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*** While Chemwatch has taken all efforts to ensure the accuracy of information in this publication, it is not intended to be comprehensive or to render advice. Websites rendered are subject to change.**

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ASIA PACIFIC

Decision tools to help you categorise your chemical importation or manufacture

2020-05-18

These decision tools are designed to help you categorise your chemical importation or manufacture (introduction) when used in conjunction with our Categorisation Guidelines.

How do these work?

These are self-guided tools that you can use as you work through the steps towards categorising your introduction as either **exempted, reported** or **assessed**. You can use some or all of these tools – it's up to you – but we recommend that you start from step 1. You may not need to complete them all to reach an outcome. Depending on your answers, they'll tell you to complete another tool or give you an outcome, or both. You'll need to refer to the Categorisation Guidelines to help you answer some of the questions.

Before you start

Have you checked whether your chemical is in our Inventory? If your chemical is on our Inventory AND your introduction meets any terms of the Inventory listing, your introduction is categorised as a 'listed' introduction. Read about listed introductions.

Decision tools to help you categorise your chemical introduction

Step 1: Introductions that cannot be exempted or reported

- Decision tool – Work out if your introduction cannot be exempted or reported

Step 2: Introductions that are automatically categorised as exempted

- Decision tool – Work out if your introduction is automatically categorised as exempted
- Decision tool – Work out if your polymer is a Polymer of Low Concern (PLC) (**coming soon**): while we work on this tool, please read our guidance on PLCs.

Step 3: Introductions that are automatically categorised as reported

- Decision tool – Work out if your introduction is automatically categorised as reported

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Step 4: Work out the human health risk of your introduction

Step 4.1: Introductions that are always medium to high risk for human health

- Decision tool – Work out if your introduction is medium to high risk for human health

Step 4.2: Introductions that can be low risk for human health

- Decision tool – Work out if your introduction is low risk for human health

Step 4.3: Work out your human health exposure band

- Decision tool – Work out your human health categorisation volume
- Decision tool – Work out your human health exposure band (**coming soon**)

Step 4.4 and 4.5: Work out your human health hazard characteristics

- Decision tool – Hazard characteristics for human health exposure band 1: use this tool if your introduction is in human health exposure band 1.
- Decision tool – Hazard characteristics for human health exposure band 2: use this tool if your introduction is in human health exposure band 2.
- Decision tool – Hazard characteristics for human health exposure band 3 (**coming soon**): use this tool if your introduction is in human health exposure band 3.
- Decision tool – Hazard characteristics for human health exposure band 4 (**coming soon**): use this tool if your introduction is in human health exposure band 4.

Step 5: Work out the environment risk of your introduction

Step 5.1: Introductions that are always medium to high risk to the environment

- Decision tool – Work out if your introduction is medium to high risk to the environment

Step 5.2: Introductions that can be low risk to the environment

- Decision tool – Work out if your introduction is low risk to the environment

Step 5.3: Work out your environment exposure band

You can use some or all of these tools – it's up to you – but we recommend that you start from step 1.

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- Decision tool – Work out your environment categorisation volume
- Decision tool – Work out your environment exposure band

Step 5.4 and 5.5: Work out your environment hazard characteristics

- Decision tool – Hazard characteristics for environment exposure band 1: use this tool if your introduction is in environment exposure band 1
- Decision tool – Hazard characteristics for environment exposure band 2: use this tool if your introduction is in environment exposure band 2.
- Decision tool – Hazard characteristics for environment exposure band 3 (**coming soon**): use this tool if your introduction is in environment exposure band 3.
- Decision tool – Hazard characteristics for environment exposure band 4 (**coming soon**): use this tool if your introduction is in environment exposure band 4.

Step 6: Complete your categorisation

- Decision tool – Work out your introduction category

NICNAS, 18 May 2020

<https://www.nicnas.gov.au/media/components/landing-tiles/categorise-your-chemical-introduction/decision-tools-to-help-you-categorise-your-chemical-importation-or-manufacture>

APVMA to implement new cost recovery arrangements

2020-05-18

The Australian Pesticides and Veterinary Medicines Authority (APVMA) will implement revised cost recovery arrangements, as outlined in our [Cost Recovery Implementation Statement \(CRIS\)](#), on 1 July 2020.

The revised CRIS replaces the current fee structure.

Our revised cost recovery arrangements take into account stakeholder feedback received during CRIS consultation, and include a staged increase in the registration renewal fee, and an increase in some Item and Module application fees.

Further information about the APVMA's [revised cost recovery arrangements](#) is available on our website.

APVMA, 18 May 2020

<https://apvma.gov.au/node/67676>

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AMERICA

Wisconsin celebrates clean air month this May

2020-05-17

When you take a breath outside in Wisconsin, you are breathing the cleanest air the state has seen in 50 years. Not only is May Clean Air Month, but this year is also the 50th anniversary of the Clean Air Act.

Passed in 1970, the Clean Air Act is a landmark piece of environmental legislation largely responsible for the quality of the air we breathe today. Since its enactment 50 years ago, the combined emissions of six common pollutants have fallen by 73%. The Clean Air Act is one of the most comprehensive air quality laws in the world.

“Clean Air Month gives DNR the opportunity to shine a light on the accomplishments the state’s air has seen. Fifty years ago today, the air was nowhere near as clean or clear as it is today,” said Gail Good, the DNR’s Air Program Director. “Today’s positive air quality story is a direct result of a combination of federal regulation, state enforcement and action, and voluntary actions by businesses and citizens.”

The DNR is responsible for ensuring the regulations in the Clean Air Act are followed throughout the state. The Air Program continuously works at this process and improving the quality, consistency and efficiency of the air permitting and compliance process, air quality planning and monitoring as well as communications. Program efforts also address climate change and implement Governor Tony Evers’ Executive Order #52, which calls for the development of strategies to mitigate and adapt to the effects of climate change.

Recent Air Program efforts include:

Mobile Air Monitoring Lab (MAML) – The Air Program deployed the MAML for the first time in 2019. The state-of-the-art mobile lab has extensive monitoring capabilities including a 10 meter meteorological tower, a suite of continuous criteria pollutant analyzers and a volatile organic compound (VOC) instrument. MAML monitoring data is captured with a goal of informing primary pollutant contribution to ozone formation. The mobility of the lab allows the program to place it in strategic locations during Wisconsin’s ozone season. From May through October of 2019, the MAML spent time monitoring ozone in Kenosha and Milwaukee counties. The MAML will spend 2020 monitoring ozone in Sheboygan County.

Since its enactment 50 years ago, the combined emissions of six common pollutants have fallen by 73%.

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Per- and Polyfluoroalkyl Substances (PFAS) – DNR launched a task force to explore PFAS compounds and their impacts. PFAS are a large group of human-made chemicals used in industry and consumer products worldwide since the 1950s. Exposure to certain PFAS compounds may increase the risk of adverse health effects. There are currently no federally approved sampling methods for PFAS compounds in ambient air. The Air Program is currently collaborating with the Wisconsin State Lab of Hygiene on PFAS monitoring method development, and is working with other states on the matter.

Air Quality Trends – The program once again released the annual Air Quality Trends report. The report includes air monitoring data through 2018 and shows overall air quality in Wisconsin continues to improve, building on a 20-year trend in the state. Success stories include the 50 percent drop in emissions of ozone-forming pollutants like volatile organic compounds (VOCs) and nitrogen oxides (NOx) and a 68 percent drop in sulfur dioxide emissions since the early 2000s. For the first time, this report also includes maps of NO₂ derived from National Aeronautics and Space Administration (NASA) satellite data collected from 2006-2018. Satellite data observed large reductions of NO₂ across most of the state, with the greatest reductions found in the Milwaukee area. This is consistent with the decreases in NO₂ observed by the state's ground-based monitors and indicates that the reduction of this ozone-forming pollutant is widespread.

Clean Diesel Grants – The program awarded more than \$750,000 to nearly 40 projects aimed at improving Wisconsin's air quality and addressing climate change. The projects include replacement or upgrade of older, higher-emitting diesel engines on school buses and construction equipment across the state with newer, cleaner technologies. One project funds the purchase of zero-emission lawn mowers in the City of Eau Claire to replace aging diesel equipment.

e-Signature – The growth of the department's first U.S. Environmental Protection Agency approved e-Signature reporting option for facilities in Wisconsin. E-Signature provides facilities the option of reporting, submitting and signing Air Program compliance and monitoring reports electronically to DNR. Since e-signature was implemented, 414 distinct facilities have e-signed documents. DNR expanded the e-Signature program this past year and it is now being used by DNR's Waste Program as well.

Permit tracking bar – The Air Program added a new progress bar in the Permit Search Tool to make permit tracking easier for facilities and the

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public. As each step of the permit application review process is completed, a section of the progress bar is filled in. The progress bar serves as an easier, more visual way of tracking a permit's progress.

Seehafernews.com, 17 May 2020

<https://www.seehafernews.com/2020/05/17/79442/>

EPA releases final rule amending small manufacturer definition for reporting and recordkeeping requirements under TSCA Section 8 (a)

2020-05-15

On May 11, 2020, the U.S. Environmental Protection Agency (EPA) released a pre-publication copy of the final rule "Small Manufacturer Definition Update for Reporting and Recordkeeping Requirements

Under the Toxic Substances Control Act (TSCA) Section 8(a)."

The rule revises the definition of small manufacturer (and importer) - the new definition will apply to TSCA section 8(a) reporting obligations, including the 2020 Chemical Data Reporting (CDR) rule. As discussed below, EPA is adjusting the sales standard levels for inflation from \$40 million to \$120 million under its first size standard and from \$4 million to \$12 million under its second size standard. EPA believes that the amended definition will eliminate CDR reporting entirely for 127 sites and the need to report at least one chemical for additional 173 sites.

With certain exceptions, TSCA section 8(a) reporting requirements generally exclude small manufacturers and processors. EPA had established the general section 8(a) small manufacturer definition in 1988, but under the Frank Lautenberg Chemical Safety for the 21st Century Act (LCSA), enacted on June 22, 2016, within 180 days of enactment EPA was required to consult with the U.S. Small Business Administration to review the adequacy of standards for determining whether manufacturers and processor qualify as "small" manufacturers and processors. Based on this review, EPA decided that revisions to the standards were appropriate.

The final rule the size standards definition for small manufacturers under TSCA section 8(a) reporting as follows:

- **First standard:** EPA increased the annual sales threshold based on inflation from \$40 million to \$120 million. Thus, under the final rule

As discussed below, EPA is adjusting the sales standard levels for inflation from \$40 million to \$120 million under its first size standard and from \$4 million to \$12 million under its second size standard.

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a manufacturer/importer is considered “small” if its total annual sales (when combined with its parent company) are less than \$120 million.

- However, if the annual production or importation volume of a substance at any individual site owned or controlled by the manufacturer/importer is greater than 100,000 pounds, the manufacturer/importer will not qualify as “small” for purposes of reporting on the production or importation of that substance at that site..
- **Second standard:** EPA increased the annual sales threshold based on inflation from \$4 million to \$12 million. Thus, under the final rule a manufacturer/importer is considered “small” if its total annual sales (when combined with the parent company) are less than \$12 million, regardless of the quantity of substances manufactured or imported.

An otherwise reportable substance that is manufactured at or imported by a site must be reported. However, if the substance is subject to a proposed or final TSCA section 4 test rule; a TSCA section 4 test order; a proposed or final rule under section 5(b)(4) (concern list); a proposed or final section 6 rule; a section 5(e) order; or if relief has been granted under a section 5 or 7 civil action. [RKJ1]

EPA also added a definition for small governments in order to reduce reporting their burdens under the CDR. The final rule defines a small government as a “government of a city, county, town, township, village, school district, or special district with a population of less than 50,000. State and tribal governments are not considered small governments.”

EPA also made a technical correction to the small manufacturer reference for hexafluoropropylene oxide and a proposed update to the current small manufacturer definition in the section 8(a) Preliminary Assessment Information Rule (PAIR).

For more information, please visit EPA’s website.

The National Law Review, 15 May 2020

<https://www.natlawreview.com/article/epa-releases-final-rule-amending-small-manufacturer-definition-reporting-and>

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EPA decides against limits on drinking pollutant linked to health risks, especially in children

2020-05-15

The Environmental Protection Agency has decided not to limit perchlorate, a chemical that has long been detected in the drinking water of many Americans and linked to potential brain damage in fetuses and newborns and thyroid problems in adults, according to two agency officials briefed on the matter.

They spoke on the condition of anonymity because the decision hasn’t been announced.

The move, which comes despite the fact that the EPA faces a court order to establish a national standard for the chemical compound by the end of June, marks the latest shift in a long-running fight over whether to curb the chemical used in rocket fuel.

Under President Barack Obama, the EPA had announced in 2011 that it planned to set the first enforceable limits on perchlorate because of its potential health impacts. Both the Defense Department and military manufacturers have long resisted any restrictions on the chemical, which is also used in fireworks, munitions and other ignition devices. It naturally occurs in some areas, such as parts of the Southwest.

The Washington Post, 15 May 2020

<https://www.washingtonpost.com/climate-environment/2020/05/14/epa-decides-against-limits-drinking-water-pollutant-linked-health-effects/>

Ozone-depleting chemical alternatives getting into our food and water

2020-05-14

An international environmental agreement to regulate the use of chemicals depleting the ozone layer may have inadvertently allowed higher levels of other harmful chemicals to flourish, new research co-led by York University and Environment and Climate Change Canada has found.

The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer was designed to phase out ozone-depleting chemicals, chlorofluorocarbons (CFCs), such as freon used in older air conditioners.

The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer was designed to phase out ozone-depleting chemicals, chlorofluorocarbons (CFCs), such as freon used in older air conditioners.

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But these replacement compounds, thought to be a better alternative, degrade into products that do not break down in the environment and have instead continually increased in the Arctic since about 1990.

“Our results suggest that global regulation and replacement of other environmentally harmful chemicals contributed to the increase of these compounds in the Arctic, illustrating that regulations can have important unanticipated consequences,” says Assistant Professor Cora Young of the Faculty of Science and the paper’s corresponding author.

It is important to study these products of CFC replacement compounds, short-chain perfluoroalkyl carboxylic acids (scPFACs), before more of them are phased in over the next few years as they can adversely impact human health and the environment. They are part of the perfluoroalkyl substances (PFAS) class of man-made chemicals used in commercial products and industrial processes that are currently receiving a lot of attention.

Phys.org, 14 May 2020

<https://phys.org/news/2020-05-ozone-depleting-chemical-alternatives-food.html>

EUROPE

May infringements package: key package

2020-05-14

Overview by policy area

In its regular package of infringement decisions, the European Commission pursues legal action against Member States for failing to comply with their obligations under EU law. These decisions, covering various sectors and EU policy areas, aim to ensure the proper application of EU law for the benefit of citizens and businesses.

