogen production but with carbon capture and storage, CCS. Comment: CCS was also launched in 2001 by the Bush administration, but despite a huge world-wide effort, it has delivered very little apart from enhanced oil recovery, i.e. using CO<sub>2</sub> to squeeze more oil from wells with declining production. It has

- not demonstrated any significant CO<sub>2</sub> reduction anywhere.
- 5. Water electrolysis with renewable electricity. Comment: If hydrogen is going to play a major part in the future energy system, this is it. It will be very difficult to market hydrogen cars and other applications unless the hydrogen can be produced cleanly and easily and on a large scale fairly soon.

**The IEA expects** electrolytic hydrogen to cost \$2.8/kg in 2030, much more than hydrogen from fossil gas (\$1.8/kg with no carbon cost, some \$2.2/kg with carbon cost). This is calculated using an electricity price of 4 cents/kWh. But at good locations, costs are much lower than that, at least some of the time.

Large amounts of wind power are being built in Sweden and Norway with insignificant subsidies, and auction prices of 2 cents have recently been reported from Los Angeles and Brazil.

In Germany and Denmark, prices are sometimes even negative.

There are 8640 hours in a year, and if hydrogen is produced for 4000 or 5000 of these hours, when the price is low enough, the electricity at good locations should cost well below 4 cents.

It may still be cheaper to produce hydrogen from fossil gas, but that does not matter if it is seen as unacceptable in most countries, and by consumers.

There is no way to say how much hydrogen the world will use in 2025 or 2040, but it is likely that it will increase from now, perhaps by a large factor. If nothing else, it is needed in biorefineries, for fuels and making plastic from wood.

That hydrogen has to be produced sustainably.

Fredrik Lundberg

<sup>1</sup> The Future of Hydrogen: Seizing Today's Opportunities June 2019 at iea.org

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### **Court rulings on air pollution**

On 26 June, the European Court of Justice ruled that citizens have the right to challenge the air pollution monitoring systems in their cities and that the competent courts (in this case the Brussels court) must enforce EU rules to make sure monitoring stations are located where the highest concentrations of air pollution occur. Average values across a whole zone or city are insufficient as they may underestimate the actual exposure to polluted air.

The ruling follows a case brought against the Brussels government by ClientEarth and five Brussels residents for failure to meet EU air quality limits.

The case will now return to the Brussels court for the concluding judgment.



© SHUTTERSTOCK - MANFREDXY Monitor stations must be placed where the air pollution levels are the highest.

On 25 June, France lost a landmark court case brought by a mother and her daughter to hold the French government responsible for failing to tackle air pollution.

The LIFE Project "Legal Actions – Right to Clean Air", led by Environmental Action Germany (DUH), recently updated its English background information and added new examples of legal actions around several European countries (link below).

Sources: T&E and ClientEarth press releases, 26 June 2019. Link: https://www.right-to-clean-air.eu/en/library/

### Climate change and the Andean cryosphere

Glaciers of the tropical Andes are strongly threatened by global climate change, as revealed by a new report from FARN – Fundacion Ambiente y Recursos Naturales – with support from AirClim. The Andes are the longest continental mountain range in the world, extending for more than 7,000 km from Venezuela in the north to Argentina in the south.

Glaciers are retreating along the entire length of the Andes, with some

glaciers having lost two-thirds or more of their mass. Glacial meltwater is a critical water source for millions of people living in the Andean highlands.

Link: https://farn.org.ar/archives/27148



## Ammonia pollution damaging more than 60% of UK land

Over 60 per cent of the United Kingdom land area currently receives ammonia concentrations above the critical level set to protect lichens and bryophytes (1  $\mu g$  m-3), according to a report commissioned by the UK government. Just over 3% of the UK land area receives ammonia concentrations above the critical level set to protect higher plants (3  $\mu g$  m-3) in 2013–2015. The higher ammonia levels are concentrated around a few hotspots in Northern Ireland and England. In Northern Ireland as much as 17.2% of the land area is affected by the higher concentrations.

The report also covers exceedance of critical loads for nitrogen and acid, which

occur when significant harmful effects are reached for a specific habitat.

Critical loads of nutrient nitrogen (nutrient-N) were exceeded in 62% of nitrogen-sensitive habitats in the UK in 2014–2016. That is a reduction from 75% in 1995–1997. The area with the largest reduction was seen in Scotland, where the area of exceedance went from 59% to 41% between the two periods. In England there has been very little change, from 98% to 96%. Almost all of the area of unmanaged beech woodland shows exceedance of nutrient-N critical loads. However, the magnitude of exceedance nearly halved from 22.7 kg N per ha per

year in 1995–97 to 12.1kg N per ha per year in 2014–16.

The area of acid-sensitive habitats in the UK that exceeded acidity-critical loads fell by more than one third, from 73% in 1995–97 to 43% in 2014–16, due mainly to decreases in sulphur deposition. The greatest change was seen in Scotland and the least in Northern Ireland.

Trends Report 2018: Trends in critical load and critical level exceedances in the UKLInk: http://www.cldm.ceh.ac.uk/content/trends-report-2018-trends-critical-load-and-critical-level-exceedances-uk

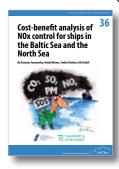
Critical loads for nitrogen were exceeded in 62% of nitrogen-sensitive habitats in the UK. Air Pollution & Climate Secretariat Första Långgatan 18 413 28 Göteborg Sweden

### **Recent publications from the Secretariat**

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



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



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



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



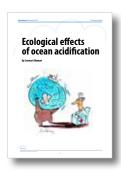
Paths to a sustainable agricultural system (Dec 2017). By Johan Karlsson et al. Exploring ways for sustainably feeding the Nordic countries.



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



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



Ecological effects of ocean acidification (March 2018). By Lennart Nyman. By absorbing CO<sub>2</sub> the ocean is becoming more acidic, and this happens at a rate faster than any period in the past 300 million years.



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

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### Coming events

IMO Intersessional Working Group on reduction of GHG emissions from ships. London, UK, 11 - 15 November 2019. Information: www.imo.org

**Symposium on IMO 2020 and Alternative Fuels.**London. UK, 17 - 18 October 2019. Information: *www.imo.org* 

**EU Clean Air Forum.** Bratislava, Slovakia, 28 - 29 November 2019. Information: https://ec.europa.eu/ info/events/eu-clean-air-forum-2019-nov-28 en

POLIS Annual Conference. Innovation in Transport for Sustainable Cities and Regions.

Brussels, Belgium, 27 - 28 November 2019. Information: www.polisnetwork.eu/2019conference

**UNFCCC COP25.** Chile. 11 - 22 November 2019. Information: *http://unfccc.int/* 

**CLRTAP Executive Body.** Geneva, Switzerland, 9 - 13 December 2019. Information: www.unece.org/env/lrtap/welcome.html

**EU Environment Council.** 19 December 2019. Information: www.consilium.europa.eu/en/press/calendar/

IMO PPR 7 (Sub-Committee on Pollution Prevention and Response). London, UK, 17 - 21 February 2020. Information: www.imo.org

**12th International Conference on Air Quality** — **Science and Application.** Thessaloniki, Greece, 9 - 13 March 2020. Information: https://www.herts.ac.uk/airqualityconference

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

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

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

**8th Global Nitrogen Conference.** Berlin, Germany, 3 - 7 May 2020. Information: https://ini2020.com

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

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