The key decisions taken by the Commission are presented below and grouped by policy area. The Commission is also closing 70 cases in which the issues with the Member States concerned have been solved without the Commission needing to pursue the procedure further.

On 30 January 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a ‘public health emergency of international concern’ and, on 11 March, characterised it as a pandemic. While the Commission has made it clear that it will continue to pursue infringement proceedings

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in cases it deems necessary, it has also acknowledged that the COVID-19 pandemic and the ensuing measures to combat the pandemic have put a serious strain on national administrations. In particular, in certain cases the crisis may also affect the capacity of the Member States’ administrations to ensure the implementation of EU law. In light of this, the Commission recently informed the Member States that the time periods for replies to ongoing infringement procedures launched since the beginning of the year have been extended. And today, it has been decided to give Member States the possibility to reply to each letter of formal notice and reasoned opinion submitted in this infringements package, within four months instead of the usual two months.

For more information on the EU infringement procedure, see the full [MEMO/12/12](#). For more detail on all decisions taken, consult the [infringement decisions’ register](#).

European Commission, 14 May 2020

https://ec.europa.eu/commission/presscorner/detail/en/inf_20_859

List of compliant notifications for inclusion in the BPR Review Programme updated

2020-05-19

On 11 May 2020, ECHA updated the list of those active substance/product-type combinations for which a compliant notification for inclusion in the BPR Review Programme has been made. The following substances were updated:

Silver, as a nanomaterial

Chlorine dioxide generated from sodium chlorite and sodium persulfate

Eucalyptus citriodora oil and citronellal, hydrated, cyclized

1-[2-(Allyloxy)-2-(2,4-dichlorophenyl)ethyl]-1H-imidazole

Yordas Hive, 19 May 2020

<https://www.yordashive.com/news/article/915>

These decisions, covering various sectors and EU policy areas, aim to ensure the proper application of EU law for the benefit of citizens and businesses.

In addition, under the sustainable products initiative announced in the CEAP, it will work on a legislative initiative on re-use in food services to substitute single-use food packaging and cutlery by re-usable products.

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A farm to fork strategy for a fair, healthy, environmentally-friendly food system

2020-05-20

Food packaging plays a key role in the sustainability of food systems. The Commission will revise the food contact materials legislation to improve food safety and public health (in particular in reducing the use of hazardous chemicals), support the use of innovative and sustainable packaging solutions using environmentally-friendly, re-usable and recyclable materials, and contribute to food waste reduction. In addition, under the sustainable products initiative announced in the CEAP, it will work on a legislative initiative on re-use in food services to substitute single-use food packaging and cutlery by re-usable products.

European Commission, 20 May 2020

https://ec.europa.eu/info/sites/info/files/communication-annex-farm-fork-green-deal_en.pdf

INTERNATIONAL

icca provides information to guide chemical companies restarting facilities post COVID-19 shutdown

2020-05-20

One of the many unforeseen consequences of the global COVID-19 pandemic is the potential impact on chemical manufacturing facilities that have had to shut down operations for days or even weeks, and then restart their manufacturing processes.

According to the U.S. Chemical Safety Board, the majority of chemical facility incidents occur during facility startup. In the United States, for example, process safety incidents are five times more likely to occur during startup as compared to normal operations.

To address this, the International Council of Chemical Associations (ICCA) developed a guidance document, "**Be Smart: Safe Restart: Restarting Chemical Production Facilities Post COVID-19 Restrictions**," intended to prompt owners and operators of chemical production facilities to consider how the unique circumstances created by COVID-19 may have impacted their ability to restart safely.

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The document highlights the importance for facility operators to conduct a pre-startup safety review, to reassess hazards that may exist due to any changes that occurred during the shutdown period. A pre-startup safety review can help companies evaluate additional impacts due to any complications associated with complete shutdown that might impact startup procedures of any or all processes.

While safe restart procedures will vary by company, and often involve great detail, the document outlines general elements that a company can include in its restart approach. While the information in the document is applicable to all types of facilities, ICCA seeks to specifically promote this information to small and medium-sized companies and facilities in developing nations.

ICCA is circulating "**Be Smart: Safe Restart**" to chemical manufacturing companies around the globe via their national chemical associations and is translating it into several languages, including English, Spanish, French, German, Hindi, Mandarin, Thai, Malay and Korean. The document is being posted to the ICCA website and the American Chemistry Council's COVID-19 Resources website, and other national associations are encouraged to include it on their websites as well.

ICCA, 20 May 2020

<https://www.icca-chem.org/icca-provides-information-to-guide-chemical-companies-restarting-facilities-post-covid-19-shutdowns/>

In the United States, for example, process safety incidents are five times more likely to occur during startup as compared to normal operations.

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REACH Update

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3 REACH testing proposal consultations launched

2020-05-19

On 14 May 2020, ECHA started a 45 day public commenting period on 3 testing proposals for the following substances:

Distillates (petroleum), hydrodesulfurized middle

Distillates (petroleum), hydrotreated middle

Gas oils (petroleum), hydrodesulfurized

Yordas Hive, 19 May 2020

<https://www.yordashive.com/news/article/912>

Are nanomaterials getting under your skin?

2020-05-20

A recent study has analysed existing research on whether nanomaterials used in consumer products and at workplaces are absorbed through the skin. The study calls for more comparable and high-quality data through well-organised and structured research programmes that follow OECD test guidelines.

The study, commissioned by the EU Observatory for Nanomaterials (EUON), found that the lack of standardised, validated methods and the use of varying testing protocols makes it difficult to compare results and evaluate whether nanomaterials can penetrate the skin.

Based on the findings, nanomaterials rarely absorb through intact skin, except for silver that is likely to partly penetrate in ionic form. Silver is used for its anti-bacterial properties in textiles and can be found in other consumer products such as pharmaceuticals and cosmetics.

Some of the analysed studies suggest that absorption through damaged skin is higher than through intact skin.

A key recommendation for any new studies that aim to provide proof of absorption through the skin is to perform them using tests performed on tissue in external environments with minimal alterations to natural conditions (ex vivo), comparable to OECD Test Guideline 428, with human or porcine skin. Rodent skin should not be used due to differences in skin characteristics between rodents and humans.

The study covered experimental data including tests performed inside the bodies of living organisms (in vivo) and ex vivo studies. It looked at factors

Based on the findings, nanomaterials rarely absorb through intact skin, except for silver that is likely to partly penetrate in ionic form.

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associated with test methodology that can affect absorption through the skin, for example: exposure conditions, different experimental set-ups, and methods. The effects of the characteristics of nanomaterials on skin absorption, including particle size and surface charge, were also analysed.

In addition to compiling relevant studies, the study looked at test guidelines and whether the results are available in a structured way, for example, following OECD harmonised templates.

The study was carried out for the EUON by RPA consortium of Triskelion and RIVM.

Background

Many products we use in our daily lives come into contact with our skin. Some, including cosmetics such as sunscreens, and textiles, use nanotechnology to improve their quality. This means our skin can also come into contact with manufactured nanomaterials.

This study looks at existing research to make recommendations for generating comparable and high-quality data to enable authorities to better regulate nanomaterials and companies to ensure their safe use.

The EUON aims to increase the transparency of information available to the public on the safety and markets of nanomaterials in the EU. A key aim of the observatory is to create a one-stop shop for information, where EU citizens and stakeholders including NGOs, industry, and regulators can find accessible and relevant safety information on nanomaterials on the EU market.

The EUON uses a part of its funding to carry out studies on different aspects related to the safety and uses of nanomaterials in the EU.

EUON, 20 May 2020

https://euon.echa.europa.eu/view-article/-/journal_content/title/are-nanomaterials-getting-under-your-skin-?utm_source=Twitter.com&utm_medium=social&utm_campaign=EUON

Updated guidance clarifies labeling requirements for poison centre notifications

2020-05-19

The Guidance on harmonised information relating to emergency health response – Annex VIII to CLP – has been updated (version 3.0) to include

In addition, the Labeling and Packaging Guidance has also been updated.

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changes following the annex's first amendment, which entered into force on 20 January 2020.

In addition, the Labelling and Packaging Guidance has also been updated.

ECHA is currently working on additional changes to the Guidance resulting from the second amendment of Annex VIII, which has been consulted with Competent Authorities for REACH and CLP (CARACAL) on 15 May 2020 and expected to be finalised and adopted by the Commission by the end of summer 2020.

The second amendment covers workability issues identified by certain industry sectors, such as for mixtures with high or unpredictable composition variability, where a disproportionate number of notifications and UFI's would be required.

ECHA, 19 May 2020

<https://poisoncentres.echa.europa.eu/-/updated-guidance-clarifies-labelling-requirements-for-poison-centre-notifications>

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Janet's Corner

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Chemical formula for a banana

2020-05-29

What Is The Chemical Formula for Banana?

BaNa2



 CHEMISTRYJOKES.COM

<https://www.chemistryjokes.com/jokes/what-is-the-chemical-formula-for-banana/>

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Hazard Alert

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Butanone

2020-05-08

Butanone—also known as methyl ethyl ketone (MEK)—is a colourless liquid organic compound. The chemical formula for MEK is C_4H_8O or $CH_3COCO_2CH_3$. It has a sweet sharp odour, reminiscent of acetone or mint. The compound is naturally occurring in some fruits and vegetables in trace amounts—however it is usually produced on an industrial scale for chemical use. Butanone can also be found in the air, as a by-product of car and truck exhausts. It is soluble in water [1,2]

USES [1,2]

Butanone is most commonly used across chemical industries as a solvent and as a plastic welding agent. As a solvent, it is often used in paints, resins and other coatings because it effectively dissolves many substances and due to its quick evaporation time. As a plastic welding agent, MEK effectively dissolves polystyrene and other plastics—an application which is often used in scale model kits.

ROUTES OF EXPOSURE [3]

- Methyl ethyl ketone can be found in both indoor and outdoor air.
- It can be produced in the outdoor air by the photo-oxidation of butane.
- The compound has also been found in drinking and surface water.

HEALTH EFFECTS

Methyl ethyl ketone poisoning affects a range of systems including the respiratory, nervous and blood systems.

Acute Effects [3]

Severity of symptoms depend on the level and type of exposure.

- Acute, but high concentrations, of MEK can result in irritation to the eyes, nose and throat.
- Acute exposure can also result in CNS depression, nausea and headaches.
- Dermal exposure to the compound has resulted in dermatitis.

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Chronic Effects [4]

Methyl ethyl ketone is toxic to multiple body systems. Long-term exposure to the compound can result in severe chronic headaches, loss of balance, memory loss, fatigue and tachycardia. It can also cause encephalopathy, distal axonopathy, persistent neurological problems, cerebellar and brainstem atrophy and general central nerve fibre degeneration. It is not a carcinogen.

SAFETY

First Aid Measures [5]

- Ingestion: DO NOT INDUCE VOMITING. If the victim is not convulsing, and is conscious, give them one or two glasses of water to dilute the compound. If they are unconscious or convulsing, put the victim in the recovery position. Immediately contact a medical professional.
- Skin contact: Immediately wash affected skin with water, while removing contaminated clothing. Do not re-wear until it has been thoroughly de-contaminated. Wash affected areas with soap and water. If symptoms persist, contact a healthcare professional.
- Eye contact: Check for and remove contact lenses if easy to do so. Rinse eyes carefully with water or normal saline solution for 20-30 minutes. Take the victim to a medical centre.
- Inhaled: Take victim to the nearest fresh air source and monitor their breathing. Allow them to rest and contact a medical professional.
- General: Never administer anything by mouth to an unconscious, exposed person.

Exposure Controls/Personal Protection [4]

- Engineering controls: Emergency eyewash fountains and safety showers should be accessible in the immediate area of the potential exposure. Ensure there is adequate ventilation. Whenever possible, material should be handled in a laboratory.
- Personal protection: Safety glasses, protective and dustproof clothing, glove, an apron and an appropriate mask.

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Hazard Alert

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REGULATION [5]

United States:

The Occupational Safety and Health Administration (OSHA) has set an 8-hour time weighted average (TWA) concentration for butanone of 200ppm. The National Institute of Occupational Health and Safety (NIOSH) has set a short-term exposure limit (STEL) of 300ppm.

Australia [6]

Safe Work Australia has set an 8-hour time TWA for butanone of 150ppm. They have set a STEL of 300ppm.

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Oldest *Homo sapiens* in Europe—and a cave bear pendant—suggest cultural link to Neanderthals

2020-05-11

During a warm spell about 46,000 years ago, a small band of people took shelter in a cave on the northern slope of the Balkan Mountains in what is now Bulgaria. There, they butchered bison, wild horses, and cave bears, leaving the cave floor littered with bones and a wealth of artifacts—ivory beads, pendants made with cave bear teeth, and stone blades stained with red ochre.

This region had long been home to Neanderthals, who left stone tools in the same cave more than 50,000 years ago. But these cave dwellers were new to Europe, as an international team [reports in *Nature*](#) this week. Researchers re-excavated the cave and used a cutting-edge toolkit of their own to identify a molar and a handful of bone fragments as belonging to *Homo sapiens*, our own species. Precise new dates show these cave dwellers lived as early as 46,000 years ago, which makes them the earliest known members of our species in Europe. “It’s a wonderful example of pulling all these lines of evidence together to make a solid argument that *H. sapiens* were the authors” of a particular style of jewelry and tools, says paleoanthropologist Katerina Harvati of the University of Tübingen. The work is also reigniting a long-standing debate about how Neanderthals and moderns may have influenced each other—because Neanderthals crafted similar artifacts a few thousand years later.

The last Neanderthals didn’t vanish from Western Europe until about 40,000 years ago, so the two kinds of humans must have overlapped on the continent for at least 5000 to 7000 years; previous DNA studies have shown that they mated. Bones of early *H. sapiens* in Europe are scarce, so researchers try to match their presence to the tools they carried, such as the sophisticated artifacts known as the Aurignacian, including specialized bladelets, carved figurines, and musical instruments, which date from 43,000 to 33,000 years ago. The reign of the Neanderthals from about 400,000 to 40,000 years ago, in contrast, is marked by less refined Mousterian tools. But researchers have puzzled over who crafted “transitional” artifacts—a grab bag of bone tools, beads, and jewelry immediately preceding the Aurignacian. One of these diverse toolkits, called the Initial Upper Paleolithic (IUP), shows up first in the Middle East about 47,000 years ago and is soon found across Eurasia.

Fragmentary fossils found with the artifacts at one site in the United Kingdom and one in Italy suggested *H. sapiens* made some transitional

This region had long been home to Neanderthals, who left stone tools in the same cave more than 50,000 years ago.

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assemblages, but questions persist about the links between fossils and artifacts at those sites. The Bulgarian cave, called Bacho Kiro, yielded two partial human jaws in the 1970s, but those were lost.

In 2015, paleoanthropologist Jean-Jacques Hublin and colleagues at the Max Planck Institute for Evolutionary Anthropology joined forces with Bulgarian researchers to re-excavate Bacho Kiro. They uncovered thousands of bones, stone and bone tools, beads and pendants, and a human molar.

The shape of the molar marked it as a member of *H. sapiens*, but many of the bones were too fragmentary to tell whether they were animal or human. So, the Max Planck team scrutinized proteins in the bone. They extracted collagen from 1271 fragments and applied a new method called ZooMs to analyze them. Four fragments from the older layers were human. Researchers then extracted DNA from these bones and the tooth and found that the mitochondrial sequences—the most abundant DNA in many fossils—were those of *H. sapiens*. The team is now analyzing the fossils' nuclear DNA.

Meanwhile, Max Planck radiocarbon dating specialist Helen Fewlass and her colleagues directly dated collagen from 95 bones. They report in *Nature Ecology & Evolution* that the human bones and artifacts date from 43,650 to 45,820 years ago. The ages of animal bones cut or modified by people suggest they were in the cave “probably beginning from 46,940” years ago, Fewlass says. At about this time, the climate of Europe had begun to warm, which may have enticed *H. sapiens* with IUP toolkits to venture north from the Middle East, into the Balkans and beyond, Hublin says. (The DNA of these early arrivals shows, however, that they left no descendants in Europe today.)

Hublin notes that pendants made from the teeth of cave bears at Bacho Kiro are similar to pendants thought to be the handiwork of later Neanderthals and crafted about 42,000 to 44,000 years ago—the so-called Châtelperronian industry, first found at the Grotte du Renne site in France. He argues that this supports his long-held contention that Neanderthals picked up this type of pendant from moderns.

Others say that extrapolation goes too far. The “transitional” technologies such as IUP are so diverse and widespread that it's not clear that only one kind of human invented them, says archaeologist Nick Conard, also at the University of Tübingen. And archaeologist Francesco d'Errico of the University of Bordeaux, who has long debated Hublin over Neanderthals' abilities, points to earlier notched bone scrapers and beadlike objects

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made of eagle talons as evidence that Neanderthals could create sophisticated art and technology well before they met modern humans.

Debate is sure to continue, but archaeologists welcome the “very significant” dates at Bacho Kiro, says Tom Higham, a radiocarbon specialist at the University of Oxford. “For the first time, we're able to pin the IUP as being made by anatomically modern humans in Europe.”

sciencemag.org, 11 May 2020

<https://www.sciencemag.org>

Robots that can sniff out chemical weapons and pollution are coming soon—a study

2020-05-12

Whether it's old gym clothes, a wet dog, or strong body odor -- our brains are remarkably good ignoring pervasive smells. It's a quirk of our olfactory system that's called **habituation**, which increases focus on new and threatening smells. Beyond uses in our brain, scientists believe a form of habituation can be used by A.I. to process massive amounts of data.

Borrowing neural circuitry from a fruit fly, scientists have designed an algorithm to mimic this neurobiological phenomenon, hoping to learn more about habituation. Researchers think this algorithm could design an **electronic nose** to sniff out pollution in cities or chemical weapons in combat.

Bottom of Form

Even if you've got the best nose in the world, it's very likely that there are smells your nose has hidden from you.

Take your house for example. To you, your house might not smell like anything, but a person visiting for the first time might quickly pick-up on the fact that you have a not-so-small addiction to lavender lotion. This discrepancy isn't due to anything fundamentally wrong with your sniffer, but rather that your brain has had enough prolonged exposure to the scent to decide it's not important enough to bring to the forefront of your attention. Unlike, say, a sudden gas leak in your kitchen that would pose a danger.

In new research, published Monday in the journal *Proceedings of the National Academy of Sciences*, a group of researchers from UC San Diego, the Salk Institute for Biological Studies and Cold Spring Harbor Laboratory

Researchers think this algorithm could design an electronic nose to sniff out pollution in cities or chemical weapons in combat.

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draws on the pastoral example of a dog in a field of flowers to illustrate this point.

“For example, if a dog sitting in a garden habituates to the smell of the flowers, then any change to the environment — for example, a coyote appearing in the distance — would more likely be detected by the dog, despite the fact that the coyote’s smell represents only a small component of the raw odor entering the dog’s nose,” write the authors.

Looking beyond mammals, the researchers chose to focus on an old, scientific standby, co-author and associate professor of biology at Cold Spring Harbor Laboratory, [Saket Navlakha](#), tells *Inverse*: **fruit flies**.

“Fruit flies are a wonderful model because so much is known about their neural anatomy and physiology. Fruit flies have about 100,000 neurons in their brain and recently, a large portion of their connectome was mapped out at very fine (synaptic) resolution,” A connectome is a comprehensive map of neural connections in the brain, think of it like a wiring diagram for the most complex computer in the world.

“This has made it possible to uncover the algorithms that neural circuits have evolved to solve basic neurobiological problems. In addition, there is evidence that some of the basic computational strategies used by fruit flies may be conserved in mammals; so studying fruit flies may give us a basis for understanding computations in other species.”

After frolicking in a field of flowers for awhile, a dog will become habituated to the scent and stop noticing it. This is important because it allows them to notice other scents, like a dangerous coyote. PNAS

In their algorithm, the researchers mimicked a part of the fruit fly’s neural circuitry called the “negative image” model of habituation. Essentially, this model works by storing a habituated odor and comparing it with new odor landscapes to detect differences or new smells. In animals, like fruit flies, this helps differentiate between new smells that could be dangerous and existing smells that mean no harm.

“Habituation is a type of background subtraction method that computer scientists have long used in areas such as computer vision. The basic goal is to identify changes in a scene (e.g., a moving car, or a person walking), by subtracting a static or nearly static background, and therefore, highlighting the foreground. Turns out that this is an important problem in olfaction, as well,” says Navlakha.

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Going forward, Navlakha tells *Inverse* that a simple biologically derived algorithm like this could be an important tool for computer systems, like neural networks, that process a lot of information very quickly.

“[The] approach we developed studying the fruit fly is very simple, easy to implement, and has good properties (e.g., fast dishabituation in case the background becomes important),” says Navlakha. “As an example, we showed in our paper that this type of algorithm could be useful for performing online similarity searches. We also think it may play well in deep networks, though we did not explore this idea here.”

And even beyond simple computer processing, Navlakha says that this algorithm could be used to develop electronic noses that can sniff out chemical weapons or dangerous pollution.

“There are lots of potential applications for electronic noses, ranging from pollution detection in cities, quality control of food in kitchens and restaurants, and chemical detection in combat scenarios,” says Navlakha. “This would be similar to giving robots a sense of smell, and there are indeed many companies today trying to replicate some of the basic features of the nose (ranging from designing olfactory sensors to designing odor identification algorithms).”

[inverse.com](#), 12 May 2020

<https://www.inverse.com>

he end of plastic? New plant-based bottles will degrade in a year

2020-05-16

Beer and soft drinks could soon be sipped from “all-plant” bottles under new plans to turn sustainably grown crops into plastic in partnership with major beverage makers.

A biochemicals company in the Netherlands hopes to kickstart investment in a pioneering project that hopes to make plastics from plant sugars rather than fossil fuels.

The plans, devised by renewable chemicals company Avantium, have already won the support of [beer-maker Carlsberg](#), which hopes to sell its pilsner in a cardboard bottle lined with an inner layer of plant plastic.

Avantium’s chief executive, Tom van Aken, says he hopes to greenlight a major investment in the world-leading bioplastics plant in the Netherlands

Globally around 300 million tonnes of plastic is made from fossil fuels every year, which is a major contributor to the climate crisis.

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by the end of the year. The project, which remains on track despite the coronavirus lockdown, is set to reveal partnerships with other food and drink companies later in the summer.

The project has the backing of Coca-Cola and Danone, which hope to secure the future of their bottled products by tackling the environmental damage caused by plastic pollution and a reliance on fossil fuels.

Globally around 300 million tonnes of plastic is made from fossil fuels every year, which is a major contributor to the climate crisis. Most of this is not recycled and contributes to the scourge of microplastics in the world's oceans. Microplastics can take hundreds of years to decompose completely.

"This plastic has very attractive sustainability credentials because it uses no fossil fuels, and can be recycled – but would also degrade in nature much faster than normal plastics do," says Van Aken.

Avantium's plant plastic is designed to be resilient enough to contain carbonate drinks. Trials have shown that the plant plastic would decompose in one year using a composter, and a few years longer if left in normal outdoor conditions. But ideally, it should be recycled, said Van Aken.

The bio-refinery plans to break down sustainable plant sugars into simple chemical structures that can then be rearranged to form a new plant-based plastic – which could appear on supermarket shelves by 2023.

The path-finder project will initially make a modest 5,000 tonnes of plastic every year using sugars from corn, wheat or beets. However, Avantium expects its production to grow as demand for renewable plastics climbs.

In time, Avantium plans to use plant sugars from sustainable sourced biowaste so that the rise of plant plastic does not affect the global food supply chain.

theguardian.com, 16 May 2020

<https://www.theguardian.com>

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New solar panels suck water from air to cool themselves down

2020-05-11

Like humans, solar panels don't work well when overheated. Now, researchers have found a way to make them "sweat"—allowing them to cool themselves and increase their power output.

It's "a simple, elegant, and effective [way] to retrofit existing solar cell panels for an instant efficiency boost," says Liangbing Hu, a materials scientist at the University of Maryland, College Park.

Today, more than 600 gigawatts of solar power capacity exists worldwide, providing 3% of global electricity demand. That capacity is expected to increase fivefold over the next decade. Most use silicon to convert sunlight to electricity. But typical silicon cells convert only 20% of the Sun's energy that hits them into current. Much of the rest turns into heat, which can warm the panels by as much as 40°C. And with every degree of temperature above 25°C, the efficiency of the panel drops. In a field where engineers struggle for every 0.1% boost in power conversion efficiency, even a 1% gain would be an economic boon, says Jun Zhou, a materials scientist at Huazhong University of Science and Technology.

Decades ago, researchers showed that cooling solar panels with water can provide that benefit. Today, some companies even sell water-cooled systems. But those setups require abundant available water and storage tanks, pipes, and pumps. That's of little use in arid regions and in developing countries with little infrastructure.

Enter an atmospheric water collector. In recent years, researchers have devised materials that can suck water vapor from the air and condense it into liquid water for drinking. Among the best is a gel that strongly absorbs water vapor at night, when the air is cool and humidity is high. The gel—a mix of carbon nanotubes in polymers with a water-attracting calcium chloride salt—causes the vapor to condense into droplets that the gel holds. When heat rises during the day, the gel releases water vapor. If covered by a clear plastic, the released vapor is trapped, condenses back into liquid water, and flows into a storage container.

Peng Wang, an environmental engineer at Hong Kong Polytechnic University, and his colleagues thought of another use for the condensed water: coolant for solar panels. So, the researchers pressed a 1-centimeter-thick sheet of the gel against the underside of a standard silicon solar panel. Their idea was that during the day, the gel would pull heat from

Now, researchers have found a way to make them "sweat"—allowing them to cool themselves and increase their power output.

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the solar panel to evaporate water it had pulled out of the air the previous night, releasing the vapor through the bottom of the gel. The evaporating water would cool the solar panel as sweat evaporating from the skin cools us down.

The researchers found that the amount of gel they needed depended primarily on the environment's humidity. In a desert environment with 35% humidity, a 1-square-meter solar panel required 1 kilogram of gel to cool it, whereas a muggy area with 80% humidity required only 0.3 kilograms of gel per square meter of panel.

The upshot in either case: The temperature of the water-cooled solar panel dropped by as much as 10°C. And the electricity output of the cooled panels increased by an average of 15% and up to 19% in one outdoor test, where the wind likely enhanced the cooling effect, Wang and his colleagues report today in *Nature Sustainability*.

"The efficiency increase is significant," Zhou says. But he points out that rain could dissolve the calcium chloride salt in the gel, sapping its water-attracting performance. Wang agrees, but notes the hydrogel sits beneath the solar panel, which should shield it from rain. He and his colleagues are also working on a second-generation gel that shouldn't degrade, even when wet.

Another design option, Wang says, is a setup that could trap and recondense water after it evaporates from the gel. That water, he says, could be used to clean any dust that accumulates on the solar panels, solving a second power-sapping problem at the same time. Alternatively, that same water could be stored for drinking, addressing another desperate need in arid regions.

sciencemag.org, 11 May 2020

<https://www.sciencemag.org>

Neuroscientists think they've found a previously unknown form of neural communication

2020-05-16

Scientists think they've identified a previously unknown form of neural communication that self-propagates across brain tissue, and can leap wirelessly from neurons in one section of brain tissue to another – even if they've been surgically severed.

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The discovery, made in February 2019, offers some radical new insights about the way neurons might be talking to one another, via a mysterious process unrelated to conventionally understood mechanisms, such as synaptic transmission, axonal transport, and gap junction connections.

"We don't know yet the 'So what?' part of this discovery entirely," said neural and biomedical engineer Dominique Durand from Case Western Reserve University last year.

"But we do know that this seems to be an entirely new form of communication in the brain, so we are very excited about this."

Before this, scientists already knew there was more to neural communication than the above-mentioned connections that have been studied in detail, such as synaptic transmission.

For example, researchers have been aware for decades that the brain exhibits slow waves of neural oscillations whose purpose we don't understand, but which appear in the cortex and hippocampus when we sleep, and so are hypothesised to play a part in memory consolidation.

"The functional relevance of this input- and output-decoupled slow network rhythm remains a mystery," explained neuroscientist Clayton Dickinson from the University of Alberta, who wasn't involved in the new research but has discussed it in a perspective article.

"But [it's] one that will probably be solved by an elucidation of both the cellular and the inter-cellular mechanisms giving rise to it in the first place."

To that end, Durand and his team investigated slow periodic activity *in vitro*, studying the brain waves in hippocampal slices extracted from decapitated mice.

What they found was that slow periodic activity can generate electric fields which in turn activate neighbouring cells, constituting a form of neural communication without chemical synaptic transmission or gap junctions.

"We've known about these waves for a long time, but no one knows their exact function and no one believed they could spontaneously propagate," Durand said.

"I've been studying the hippocampus, itself just one small part of the brain, for 40 years and it keeps surprising me."

"But we do know that this seems to be an entirely new form of communication in the brain, so we are very excited about this."

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This neural activity can actually be modulated - strengthened or blocked - by applying weak electrical fields and could be an analogue form of another cell communication method, called ephaptic coupling.

The team's most radical finding was that these electrical fields can activate neurons through a complete gap in severed brain tissue, when the two pieces remain in close physical proximity.

"To ensure that the slice was completely cut, the two pieces of tissue were separated and then rejoined while a clear gap was observed under the surgical microscope," the authors explained in their paper.

"The slow hippocampal periodic activity could indeed generate an event on the other side of a complete cut through the whole slice."

If you think that sounds freaky, you're not the only one. The review committee at *The Journal of Physiology* - in which the research has been published - insisted the experiments be completed again before agreeing to print the study.

Durand et al. dutifully complied, but sound pretty understanding of the cautiousness, all things considered, given the unprecedented weirdness of the observation they're reporting.

"It was a jaw-dropping moment," Durand said, "for us and for every scientist we told about this so far."

"But every experiment we've done since to test it has confirmed it so far."

It'll take a lot more research to figure out if this bizarre form of neural communication is taking place in human brains - let alone decoding what exact function it performs - but for now, we've got new science that's shocking in all kinds of ways, as Dickson adroitly observes.

"While it remains to be seen if the [findings] are relevant to spontaneous slow rhythms that occur in both cortical and hippocampal tissue *in situ* during sleep and sleep-like states," Dickson wrote, "they should probably (and quite literally) electrify the field."

sciencealert.com, 16 May 2020

<https://sciencealert.com>

Coronavirus, the planet and you

2020-05-15

COVID-19 has turned the world upside down and remains widespread.

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We can all educate ourselves on the virus and how it moves in the world around us.

Here's our guide.

Coronavirus explained

Coronaviruses are a large family of viruses common in people and animals. SARS-CoV-2 is the novel coronavirus that causes the disease COVID-19, to which there is presently no cure.

COVID-19 was first reported in Wuhan, China, in December 2019 and has rapidly spread across the globe. All 50 states have reported infections. It is, as of May 2020, the leading cause of death in the United States.

On March 11, the COVID-19 outbreak was characterized as a pandemic by the World Health Organization.

Read on for possible explanations for the rise in animal-borne diseases, environmental characteristics that can increase your risk, symptoms, and steps you can take to protect yourself and your family.

Coronavirus and climate change

There is no direct evidence that climate change has affected the spread of coronavirus. However, what we do know is that climate change makes animals of all sizes move to escape the heat as the planet warms. This causes ecosystems to collide and **animals without previous contact to interact**, creating opportunities for pathogens to find new hosts.

Climate change has caused favorable conditions for other infectious diseases:

- Lyme disease
- Waterborne diseases
- Mosquito-borne diseases

Root causes of climate change also impact the likelihood of animal-borne diseases:

- **Deforestation** - loss of habitat that forces animals to migrate and potentially come in contact with other animals or people and share germs.
- For example, bats that carried Ebola were forced to move to new habitats because the forests in West Africa they lived in were cut down to grow palm oil trees.

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- **Large livestock farms** - increase the risk of transmission from animals to people. Alternatives to these farms would lower risk of disease and decrease greenhouse gas emissions.

In detail: [This conversation on COVID-19](#) with the director of Harvard University's Center of Climate, Health and the Global Environment further discusses climate change and coronavirus.

Coronavirus and the environment

Air pollution has been shown to increase risk of catching respiratory diseases, and causing the effects to be worse—a study done on SARS, a virus closely related to COVID-19, found that people who breathed dirtier air were about twice as likely to die from the infection.

In detail: Our reporter looks at the Pittsburgh, Pennsylvania region and [how its chronic air pollution connects to its above-average coronavirus death rate](#).

Who the coronavirus is killing suggests that the disease is not only a health crisis, but also an **environmental justice crisis**. African American, Latino, and Native American populations all carry disproportionately high COVID-19 related death rates.

In detail: From MLK Jr. to lead poisoning, [this article](#) from Grist highlights how the warning signs were there, but vulnerable populations across America were left unprepared and unprotected.

These populations are more likely to:

- Live in close or cramped communities where it is difficult to self-isolate
- Work in or live near factories that have left their respiratory systems compromised and more susceptible to diseases
- Deal with underlying health conditions such as diabetes, asthma, and cancer that heighten risk
- Lack access to safe drinking water or good health care

Bottom line: Your environment drastically affects your likelihood of catching and fighting coronavirus.

In detail: [This opinion piece](#) by Chase Iron Eyes of the Lakota People's Law Project warns us to use «the lessons of this pandemic in our fight to preserve the planet» before it's too late.

We've covered the impact of the environment on coronavirus, but what about the impact of coronavirus on the environment?

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Check out [this infographic](#) to discover how coronavirus has changed (both for the worse and for the better) the physical world we live in, from carbon emissions to waste, wildlife to energy.

Coronavirus and your health

As labs across the world race to find a vaccine, millions of humans have caught the virus or remain susceptible to catching it. Knowing the symptoms is important to help with early detection, isolation, and seeking medical care.

Infection is caused by droplets from an infected person's cough, sneeze or breath. **These droplets could be in the air or on a surface an infected person has touched.**

Coming into contact with the virus, then touching your eyes, nose, or mouth, gives the virus access to the mucous membranes in your throat, where it then spreads, and within 2-14 days you may show symptoms such as:

- Fever
- Cough or shortness of breath
- Fatigue
- Chills
- Headache

For most people, symptoms will end with a cough and fever—**more than 8 in 10 cases are mild**. But for some, especially those fragile or with underlying health conditions, the virus can cause more severe symptoms and develop into pneumonia and acute respiratory distress syndrome, which can eventually cause the body to shut down.

Take action

Protect yourself and your family.

- Wash your hands frequently—good ol' soap and warm water will work just fine.
- Wear a mask when out in public—this will help reduce the spread of infection.
- Practice social distancing—remain at least 6 feet apart to again help reduce spread of the virus. Even if a friend seems healthy, remember that many people who catch the virus asymptomatic and, without knowing it, can spread the disease.

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- Follow state and national mandates—as frustrating as it may be sometimes, being diligent now will prove a better outcome over time.

Don't fall into national panic-buys.

- Expect minor shortages, as factories are shut down and shipping and delivery slows due to precautionary measures taken to sanitize and ensure the safety of essential workers.
- Nevertheless, be smart with your money and resources. As panic around an item's availability increases, prices can skyrocket. Amazon, eBay and other online retailers have taken steps to curb price gouging, but still be sure to weigh the necessity of the item with the cost it may be.

Pressure your representatives to create lasting change.

- Contact your local, state, and national representatives to emphasize the need for permanent reforms, from workplace benefits and sick-leave rights to investing in low-carbon technologies to make our communities more climate-resilient.
- Rethinking our agricultural practices, reducing pollutants in our air, and investing in public health research are steps we can take to have a long-lasting impact on the welfare of our health and our planet. Let your government know you care.
- Find your state and national representatives [here](#).

ehn.org, 15 May 2020

<https://www.ehn.org>**Hoovering the ocean**

2020-05-13

SAN DIEGO — A spring storm had retreated inland during the night, leaving a canopy of unbroken clouds over Mission Bay. About 20 engineering students and others gathered in the morning chill to launch a cockeyed-looking vessel, mechanical guts fully visible, into the still water.

The contraption's hull, cannibalized from a 16-foot, decades-old catamaran, supported a conveyor belt, motor and array of batteries the size of a picnic cooler. Solar panels were mounted like an awning atop the aluminum frame. Its creators had relied on off-the-shelf materials during construction and christened the result FRED — an endearing acronym for floating robot for eliminating debris.

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"We're just happy that it floats," joked Justin Ho, a mechanical engineering major at the University of California at San Diego, who took the first turn at remotely steering the prototype around the bay using a modified video-game controller.

Grand, maybe unrealistic, hopes ride on FRED, whose baptism last month was only a first test for the students and a small start-up called [Clear Blue Sea](#). Like other emerging ventures around the world, the nonprofit group is trying to help solve one of the planet's most daunting problems: oceans littered with plastic. By next spring, the Californians hope to deliver a proven design for a 50-foot version of FRED capable of autonomously collecting trash on open bodies of water. They also plan to make their blueprints public to accelerate research.

"We all need to do our part," said Susan Baer, a former management consultant who abandoned retirement to found Clear Blue Sea four years ago. Otherwise, "this stuff is never going to go away." Blue Sea tests FRED in San Diego

While most efforts remain untested — proverbial drops in the ocean — they reflect the exponential growth in awareness of the damage that plastic is wreaking. Many groups are grass-roots endeavors. Sailor Mary Crowley's [Ocean Voyages Institute](#) recruits mariners to tag debris with satellite trackers so it can be easily retrieved later. Three [siblings from Indonesia](#), with hardware-store ingenuity, built a series of wire-mesh screens to filter discarded plastic out of rivers in their homeland before it reaches open waters.

Yet the accelerating search for global remedies is not limited to just cleaning up the mess in waterways. Scientists have identified bacteria, worms and caterpillars that can digest plastic and might be used as alternatives to recycling, burning or burying it.

By the end of this year, Marriott International has promised to eliminate single-use plastic bottles of shampoo and conditioner in most of its 7,000 hotels. Hyatt Hotels said it will do the same at 900 properties by mid-2021.

And some plastic-heavy industries are trying to become solution leaders. Dell has pledged to source all of its packaging and half of its product material from recycled or renewable materials by 2030. The computer company is part of [NextWave Plastics](#), a consortium of tech and consumer brands incorporating plastic waste into their supply chains to make not only laptops but handbags and running shoes. They've committed to

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diverting at least 25,000 metric tons of plastic — the equivalent of 1.2 billion plastic water bottles — from entering the ocean by the end of 2025.

“The plastic issue is a sustainability issue,” said Holmes Rolston III, a philosopher at Colorado State University and a leading expert in environmental ethics. “We cannot sustain the dumping of trillions of bits of plastic into the ocean. It is more of a moral issue now, more than it ever was, which makes it a lot like global warming. We became responsible when we realized what was going on.”

If these actions were born through any single event, it might be the day in August 2015 when a team of Texas researchers encountered an injured turtle off Costa Rica. A plastic straw was stuck in its nostril and had to be extracted with pliers. The [video](#) the researchers took as they did so went viral and is largely credited for a widespread vilification of plastic straws. Stores and cities started to impose bans.

Reports and images of suffering animals continue to flood the Internet, many showing dead seabirds, manta rays and [whales with stomachs full of plastic](#). A famous photo posted to Instagram in 2017 showed a sea horse off Indonesia clutching a plastic swab in its tail.

The most notorious symbol of the ocean plastic pandemic, and the specific inspiration for FRED, swirls halfway between California and Hawaii. Dubbed the [Great Pacific Garbage Patch](#), the vortex is popularly described as twice as big as Texas. The size estimate is a bit misleading since the patch does not have a clear boundary and exists in the north Pacific as well as to the south.

“People can argue about climate change and say it is part of a natural cycle,” said oceanographer Nikolai Maximenko of the University of Hawaii, who has studied how debris interacts with currents and marine life. “But no one can deny plastic is a change we produced.”

Exactly how much lies in our oceans is unknown. Available data suggest that about 300 million tons have entered the water since plastic went into mass production in the late 1940s, Maximenko said. (That’s comparable to more than 2 million blue whales, the largest animal ever known to have lived.) Every year, the worldwide total increases by about 8 to 10 million tons, with as much as 250,000 tons being microplastics that are smaller than a quarter-inch — the width of a pencil eraser.

A [study](#) led by the Scripps Institution of Oceanography at the University of California at San Diego found that plastic is part of our fossil record,

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deposited in ocean floor sediment for the past 70 years. Nanoplastics, the smallest plastic particles, can be conveyed in water vapor and have been found in Antarctic ice as well as in rain high atop the Andes. They also have been found in seafood we eat, our beer and drinking water — even in our feces. Microscopic bits of plastic are indeed inside of us. Living in an age of plastic, we have become plastic.

“There is very little doubt these particles are in our food and water supply at this point,” said Phoebe Stapleton, an assistant professor of pharmacology and toxicology at Rutgers University who studies their still-unknown effects on human physiology.

Many scientists and activists consider mitigation efforts to be among the least effective ways of attacking the problem. Dianna Cohen is chief executive of the [Plastic Pollution Coalition](#), a global nonprofit organization linking individuals, organizations, policymakers and companies. She says a lasting solution will require producers, not consumers, to shoulder the responsibility and cost of managing plastic waste. That should go well beyond the cost of producing plastic, which is made from petroleum, and should factor in its afterlife and its environmental impact, Cohen says.

Beach cleanups, anti-pollution campaigns and recycling programs are part of what she calls “greenwashing” — a distraction and ultimately doomed to fail. In fact, because making virgin plastic is still so inexpensive, the commercial value of recycled plastic is so low that it has become worth far less than the cost of doing business.

“Recycling is not part of the solution of ocean trash. It’s part of the problem,” said Andrew McAfee, a scientist at the Massachusetts Institute of Technology and an expert in environmental economics.

No single solution exists. There is disagreement about how best to clean the ocean and even whether the benefits are worth the enormous expense and carbon footprint.

The [Ocean Cleanup](#), a Dutch organization led by inventor Boyan Slat, is attempting to design and deploy a system of nets and booms in the Pacific to passively gather debris in the patch. Its own research, announced this month, suggested that 90 percent of ocean plastic resides within five meters of the water surface, degrading over time into the microplastic that sinks to lower depths.

The group completed its first successful collection in late 2019 after a year of testing about 1,100 miles from the California coast and brought the

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trash, enough to fill a shipping container, to port in Vancouver on a gusty, rain-soaked day. Ocean Cleanup intends to certify the material as genuine ocean plastic and turn it into high-end products — an exotic backstory aimed at commanding a markup to fund future expeditions.

“We realized it was not just about the physical quality of the material, but it’s about the emotional quality,” said Slat, whose TED talks became a viral sensation and drew wealthy investors to his cause. “If the patch was made of aluminum, we would not have to get creative.”erceptor” in several rivers

By December, the organization had also built and positioned the “Interceptor.” The stationary barge diverts and traps the main source of ocean pollution: urban garbage floating down rivers. Two have already been used in Indonesia and Malaysia; two others will be put to work in Vietnam and the Dominican Republic.

Like FRED, the sleek, bullet-shaped Interceptor uses conveyor belts to draw waste into onboard bins. Its development began under wraps in Rotterdam, the Netherlands in 2015, about a year before Baer started Clear Blue Sea in San Diego with far more modest resources. For her, skepticism was as big a head wind as funding.

“The response was ... it’s too big to clean up,” Baer recalled recently. Her team moved ahead on a budget that slowly grew to \$230,000. In garage-band fashion, they worked in a small industrial park warehouse near the Miramar neighborhood’s military air base. Help was enlisted by word of mouth. The beer brewery next door proved a good place for recruitment.

Almost 100 unpaid interns from UC San Diego and other local colleges have contributed their time. No employee draws a salary, although next year the company hopes to have 10 paid staff and raise \$2 million in funding. Its next testing sites might be San Diego Bay and the heavily polluted Tijuana River.

“We always feel like we’re behind schedule,” said Tim Perry, a professional engineer in his 30s who led the hour-long testing that morning on Mission Bay.

He and the others kept FRED within 100 feet of the boat ramp. And they offered easy targets for its first foray, tossing table-tennis balls, Styrofoam tubes and painted water bottles into the water. Moving like a clumsy toddler, FRED struggled to capture its quarry. Most stuff got away, in part because the vessel unexpectedly created its own eddies that scattered items just before they could reach the conveyor belt. The human minders,

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both kayaking and swimming, collected as much by hand as their creation did.

On shore, the team mentally counted bugs and concocted fixes. Stiffen the boom arms that funnel debris. Reduce hydrodynamic drag by adding mesh or tines. Add buoyancy. The next version will have to be stouter, more efficient and sit higher above the waterline. Its solar panels will need to power propulsion, steering, electronics and mechanical systems with no backup power source.

What had begun with a mood of ceremonial thrill — everyone wearing a bright aqua T-shirt — ended swiftly. FRED was pulled up the boat ramp, strapped onto a trailer and towed back to the warehouse, its future life at sea still far on the horizon.

washingtonpost.com, 13 May 2020

<https://www.washingtonpost.com>

Seeds of hope: on a mission to protect Tasmania’s ancient pencil pines

2020-05-14

Hunched against the wind in Tasmania’s central highlands are the floral relics of the last ice age. Walking among them, armed with a large pole and a cloth bag, is James Wood, the coordinator of the Tasmanian seed bank. It is the first time in five years that Tasmania’s 1,000-year-old conifers have seeded, and he is determined not to miss it.

It is the third week of April. A coronavirus outbreak has occurred in Tasmania’s north-west, causing the premier to close two regional hospitals and place 5,000 health workers and their families in quarantine. And Wood is walking a deserted stretch of the Overland Track, alone but for Justin Dyer, his guide from the Tasmanian Walking Company, in search of stands of pencil pines, or *Athrotaxis cupressoides*.

On an ordinary day, the Overland Track carries 60 hikers. But the national parks are closed and travel banned due to the coronavirus, so for five days Wood and Dyer see no one except for a few park rangers, dozens of pademelons (a squat, short-tailed wallaby) and a hungry platypus that ignored them in favour of hunting in a tarn, two humans being no competition to the lure of a full belly.

“It was just incredibly quiet,” Wood says. “You do get this feeling of real privilege that you’re getting that place pretty much to yourself.”

It is the first time in five years that Tasmania’s 1,000-year-old conifers have seeded, and he is determined not to miss it.

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The pencil pines are one of five species of conifer endemic to Tasmania's high country, the most well-known of which are king billy pines (*Athrotaxis selaginoides*). They are the last remnants of the Gondwana forest, from a genus that is at least 150m years old.

The trees are not listed as threatened because they are not uncommon within their ecosystems, but that could change any given summer. Stands of pencil pines and cheshunt pines at Lake Mackenzie were destroyed when a fire raced down the Devil's Gullet in 2016. Stands of king billy pines were also lost.

"The reality is that if fire frequency increases in these upland areas, and that seems very likely, that could change very quickly," Wood says. "So what we are trying to do here is act preemptively and get seed collections in place when we can."

The Tasmanian pines are more dispersed and their habitat wilder, making a rescue effort like that which saved the ancient Wollomi pines in the New South Wales Blue Mountains this summer more difficult.

"It does make them very vulnerable," Wood says.

Pencil pines and other *Athrotaxis* produce seeds only every few years, as part of a global masting event that triggers sudden seed production in unrelated plants around the world.

The last masting event was in 2015. The trigger, says Wood, appears to be two successively hotter summers, although there's no consensus on the exact cause. This year the seeding was "patchy", with pencil pines on higher and drier areas not producing pine cones, and cheshunt pines, which often grow nearby, not seeding at all.

It means that while Tasmania will likely deliver on the prerequisite for hotter summers, due to the climate emergency, the accompanied drying out of the highlands could leave the pencil pines too stressed to seed.

That is why the 2020 masting was so important. An ambitious plan involving teams of volunteers, visiting specialists from the Royal Botanic Gardens in Edinburgh, helicopters and arborists was formed in December and tree enthusiasts on Facebook were mobilised to monitor conifer flowering. Those plans were spiked when the pandemic was declared, and Wood got permission for the two-person operation focused just on the pencil pines.

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Pencil pines are particularly tricky for seed gatherers, because they grow in the wild as suckers.

"Most of the stands of the trees that you see in Tasmania are all clonal," Wood says. "They sucker from their roots and spread that way so large strands of trees generally have only a couple of individuals. You may see several hundred trees but there may be only a dozen or less individuals in that stand."

They walked 70km over the five days, gathering two handfuls of pine cones from each of the 46 stands visited to ensure the seeds collected were genetically diverse. At the end, the bank was 8,000 seeds richer.

"Unfortunately we have missed all the other opportunities we had," Wood says. "Hopefully when the next masting event takes place those stands will still be there and still be happy."

[theguardian.com](https://www.theguardian.com), 14 May 2020

<https://www.theguardian.com>

Lab-evolved algae could protect coral reefs

2020-05-13

For the third time in 5 years, an underwater heat wave has turned vast stretches of coral on Australia's Great Barrier Reef ghostly white, a desperate survival strategy that is often a prelude to coral death.

Now, scientists there have taken a small step toward helping coral survive in a warmer world. For the first time, researchers have grown algae in a lab that can reduce coral bleaching, as it's known. The results are a notable advance in the growing field of "assisted evolution," in which scientists are working to alter coral genetics to help them endure hotter water.

It's a "groundbreaking" study, says Steve Palumbi, an evolutionary biologist at Stanford University who was not involved with the work. But he cautions that the approach is a far cry from something that could be used in the wild.

Coral and their algae are deeply intertwined. The tiny, plantlike organisms live inside the cells of coral polyps, the small, anemonelike single animals that form colonies to create the fantastically shaped skeletons typically called coral. The algae, called zooxanthellae, use coral waste products to help photosynthesize food, while in turn nourishing the coral host.

For the first time, researchers have grown algae in a lab that can reduce coral bleaching, as it's known.

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But that relationship sours during heat waves. Coral polyps eject the algae from their bodies, a phenomenon scientists suspect is a reaction to a flood of tissue-damaging molecules released by the overheated algae. Without their algae, the corals turn white, and, if the bleaching is severe enough, they can starve to death.

Coral geneticist Madeleine van Oppen hoped the algae could be coaxed to evolve into strains that reduced the bleaching response. To do that, van Oppen—a [leading promoter of assisted evolution](#) at the University of Melbourne—and colleagues turned to a common coral alga, *Cladocopium goreaui*. Starting with clones of a single copy of the alga to ensure they were genetically identical, they raised more than 100 generations over 4 years in 31°C water, comparable to a heat wave on the Great Barrier Reef.

Then Patrick Buerger, a postdoctoral researcher with the Australian government's Commonwealth Scientific and Industrial Research Organisation, squirted 10 different strains of the hot water algae into separate vials containing coral larvae. The pinhead-size animals absorbed the algae into their cells. He did the same thing to algae raised in more typical 27°C water. The team then stuck the combined larvae and algae into 31°C water for 1 week.

The results were mixed. Some heat-adapted algae that coped with hot water on their own didn't fare well when paired with coral larvae. The density of algal cells started to fall, a sign of bleaching. Some larvae died. But in three algal strains, the [cell density rose by 26%](#), the researchers report today in *Science Advances*. "Some of these [algae] can decrease coral thermal bleaching," van Oppen says. "So that is very exciting."

There are genetic clues about why some algae stood out. In one breed of the bleach-resistant algae, genes tied to converting carbon into sugars became more active after the hot water exposure, whereas genes related to photosynthesis turned down. It's possible that the decrease in photosynthesis protected the coral from toxic byproducts called reactive oxygen species that can spike during a heat wave, while the carbon activity helped keep the coral fed, she says.

Although the findings are promising, scientists have to answer a lot of questions before such algae might be used to aid wild coral. It's not known how these algae will interact with adult coral polyps. Nor is it known how they might compete with wild algae out on a reef.

Another question is whether the heat adaptations come from long-lasting changes to the algal genome, or temporary changes that could

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fade over several generations in the wild, says Debashish Bhattacharya, an evolutionary genomicist at Rutgers University, New Brunswick. Bhattacharya, who has bred algae for [salt tolerance](#) and [biofuels](#), says he suspects that with only hundreds of generations, the changes are likely not permanent. "I don't think we're talking about better genetic profiles here."

[sciencemag.org](https://www.sciencemag.org), 13 May 2020

<https://www.sciencemag.org>

Is environmental activism bad for business? History suggests not

2020-05-12

One of the big questions facing policymakers is whether to push ahead with their climate and environmental goals or to relax them during the global health pandemic. The Trump administration is choosing the latter, arguing that the regulatory pressures on business are, well, bad for business.

The global community is in pain. But a group of prominent scholars has come to a different conclusion than that of the White House. The [Oxford Smith School of Enterprise and the Environment](#) has analyzed the issue and concluded that investment in green technologies is the most efficient way to nurse an economy back to health. Renewable energy projects and modern electric grids can deliver the strongest medicine, it says, noting that those efforts have a long-term payback.

"Green fiscal recovery packages can act to decouple economic growth from greenhouse gas emissions and reduce existing welfare inequalities that will be exacerbated by the pandemic in the short-term and climate change in the long-term," says Nobel laureate Joseph Stiglitz, British climate expert Lord Nicholas Stern, Cameron Hepburn, Brian O'Callaghan, Dimitri Zenghelis, who authored the just-released study by Oxford.

They looked at previous economic recoveries and interviewed central bankers and senior economists from around the world.

How will this message resonate not just with Republican lawmakers on Capitol Hill but also with investor groups and voters generally? Congress has enacted nearly \$3 trillion in stimulus bills so far, with the vast majority going to pay for families, small businesses and to help ailing industries. More bills are planned. The one area where compromise is possible is

Renewable energy projects and modern electric grids can deliver the strongest medicine, it says, noting that those efforts have a long-term payback.

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giving some assistance to oil and gas drillers in exchange for extending tax breaks to wind and solar developers as well as electric vehicle buyers.

But the reality is that the two parties have returned to their respective corners. The [House Republicans on the Energy and Commerce Committee](#) tweeted that “Americans wants relief and results — not radicalism.” The Democrats, meanwhile, point to the Obama administration’s success with the New Energy Economy and how investments in such things as wind and solar, microgrids and battery storage have advanced energy and environmentalism — moves that were once labeled as radical but today they have become mainstream.

“Ultimately, in their recovery plans, governments should prioritize sustainability and equity and accelerate the transition to a net-zero emission economy to mitigate climate risks, create new jobs and catalyze the sustainable deployment of private capital,” says a group of [shareholder activists groups](#) including CERES, Principles for Responsible Investment and Carbon Disclosure Project. “Recovery plans that exacerbate climate change would expose investors and national economies ...”

Among the energy companies that support their mission: Edison International [EIX](#), Exelon Corp. [EXC](#) and National Grid [NGG](#).

Not business-as-usual

The [Pew Research Center](#) finds that two-thirds of U.S. adults do not think that the American government is doing enough to combat climate change. Those findings are consistent with analyses that it did before the coronavirus. But its study also shows a sharp divide between the parties over these issues. The one caveat is that Republican millennials and women favor stronger environmental positions.

That may explain why the Trump administration has tried to undo almost all of the environmental policies set by the Obama administration: fuel efficiency standards, mercury rules and carbon limitations, to name three. In response to the pandemic, the U.S. Environmental Protection Agency said that it is suspending regulatory oversight — a move now being litigated.

The White House believes in financial relief first. But economic recovery and environmental activism are not mutually exclusive. The Oxford Smith School of Enterprise and the Environment study underscores that. Furthermore, using the coronavirus as an excuse to avoid energy and environmental improvements is misguided: not only is it a hard sell in a

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general election but also a [Harvard University](#) study finds that air pollution and COVID-19 death rates are linked — that a small increase in particulate matter leads a large increase in those deaths.

Moreover, clean energy has been an American success story: employment in the sector has grown by 10.4% since 2015, according to [Clean Jobs America 2020](#) — a report sponsored by E2 and researched by BW Research. In 2019, clean energy made up 40% of employment in the energy industry and 2.5% of the nation’s overall employment.

The cumulative effect is changing minds — on both sides of the aisle. [RepublicEn.org](#), and [ConservAmerica](#) are two Republican groups that argue that economic growth and environmental stewardship go hand-in-hand.

“The only way to create long-term sustainable change is if all parties come to the table,” adds Michael Cain, president and co-founder of Dallas-based [EarthxFilm](#), in a talk with this writer. “We create a centrist platform to enter an awkward conversation to get positive results for the planet. It is a safe space and we want everyone to feel their voices will be heard.”

During stressful times, the natural reflex is to hunker down. But if the Great Recession has taught us anything, the time to take bold action is during economic difficulties: it is good for business and it can be good politics as well. The same questions are now before U.S. lawmakers and they will ultimately come before the American people.

forbes.com, 12 May 2020

<https://forbes.com>

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Most farmers in the Great Plains don't grow fruits and vegetables. The pandemic is changing that.

2020-05-12

On a recent Thursday, a group of farmers from Oklahoma, Kansas, and Nebraska hosted a remote agriculture happy hour. There were a few dozen attendees, and nearly everyone was wearing a cowboy hat. In total, they farm more than 30,000 acres of cropland, most of it planted in soy, corn, or cotton destined for the global commodity market. The happy hour started with presentations about integrating livestock into cropping systems, but then things took a surprising turn: farmers began to discuss how they are feeding their families and communities.

"Normally, between me and the consumer there is a gigantic divide that is hard to cross, but now, people are hungry and I have to do something," Tom Cannon, one of the farmers on the virtual happy hour, told me several days before the gathering. Cannon, who farms and ranches 10,000 acres near Blackwell, Oklahoma, was already feeling the squeeze from the trade wars with China when the pandemic hit.

The situation has disrupted many parts of the supply chain and left Cannon unable to move his products off the farm. He was inspired to respond after seeing long lines outside the local food pantry and bare shelves in the nearby Walmart, scenes now familiar across the country. "Even farmers are dependent on our fragile food system—and a lot of us are four days away from hunger," said Cannon. As a result, he's decided to start growing a variety of fruits and vegetables for local consumption, and he's doing it in a most unusual way.

I met Cannon this past January at No-Till on the Plains, an annual gathering in Kansas for medium to large-scale farmers somewhere along the continuum of adopting ecological methods to protect soil health. Most have reduced or eliminated tilling on their farms in an effort to use fewer pesticides and chemical fertilizers. Many also use livestock and off-season cover crops to control weeds, enrich the soil with organic matter, retain moisture, and add nutrients for planting.

I attended the conference to speak about the public health effects of sustainable agriculture, a topic that has been a focus of my research and writing. But as I planned my remarks, I struggled with the message. On the one hand, most of the farmers at the meeting are doing a great deal more than their peers to safeguard public health by ensuring cleaner water and air, and by protecting wildlife and biodiversity.

In total, they farm more than 30,000 acres of cropland, most of it planted in soy, corn, or cotton destined for the global commodity market.

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And yet they primarily sell the same short list of crops that blanket most U.S. farmland: soy, corn, wheat, and cotton. These commodities are turned into a vast array of products with only a fraction fed directly to humans. (The bulk of corn and soy is fed to animals, and a great deal of what's left gets turned into processed sweeteners and vegetable oils, hardly the mainstays of a healthy diet.)

In my talk, I did mention that the U.S. produces enough corn sweetener each year to supply us each with 60 pounds of the stuff, while we barely grow enough lettuce and carrots needed for a five-pound annual allotment. But I did not go so far as to suggest that the no-till crowd had an obligation to fix this imbalance. After all, these farmers were used to moving big equipment over sweeping plots of land, not to tending delicate rows of peas and squash.

But COVID-19 has the potential to change everything.

Tom Cannon, for one, is planting six acres of vegetables. He calls it a "chaos garden" and it's essentially a cover crop, a crop that is planted in between cash crops. But while a standard cover crop may contain alfalfa, ryegrass, or sorghum that can be used for building soil organic matter or grazing, a chaos seed mixture might include peas, squash, radish, okra, melons, sweet corn, and other edible plants. In other words, it contains groceries.

It's the perfect way for a commodity farmer like Cannon to grow fruits and vegetables without changing farming practices. "I just load my drill [planter] with 50 plus species, and don't ever go back until it is time to harvest. Cannon plans to let community members pick their own produce. "After the people get everything they want, you turn out cattle onto the field." Whatever remains serves as "green manure" to fertilize the soil.

Cannon credits Jimmy Emmons, another no-till, regenerative farmer in the area, for popularizing chaos gardens in his region. Emmons, who farms in Leedey, Oklahoma, also happens to be a regional conservation coordinator for the USDA in the Southern Plains.

"Everyone thinks I am a nut because I am not afraid to try something new," Emmons explained recently over the phone. "The country is just full of corn and soybeans. Why would you want to grow more when there is such a surplus and revenue is so terrible? I just try to grow what people want."

Five springs ago, Emmons threw squash, edible beans, and a variety of brassica seeds in with his standard cover crop mixture and planted it on a couple of acres. The bounty was so impressive that chaos gardens are

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now a regular part of his annual planting schedule. Some of the produce goes to his own kitchen but most of it gets donated to local community groups—the food bank, youth groups, and churches—with the agreement that they do the harvesting. Emmons estimates that each acre of chaos generates 4,500 pounds of produce.

In addition to ease of planting, Emmons described other benefits of a chaos approach: The blanket of plants crowds out most unwanted species, including weeds; the cucumbers and squash and other flowering species attract beneficial insects that keep pests like “squash bugs” at bay; the dense foliage increases soil moisture retention and reduces the need to water; and the plants tend to mature at different rates, allowing for several months of a diverse bounty rather than a monocrop that gets harvested all at once.

And while the lack of rows might seem like a drawback to any farmer who is used to straight lines and harvesting one type of plant, Emmons sees this as a plus. “It is more of a hunt and pick. You gather as you go and you have to navigate through the cover,” he said, describing the sounds of delight that come from his fields, as children and adults discover a watermelon here, some okra there. Apparently, harvesting a chaos garden unleashes the inner forager in everyone.

In Oklahoma, Emmons was involved in Farm to Food Bank, which was started as a partnership between USDA-NRCS, the Oklahoma Conservation Commission, and the Oklahoma Association of Conservation Districts (OACD). According to Sarah Blaney, executive director of OACD, the group helps farmers plant these alternative cover crops, identify potential volunteers to glean produce (for example, in one county, they work with the local 4-H group), identify where the produce can be donated, and then delivers it.

“It takes a lot of community organizing and education through the districts to achieve the ultimate goal of getting fresh produce where it is needed in the local community,” says Blaney.

While these gardens may appear haphazard, looks are deceiving.

“I don’t really like the term chaos garden,” said Keith Berns, co-owner of Green Cover Seed in Bladen, Nebraska. Berns collaborated with Emmons to design the first chaos seed mixes, and contends that this is a carefully planned intercropping system that was first developed centuries ago by Indigenous farmers across the Americas. Originating in Mesoamerica, this

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system traveled northward to the Mandan, Iroquois, and other groups who used the produce for food and trade.

The seed mix, which includes combinations of legumes (beans and peas), nightshades (okra, tomatoes, and eggplants), cucurbits (squash and cucumbers), brassicas (radishes and turnips), and herbs, grains, and corn offers a perfect balance of nutrients for humans, livestock, and the soil and is still a central feature of many smaller farms in the global South. It also ensures self-sufficiency and protects the farmer from the vagaries of the markets. In recognition of its lineage, Berns renamed his mix “The Milpa,” borrowing the word for “cultivated field” from the Nahuatl language spoken in central Mexico, where polycultural systems have been used for at least 3,000 years.

Since he started selling the Milpa mix, Berns has offered farmers an acre’s worth of free seed (valued at \$100), provided the harvest goes to a food bank or another public food distribution service. “We donate the seed, the farmer donates the ground, and the community donates the labor to glean,” he explained.

Over the past three years, the Milpa mix has been slowly gaining popularity, but this spring the number of orders suddenly doubled, and Berns has sent more than 20,000 pounds of the mix to 400 farmers across the country. He’s unsure how much of the growth to attribute to COVID-19, but he noted that 40 percent of the seed was part of his “first acre” donation program and he assumes the rest was planted as a cash crop. Some farmers, according to Berns, are selling the vegetables using the U-pick system, as well as at road stands, farmers’ markets, and local grocery stores.

Tom Cannon hopes to donate the food from one acre of his chaos gardens and sell the rest direct to consumers. He is working with his daughter Raegan on a long-term plan to grow 20-30 acres of chaos mix in a corn maze. “With some word of mouth, I expect that I’ll be swamped with customers in no time,” he said. Cannon will give his customers the option of foraging in the maze or simply driving up to the barn to collect their produce. But he worries that many of his new customers won’t know how to use the fresh produce.

“Even though I live in a place that’s just about as country as you can get, people don’t know how to prepare and preserve their own food,” he said. To address this, Cannon plans to offer cooking lessons, either in person or online, to “show people what to do with a squash.”

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Keith Berns is also thinking big. There are currently 200 million acres planted with corn, soy, and wheat in the U.S. If every commodity farmer chose to dedicate 1 percent of their land to a Milpa garden, it could result in 2 million acres—providing a 50 percent increase in national vegetable production and distributing it more evenly throughout the country. Farming regions across the U.S. may be growing plenty of crops, but rural communities have long had limited access to nutrient-rich fresh food.

Berns now has enough Milpa seeds to plant on 500 acres. But he thinks that a “1 percent for Milpa” nationwide food security initiative is achievable, citing conservation programs like Ducks Unlimited, Trout Unlimited, and Pheasants Forever—public-private collaborations of farmers, ranchers, and naturalists that work together to conserve wildlife habitat—as models. He believes that such a program could quickly gain traction if it offered incentives to farmers. These might include exempting Milpa acres from property taxes, publicizing the farm’s efforts, raising funds for local chapters, and underwriting the cost of the seed.

The effort could run into some red tape if it were scaled up. For example, federal agriculture policy makes it hard for commodity farmers to start growing vegetables on land that is enrolled in the USDA’s crop insurance program. However the program does allow cover crops—and chaos gardens could easily fit under that category.

Despite these obstacles, Berns feels now is the time to push it forward. “Even if we couldn’t get government agencies to pay for it, we can at least get them to say it’s okay,” he says.

Jimmy Emmons agrees, and within in his role at the USDA he’s advocating for more opportunities for commodity growers to integrate edible crops. “The [pandemic] is terrible,” he said. “The good side is that it’s driving people to do something different.”

At the happy hour, the consensus among the farmers was that it’s time for change: Most of them had started out self-identifying as no-till farmers, but then had adopted the mantle of “regenerative” or “regenerative no-till” as they added practices to improve their soil. But the conversation that I was hearing suggested that, once again, their identity was evolving to include a social mission. Mirroring the efforts of the Milpa farmers in Mexico, Guatemala, and elsewhere, many of these farmers now see their land as a way to preserve self-sufficiency while feeding farm families, neighbors, and building community.

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“It is not a regenerative mindset if I’m not directly providing food for other people,” said Berns. “There is something very gratifying for us as farmers to remake that connection. To know that you are directly nourishing another.”

Tom Cannon agreed. “For years, I was trying to grow bigger,” he said. “Now the challenge is to grow smaller and more local.”

civileats.com, 12 May 2020

<https://www.civileats.com>

EU to halve pesticides by 2030 to protect bees, biodiversity: draft

2020-05-14

BRUSSELS (Reuters) - The European Commission is seeking to halve the use of chemical pesticides by 2030 to halt the decline of pollinators, in a plan likely to draw criticism both from those urging a phase-out of the substances and from farmers who say crop yields will suffer.

The Commission, the EU executive, wants to commit the European Union to a halving of the use of chemical and “high-risk” pesticides by 2030, a draft document seen by Reuters and set to be published on May 20 showed.

It did not explain what it meant by high-risk or how it would enforce the reduction.

The Commission declines to comment on unpublished drafts, which are working documents and are subject to change until they are adopted.

A Commission plan to make agriculture more sustainable, also due on 20 May, may add details.

Beekeepers in western Europe have reported a fall in the number of bees and colony losses over the last 15 years, the European Food Safety Authority said.

EU lawmakers say this trend endangers the 76% of food production in Europe that depends on pollination.

Already EU regulators banned outdoor use of neonicotinoid insecticides in 2018, meaning they can only be used in closed greenhouses.

Beekeepers in western Europe have reported a fall in the number of bees and colony losses over the last 15 years, the European Food Safety Authority said.

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Some farming groups have said a wide ban on pesticides could cause crop yields to fall, and urged the Commission to assess the impact of the measures before fixing binding targets.

“We acknowledge calls for pesticide reductions and let’s be clear - we are open to discuss targets,” Geraldine Kutas, director general of the European Crop Protection Association, said. “Targets however have to be realistic and science-based.”

The sugar industry in the Netherlands lost 2.3 million euros (\$2.48 million) in revenue in 2019 because of impacts associated with a lack of neonicotinoid use, the International Confederation of European Beet Growers said.

Bayer, among the top makers of crop chemicals, said in an emailed statement it aimed to cut the environmental impact of crop protection by 30 percent by 2030 as part of its own sustainability goals.

Referring to a wider environmental and economic stimulus programme proposed by the Commission last year, it said it mirrored “many of Bayer’s sustainability commitments”.

A spokeswoman for BASF, another major crop chemicals maker, said the company would not comment until the document was published.

European lawmakers have called for binding targets to cut pesticide use in the EU. Organic food and farming organisation IFOAM is also pushing for more ambitious targets than the draft proposal - an 80% reduction in synthetic pesticides by 2030 and a total phase-out by 2035.

The draft also includes a goal to plant three billion trees in the EU by 2030, to help absorb carbon dioxide from the atmosphere and make cities greener.

reuters.com, 14 May 2020

<https://www.reuters.com>

How accurate are the results from self-testing for covid-19 at home?

2020-05-13

IN THE UK, essential workers are now among those being sent home testing kits for coronavirus. This involves swabbing the inside of your own nose and the back of your throat, but how useful are the results?

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Studies from early in the outbreak in China have suggested that swabs taken by healthcare professionals may give a 30 per cent “false negative” rate, where infected people are told they don’t have the virus (*NEJM*, doi.org/ggmzsp; *medRxiv*, doi.org/dvfr). This has prompted claims that self-testing will give even more false negatives and could raise the risk of infected people spreading the virus.

No test is perfect – swabbing technique and analysis errors can lead to inaccurate results. There is no defined false negative level at which covid-19 tests become worthless. “It depends what question you’re asking,” says Graham Cooke at Imperial College London.

On a national level, false negatives matter less, as testing can still give a useful indication of the rates and levels of infection, providing the false negative rate isn’t too high. False negatives are more of a concern at the individual level. In a hospital setting, if someone tests negative for coronavirus but is showing the symptoms, doctors will weigh up whether they think the person should still be placed in a covid-19 ward. “If you’re confident someone’s got covid, you would still ignore a negative,” says Cooke.

However, false negatives in infected but symptomless people are more of an issue, as they may encourage changes in behaviour that spread the virus. If trained healthcare workers get a 30 per cent false negative rate when administering tests, how bad might self-testing be?

There is reason for optimism. Yi-Wei Tang at Cepheid, a diagnostics company in California, says the false negative rate of around 30 per cent recorded early in China’s outbreak may have been higher than it is now. For instance, he says, throat swabs were initially recommended. We now know these aren’t as effective as nasal swabs.

A more recent study in the US suggests self-swabbing is relatively effective. Researchers asked about 500 clinic patients with flu-like symptoms to self-swab their nostrils and their tongues. The results were compared with swabs taken by healthcare professionals from where the back of the nose meets the throat.

The professionals detected more positive results, but the self-swabbers were within 10 per cent of the professional positives (*medRxiv*, doi.org/ggr7f6). Other types of testing may be a better option. A study that asked participants to drip saliva into collection tubes found that this was a better source of viral material than samples from where the nose meets the throat (*medRxiv*, doi.org/ggssqf). The false negative rate appears to

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be lower too – only 12 per cent, compared with 24 per cent for traditional swabbing, says Anne Wyllie at the Yale School of Public Health, who led the study.

Last week, the US Food and Drug Administration authorised testing of home-collected saliva, but studies of saliva testing have yet to appear in peer-reviewed academic journals.

The UK isn't yet turning to saliva testing. "We are aware of these tests and are awaiting peer-reviewed evidence," a UK Department of Health and Social Care spokesperson told *New Scientist*.

newscientist.com, 13 May 2020

<https://www.newscientist.com>

The surprising link between our consumer habits and deadly diseases ranging from Malaria to the Novel Coronavirus

2020-05-01

Rebecca Wong knows a thing or two about scouting exotic animals. She'll root around in online forums, take tips from friends of friends, hang out at hotels and restaurants in a certain part of town. It takes time, and a bit of serendipity. "I go to a mixture of places," she says. "You never know who can tell you where you can find them."

Wong, who investigates China's illegal wildlife trade networks at the City University of Hong Kong, has spoken to dozens of people who sell and buy wild animals through years of research. When she's looking for species used for food, that fieldwork happens in restaurants and markets much like the one implicated in the spread of COVID-19 in Wuhan.

The memory of animals slaughtered or crammed in stalls is not one she likes to recall. "It's not just the sight," she says. "It's also the smell."

Places that trade in exotic fare aren't the norm in China. "Many are disgusted by how animals are treated," Wong says. Yet the domestic demand, combined with a booming international trade, is strong enough to drive an illegal industry worth up to US\$26 billion per year that's survived pandemics before.

The business of capturing an animal for sale has something in common with clearing forests for timber or to make way for farming, commercially or for local consumption. Both disturb nature in a way that can unleash

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pathogens from the wild, bringing them closer and into more frequent contact with humans, with sometimes far-reaching consequences.

The novel coronavirus that causes COVID-19 is a dramatic example. Others include the disease-causing entities that brought us SARS, Ebola, MERS and avian influenza. Together, they signal a growing threat from infectious disease outbreaks, including those caused by pathogens that jump the species barrier from non-human animals.

"Over 60% of the emerging infectious diseases we've seen over the last several decades have been from wildlife populations," says Sam Myers, director of the Planetary Health Alliance, a global consortium focusing on how disrupting nature can affect human health. "And we know that the emergence of those diseases has been intensifying."

Contact with forest animals centuries ago is even implicated in the origins of malaria, and the disease is still fueled by forest disturbance. But this isn't about "someone else" doing the disrupting in a rainforest far away, or food preferences in unfamiliar cultures. The activities creating the right conditions for pathogens to spread are intimately connected to how people live and do business in both rich and poor countries.

Vicious Circle

Maria Anice Mureb Sallum, an epidemiologist at the University of São Paulo, believes that for malaria, control measures can never catch up as long as global trade keeps creating those conditions. "This is a vicious circle," she says. "We have to rethink the use of commodities."

Research by Sallum and colleagues recently pinned down the link between malaria risk and global trade by pulling together two familiar links in a chain: clearing forest to grow crops like coffee or cocoa beans, a known risk factor for the disease, and consumer demand that drives deforestation as well as carbon emissions. The researchers estimate that 20% of the risk of catching malaria in deforestation hot spots can be traced to exports that cater to rich countries' appetite for popular products such as coffee beans and timber.

Grabbing a cup of coffee in rush hour might seem a world away from life in an African rainforest. But the study highlights how global systems connect them.

"Low-income countries pay for their cash crop export incomes with a burden from increased malaria risk," the authors write. If a new disease finds a way to travel, other countries might pay a price too.

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In the case of malaria, the risk is linked to deforestation among other factors including climate change. For the novel coronavirus, the evidence so far points to the wildlife trade. In the case of Ebola, the jump to humans is linked to hunting wild animals for food. In each case, there's a connection between what we consume and the right conditions for a pathogen to escape the wild.

Supply Chains Under Scrutiny

Sallum and her colleagues conclude that malaria control should include policies targeting international supply chains that destroy forests. Take people making a living by logging in the Amazon, she says, making 250 reals (about US\$50) for each tree they sell to Brazilian companies. "[That's for] a huge tree, several hundred years old. And they [companies] sell the wood on the global market for a huge amount of money." If policies brought more of the proceeds back to the loggers, she argues, they may need to harvest fewer trees — and so cause less of the ecosystem disruption that exacerbates malaria.

Justin Adams is executive director of the Tropical Forest Alliance, which forges partnerships with companies trading in commodities implicated in deforestation to reduce their adverse impact. He cautions against drawing a direct link between habitat destruction and every disease, noting that details of how the new coronavirus emerged are still unclear. In the short term, when the humanitarian crisis caused by the pandemic is still unfolding, he says, it's dangerous to target companies or demonize markets that are a vital source of food.

For one, Adams says, the commodities highlighted in the malaria research aren't the ones responsible for the highest amounts of deforestation seen since 2000 — cattle, palm oil and soy.

"There's a tendency to lump everything together and say, 'well, of course, this all ends up as Unilever or Nestle supply chains — and that's increasingly too simplistic,' he says. "There's a far broader system that needs to be looked at, as opposed to simply saying, 'It's demand for products in the West that is driving it.'"

Western demand is already in the spotlight in the name of mitigating carbon emissions. Though progress is slow, companies have made commitments to change how they do business and become accountable for supply chains that destroy tropical forests.

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The connection between that work on corporate accountability and human health has been much less visible. Adams says the pandemic will now "absolutely" increase the urgency of efforts that offer benefits to both the environment and human health. In signs of such a shift, Germany's environment minister, Svenja Schulze, recently called for better communication of research into the link between environmental degradation and human health. And some investors foresee moves away from companies that trade in products linked to zoonotic disease and deforestation.

Preventing Future Pandemics

Myers says there's a strong argument for changing our relationship with wildlife to prevent future outbreaks, and that means tackling the wild animal trade, bushmeat hunting and agricultural incursions into forested land. "From a public health standpoint, rethinking those practices makes a lot of sense," he says.

Adams focuses on the complexities of how nature protection intersects with food supplies and health, and says links between them should be strengthened through existing mechanisms like the U.N. Convention on Biological Diversity, highlighted earlier this year at the World Economic Forum. "I hope it [the pandemic] creates more fertile ground for a deeper discussion about what and how we can transform these systems, because it's the systems that are broken."

Different solutions will come up depending on how one looks at the problem, according to Myers, and strategies will work best in different places. In places that are distant from emergence hot spots, the right response might be to stop pathogens spreading across borders. But where the risk of emergence is high, more focused surveillance is a good idea, he says. The non-profit EcoHealth Alliance, for example, runs a USAID-funded program to look for new zoonoses in several developing countries. It's also working with Malaysia to put a price on disease prevention by incorporating the cost of disease into land use planning in Borneo, making the case for leaving some forests intact.

Other interventions could catch early signs of trouble. Reports that the novel coronavirus was spotted in water before or just after clinical cases emerged in the Netherlands suggest monitoring water supplies could play a part in early warning. And some scientists argue for better monitoring in places where zoonotic diseases are likely to appear first.

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When it comes to the wildlife trade, Wong says policies that reduce consumer demand should be part of future public health efforts, too. "You have to have tougher enforcement, tougher laws. You also have to have behavioral change... and that has to be done by educational campaigns."

Commercial pressure for the trade partly depends on the species. In the case of the pangolin, a suspected intermediate host for the novel coronavirus, the scales are prized for traditional medicine, a large industry in China. For items like ivory, there's a global market. For salamanders, the appeal comes from cultural beliefs about their potency — "one guy told me he eats it because it makes him a better swimmer," says Wong. Expense also makes it a status symbol, a prized item to show off on social media. And with a rising middle class, more people have the spending power to afford it. "It's like having the latest sports car."

There's much yet to be learned about how COVID-19 emerged. But probing the connection with our daily lives and with systems that promote consumption could pave the way to a "new normal" where human interactions with nature carry less risk.

ensia.com, 1 May 2020

<https://www.ensia.com>

6 of the most sustainable meat alternatives

2020-05-13

After the coronavirus spread through a number of slaughterhouses in Germany and the United States, some people might be asking themselves how they can replace meat in their diets. Perhaps they're worried that meat production could collapse if facilities are in lockdown. Or maybe ethical reasons are their main concern. The recent revelation that more than 200 workers at an abattoir in western Germany were infected with COVID-19 has shed light on the catastrophic working conditions in industrial meat production. But it's no secret that the sector harms people, the environment and the climate, not to mention the suffering of animals.

Some 14.5% of human-produced global greenhouse gases come from the meat production industry. Farm animals and their waste also cause significant environmental damage: cattle produce methane gas that negatively impacts the climate, while enormous quantities of liquid manure put groundwater at risk.

Some 14.5% of human-produced global greenhouse gases come from the meat production industry

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But meat consumption is increasing worldwide — even in developing countries. And the losses in nutrients are alarming. For example, 11 kilograms (24 pounds) of plant protein are required to feed an animal to get 1 kilogram of protein in the form of meat.

There are many alternatives to steak and sausages from animals — and most of them are lower in calories, contain no cholesterol, and keep you full for longer.

1. Soy products: Schnitzel, tofu, tempeh

The typical meat substitute in supermarkets in Europe, North America and Australia comes from soya. From burgers and goulash to sliced meat, sausages and cold cuts — a variety of products are seasoned and shaped to resemble animal products. In its native Asia, soya is mostly consumed as the fresh bean, edamame, or as tofu and tempeh.

The protein content of dried soybeans is significant — about 35-40%. On top of that, the bean contains several essential amino acids that the body needs to absorb protein. But it's also important to point out that the beans' protein content drops to about 12% after cooking. Tofu contains 7-15 grams, while tempeh and soya strips contain 18-20%. Besides protein, soybeans also contain many unsaturated fatty acids and fat-soluble vitamins. By comparison, 100 grams of raw pork has about 18% protein, according to the GU nutrition table.

Given that 80% of the world's soybean cultivation comes from the United States, Argentina and Brazil, the bean usually travels some distance before it's consumed. But the argument that the rainforest is being cut down for tofu makes little sense, because 80% of the world's soya production is actually used as animal feed.

Farmers in Europe are now also growing soya, although the conditions aren't ideal — the beans come from the subtropics, and so need a warm, humid environment to thrive. Soybeans require less water than meat production, but don't score as well on that front compared to some other legumes.

2. Lupins

Meat alternatives made from sweet lupins are becoming more popular in Germany, with shredded lupin or lupin steak no longer a rarity on supermarket shelves. Lupins are most commonly used, however, as a substitute for milk, yoghurt or eggs. They're also used in gluten-free baking products because they contain no gluten.

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Lupins have an impressively high amount of protein: the plant's dried beans contain at least 40%, as well as various vitamins and minerals. Unlike soybeans, lupins can cope with a dry climate and grow well in lime and sandy soils. That means conditions in Europe are better suited to lupins than soybeans.

3. Beans and beyond

Beans, lentils and peas also have protein in spades. In their dry form, green peas contain around 23%, but that amount shrinks to 8% during cooking. Most types of beans contain 8-10% protein after cooking — more than half that of pork. These legumes aren't available as sausages or cutlets — at least not yet anyway. Still, a bean-based chili sin carne promises a decent amount of protein, as does a spread made from brown lentils instead of Leberwurst, or liver pate. Add green spelt grain, spelt or oat-flakes (17% protein) to this spread, and it becomes even healthier, as well as tasty. That's because these cereals, nuts and seeds are ideal for the absorption of protein. All legumes, including soybeans and lupins, have a positive effect on the soil they grow in. They hardly need any fertilizer, since they draw nitrogen from the air with the help of nodule bacteria. They also enrich the earth with humus.

4. Seitan – wheat protein

This meat substitute consists of wheat gluten. Its slightly fibrous texture means it is mainly used for ready-made meat alternatives. It's produced by mixing flour and water into a dough, followed by repeated rinsing to remove starch until only the protein mass remains. As with tofu, a large amount of the vitamins and minerals are lost during this process. And then there are the many flavorings and thickeners that often get added. One advantage Seitan has over soya, though, is that the wheat or spelt it comes from can be grown in many parts of the world.

5. Sunflower seeds

This type of "ground meat" comes from the remnants of sunflower seeds after they've been pressed to extract oil. It contains large amounts of protein, all the essential amino acids and many B vitamins. All nuts and seeds generally have a very high protein content. Hemp seeds top the list with more than 31%, closely followed by pumpkin seeds, peanuts (26%), almonds (21%) and sunflower seeds (19%). Nuts and seeds also contain valuable unsaturated fatty acids. This also makes them a good source of energy, in their unpressed form.

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6. Fungus over chicken

This meat substitute, known as Quorn, is made from fermented mold fungus, with added vitamins and egg protein. Vegetarians can enjoy it fried, for example, but for vegans this highly processed product isn't an option. Still, its climate footprint is likely smaller than that of a steak, if only because the production of eggs doesn't consume as many resources as that of meat.

The B12 problem

Despite all the advantages that come with plant-based meat substitutes, one essential nutrient is missing: vitamin B12. Only animal products can provide sufficient bioavailable levels of it. The German Nutrition Society recommends an intake of 3 micrograms per day. That's the equivalent of about 100 grams of beef or salmon, 150 grams of cheese, or half a liter of whole milk. That means those who don't eat animal products have to resort to food supplements to get their daily B12 dose.

[dw.com](https://www.dw.com), 13 May 2020

<https://www.dw.com>

Can't eat gluten? Pesticides and nonstick pans might have something to do with it, study says

2020-05-13

It seems like everyone knows someone with a sensitivity to gluten — a protein mixture found in cereal grains, like wheat and barley. A third of all Americans say they avoid products with gluten in them, and grocery store shelves are overflowing with gluten-free products that didn't exist a decade ago.

For roughly 1 percent of the planet's population, eating gluten triggers a genetic immune response called celiac disease that has wide-ranging consequences. The disease's symptoms range from mild, like diarrhea, fatigue, gas, to severe. Think nausea and vomiting, osteoporosis, infertility, neurological problems, and even the development of other autoimmune diseases.

The root causes of celiac disease have largely stumped epidemiologists. But a study out Tuesday by researchers from New York University establishes a link between the disease and two groups of manmade chemicals: pesticides and a compound known as PFAS, which is often found in products around the house. It might help explain why some

A third of all Americans say they avoid products with gluten in them, and grocery store shelves are overflowing with gluten-free products that didn't exist a decade ago.

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people who are susceptible to celiac disease end up developing it when others don't. The researchers analyzed the levels of toxic chemicals in the blood of 90 children, 30 of whom had recently been diagnosed celiac. They found that those with high levels of pesticides in their blood were twice as likely to develop the disease.

"Our study establishes the first measurable tie-in between environmental exposure to toxic chemicals and celiac disease," Jeremiah Levine, a coauthor and a professor of pediatrics at NYU Langone Medical Center, said.

Ben Lebwohl, director of clinical research at Columbia University's Celiac Disease Center, said the results should be treated with caution. "There are a number of limitations that prevent us from drawing sweeping conclusions," he said in an email to colleagues on Tuesday. He pointed out that the study only looked at children who had already been diagnosed with celiac. "Children who get diagnosed are likely different in important ways related to health care utilization and socioeconomic, which may be associated with these pollutant levels."

But Lebwohl said the research added to a growing body of work that suggest that environmental factors increase the risk of gluten intolerance. The study, he said, "mandates follow-up work."

Levine and the other researchers also tested for toxic chemicals called per- and polyfluoroalkyl substances found in nonstick cookware and fire retardant and have been [linked to multiple types of cancer and other harmful diseases](#). The study was conducted on subjects under the age of 21 because children and young adults are uniquely vulnerable to chemicals that may disrupt immune function.

They uncovered some surprising results. Young females exposed to higher-than-normal levels of non-stick chemicals like PFAs were five to 9 times more likely to have the disease than children exposed to lower concentrations of those chemicals (women make up a [majority of celiac cases worldwide](#)). Young males with elevated blood levels of fire-retardant chemicals were twice as likely to be diagnosed with celiac compared to children with lower levels of fire retardants in their blood.

Some of the chemicals have been out of commission for years. "We found that kids were susceptible across the board to a particular pesticide that had already been phased out of most uses," Leonardo Trasande, a co-author of the study and a professor of environmental medicine at NYU,

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told Grist. "That speaks to the fact that we have legacy effects of synthetic chemicals that were used decades ago."

Trasande said more research and a larger sample size is needed to determine whether those chemicals directly *cause* the disease and whether they're linked to other autoimmune disorders. But the study lends more support to those calling for [stricter regulation of toxic chemicals and pesticides](#).

"We do need a more rigorous structure for regulating these chemicals in the first place," Trasande said.

In the meantime, he suggests a few steps to help reduce exposure at home: Open the windows and use a wet mop to collect organic pollutant dust from furniture and electronics that might still carry flame retardants. Avoid using non-stick pots and pans. Trasande suggests replacing them with cast iron or steel. And finally, avoid athletic wear that's over-treated with chemicals. "You don't really need oil-resistance in athletic materials," he said, "you just need to repel sweat."

grist.org, 13 May 2020

<https://www.grist.org>

Plastic recycling is broken. Why does Big Plastic want cities to get \$1 billion to fix it?

2020-05-11

As the coronavirus pandemic cripples the U.S. economy, corporate giants are turning to Congress for help. Polluting industries have been among the first in line: Congress has already [bailed out airlines](#), and coal companies have snagged [over \\$30 million](#) in federal small-business loans. Big Plastic is next in line with what might seem a surprising request: \$1 billion to help fix the country's recycling.

A group of plastic industry and trade groups sent a [letter](#) to House Speaker Nancy Pelosi on April 16, asking Congress to allocate \$1 billion to municipal and state recycling infrastructure in the next pandemic stimulus bill. It would be part of legislation known as the [RECOVER Act](#), first introduced in Congress [last November](#). Recycling sounds great, and has long been an environmental policy that almost everyone — Republicans and Democrats both — can get behind. To some environmentalists and advocates, however, the latest push is simply the plastic industry trying to

According to the Environmental Protection Agency, less than 10 percent of the plastic produced in the past four decades has been recycled; the rest has wound up in landfills or been incinerated.

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get the federal government to clean up mountains of plastic waste in an attempt to burnish Big Plastic's image.

"Plastic recycling has been a failure," said Judith Enck, a former regional director for the Environmental Protection Agency and the founder of the organization Beyond Plastics. "And there's no reason to try to spend federal tax dollars to try to prop up plastic recycling when it really hasn't worked for the last 30 years anyway."

Put simply, very little of your plastic recycling actually gets recycled. According to the Environmental Protection Agency, less than 10 percent of the plastic produced in the past four decades has been recycled; the rest has wound up in landfills or been incinerated. In 2017, the U.S. produced over 35 million tons of plastic, yet less than 3 million tons was made into new products.

Part of the problem is that some items are composed of different types of plastic and chemicals, making them difficult to melt down and process. Only plastics with a "1" or "2" symbol are commonly recycled, and even then, they are more often "downcycled" into different types of products. A container of laundry detergent or a plastic soda bottle might be used for a new carpet or outdoor decking, but rarely into a new bottle. And downcycling is one step closer to the landfill. "The logo of recycling is the arrow that goes around and around — but that's never been the case with plastic," said Enck.

Big plastic-producing companies also have little incentive to use recycled materials rather than virgin materials. Plastics are made from petroleum, and when the price of crude oil is as low as it is now, it costs more to manufacture goods from recycled polymers than from crude.

Some analysts say that the RECOVER Act doesn't take on these larger issues. The act is aimed at the "curbside" aspect of recycling: funding city and state recycling collection, improving sorting at processing plants, and encouraging consumer education — teaching people what can (and cannot) go into recycling bins. (The legislation is also backed by the American Chemistry Council, which represents Dow Chemical and ExxonMobil, and has long fought against municipal plastic bag bans.)

There are some curbside problems with recycling. If plastic bags or containers covered with food waste get into recycling bins, they can contaminate other items and make sorting and reuse more difficult.

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But Jonathan Krones, a professor of environmental studies at Boston College, said the real problem isn't at the curb. It's that "there aren't robust, long-term resilient end markets for recycled material." Even if cities manage to collect and sort more recycling, without markets all those perfectly processed plastics have nowhere to go.

For decades the U.S. solved part of the problem by selling hundreds of thousands of tons of used plastics to China. Then, in 2018, the Chinese government implemented its "National Sword" policy, forbidding the import of 24 types of waste in a campaign against foreign trash. The U.S. suddenly had lost the biggest market for its used plastics, and cities across the U.S. began burning recyclables or sending them to landfills. Some cities have stopped recycling plastic and paper altogether.

So why is Big Plastic pushing the RECOVER Act? Some argue that petroleum companies are trying to paper over the failures of plastic recycling. If consumers realized that only 10 percent of their plastics are ultimately recycled, they might push for bans on plastic bags and other single-use items, or more stringent restrictions on packaging. Keeping the focus on recycling can distract public attention from the piles of plastic waste clogging up our landfills and oceans. And a recent investigation by NPR and Frontline revealed that since the 1970s the plastics industry has backed recycling programs to buttress its public image.

"Had this bill been proposed 10 years ago, I think I would have said it was a good idea," Krones said, referring to the RECOVER Act. "But what has been revealed after National Sword is that this is not, by any stretch of the imagination, a technology problem. It's a consumption problem and a manufacturing problem." He argues that any attempt to fix plastic recycling should come with constraints on the production of new materials — only manufacturing plastics that can be easily broken down and reused, for example, or mandating that companies include a certain percentage of recycled materials in their products.

There are other ways to deal with the plastic problem. In February, Senator Tom Udall of New Mexico, a Democrat, introduced the Break Free from Plastic Pollution Act, which would phase out many single-use plastic items like utensils and straws and require big companies to pay for recycling and composting products — what's known as "extended producer responsibility." Other countries have similar laws on the books: Germany has required companies to take responsibility for their own packaging since 1991, and it's been credited with dramatically reducing waste.

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For now, plastic use is on the rise. According to Rachel Meidl, a fellow in energy and environment at Rice University, the pandemic is bringing piles of takeout boxes and plastic bags to landfills, as cities ban reusable bags and enforce social distancing. She thinks that the RECOVER Act could be helpful, but that it needs to be coupled with other interventions.

“No matter how much government funding is allocated towards recycling efforts, there first needs to be a significant paradigm in human behavior,” she said. “Where plastic is viewed as a resource, not a waste.”

grist.org, 11 May 2020

<https://website>

Traditional indigenous beliefs are a powerful tool for understanding the pandemic

2020-05-12

“What are we going to do?” Jillene Joseph asked the board of the Native Wellness Institute. It wasn’t a rhetorical question.

It was mid-March, and the board was holding an emergency meeting as schools and businesses began shutting down due to the novel coronavirus. The Oregon-based institute addresses trauma in indigenous communities, usually through in-person trainings that are rooted in ancestral teachings and traditions. Joseph, the executive director, knew she had to find a new way to help community members who were adjusting to stay-at-home orders.

Native Americans are especially vulnerable to COVID-19 due to underlying health issues such as diabetes and heart disease, as well as crowded multigenerational homes. On reservations, where roughly half of Native Americans live, not everyone has indoor plumbing or electricity, making it difficult to follow the guidelines to wash hands regularly in hot water. As a result, Navajo Nation, the largest reservation in the United States, has an infection rate nearly as high as that of New York and New Jersey. As of May 11 there have been 102 confirmed deaths.

“An already traumatized people are being retraumatized,” says Joseph, a member of the Gros Ventre or Aaniiih people who are from Fort Belknap, Montana. Managing the pandemic’s psychological and spiritual toll has become her focus.

As a community health practitioner, Joseph sees traditional cultural beliefs and practices as powerful tools for helping indigenous people understand

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this pandemic. She is not alone. With an emphasis on community, resilience, and a holistic relationship with nature, spiritual leaders from different tribes express guarded optimism that people of all backgrounds will learn from the lessons coronavirus has to teach.

‘Blood memory’

For indigenous people, history plays an unavoidable role in interpreting the pandemic. One elder from Michigan called Joseph to talk about how difficult it’s been for her to care for herself and her family. After some reflection, the woman realized why: She was weighed down by thoughts of the smallpox epidemic that had killed so many Native Americans. She felt she needed to forgive the U.S. government for intentionally giving her people the illness.

While documentary evidence that Europeans or Americans purposely spread smallpox is scarce, there’s little doubt that colonizers brought infectious diseases that killed an estimated 90 percent—some 20 million people or more—of the indigenous population in the Americas. “Even though we may not have been alive in the time of the smallpox epidemic, that’s in our blood memory,” says Joseph, “just as historical resiliency is also in our blood memory.”

Those deeply rooted experiences can lead to acceptance, especially among elders. “They have been through so much and experienced so much that there’s no need to fear or even panic,” says Tiokasin Ghosthorse, the Stoneridge, New York-based host of First Voices Radio and a member of the Cheyenne River Lakota Nation from South Dakota. “It’s almost like this [pandemic] is familiar.”

As such, indigenous communities aren’t dwelling on the pandemic’s backstory. “Indigenous peoples don’t always need to go and explain what happened, why it happened,” says the Reverend David Wilson, a Methodist minister in Oklahoma City and member of the Choctaw Nation. “We just know it’s there.”

“We’re taught not to think of nature as separate,” explains Ghosthorse, and that includes COVID-19. “The coronavirus is a being,” he says. “And we have to respect that being in an ‘awe state’ and a ‘wonder state’ because it has come to us as a medicine” to treat spiritual ills.

Reconnecting with culture

At a time when people around the world are sheltering in place, maintaining meaningful connections is vital. Native American leaders are

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finding creative ways to reach out. In an effort to bring positivity, calm, and reassurance to indigenous people, Joseph and her colleagues tapped into the community of Native American storytellers, musicians, healers, and even comedians to create the Native Wellness Power Hour.

Since it launched on March 21, thousands have clicked into the [institute's Facebook page](#) to listen to prayer songs, lectures on navigating healing associated with PTSD, especially related to the ongoing epidemic of [missing and murdered indigenous women](#), or just to dance along with others tuning in from around the country.

In Oklahoma, Native American Methodists sent videos of themselves singing tribal hymns to the [Oklahoma Indian Missionary Conference](#), which incorporated them into virtual church services. "We work hard to keep people connected to our culture and our language," says Wilson, who is the conference's superintendent. "Most of the people who have texted me or called me say, man, we love that—especially the hymns."

Lessons for the future

While this pandemic is presenting an opportunity to find meaningful ways to connect, it's also a wake-up call with important lessons for the future. "If we don't learn from now," warns Mindahi Bastida Muñoz, general coordinator of the Otomi-Toltec Regional Council in Mexico, "then another thing, more powerful, is going to come."

Bastida, who is also the director of the Original Caretakers program at the [Center for Earth Ethics](#) in New York City, says the world is out of balance and that anthropocentrism—our human-centric outlook—is the cause. "We think that we are the ones who can decide everything," he says, "but we are killing ourselves."

"Mother Earth is saying, 'please listen,'" adds Joyce Bryant, known as Grandmother Sasa, the Abenaki founder of [a healing center](#) in New Hampshire. "We have to care about others. You know, the grass, the trees, the plants, the air, the water—all are extensions of ourselves. And they teach us."

"Living in harmony with Mother Earth is a lot of work," says Bastida, but it can be done by reviving the indigenous idea that humans serve as caregivers of nature. He's working with spiritual leaders across the world to return to the old ways—producing food by hand, finding medicine in plants, animals, and minerals, and performing rituals and ceremonies that send prayers to Mother Earth.

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Perhaps the biggest lesson that indigenous spiritual leaders hope people will take from the pandemic is that it's a time to be still, to reflect, and to listen to elders. Both Joseph and Wilson likened this period of stay-at-home orders to a long winter, when people would traditionally stay inside and listen to stories. According to Joseph, it's like Earth is saying "not today, humans, you need some more reflection."

[nationalgeographic.com](#), 12 May 2020

<https://www.nationalgeographic.com>

How renewable energy could emerge on top after the pandemic

2020-05-12

Before the Covid-19 pandemic hit, renewable energy was growing steadily — but still not fast enough to meet the Paris Agreement's carbon reduction goals, let alone to make the further strides needed to keep climate change from spiraling out of control.

Now, the virus-induced economic shock is likely to [slow the expansion](#) of wind, solar, and other clean power sources, at least temporarily, experts say. But while lockdowns, social distancing requirements, and financial uncertainties have put some new projects on ice, the underlying strengths of renewables remain strong, and analysts expect their economic advantage over volatile fossil fuels will only increase in the long term.

Whether the pandemic ultimately puts clean energy on a faster track than before, though, depends to a large extent on the choices political leaders make now, analysts say. Which means 2020 is shaping up to be a pivotal moment for renewables — and the world's hopes of checking warming.

Leaders must seize the opportunity to design economic recovery packages so they accelerate a shift toward wind and solar power, rather than propping up the fossil fuel economy, said Francesco La Camera, director-general of the International Renewable Energy Agency, an intergovernmental body.

"The only thing we have to be afraid of," he said, "is that governments can be pushed by lobbyists to bail out sectors that belong to the past. And this is the real danger."

As shutdowns aimed at stemming the viral spread have caused global energy demand to plummet, renewable sources have accounted for an increased share of power generation. That is in part because the low

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cost of solar and wind power means they are often dispatched to grids before other sources such as coal and nuclear power. The huge drop-off in demand, for both electricity and transportation fuels, has also pushed oil and gas prices to historic lows, and left fossil fuel companies struggling to find storage space for huge gluts of product.

In the short term, however, analysts say that the global economic fallout from the pandemic will almost certainly also be a drag on the growth of renewables. Stay-at-home orders halted production at factories making solar panels and wind turbine parts, and shipping delays have exacerbated supply problems. Construction on some big arrays stopped, and social distancing requirements have forced home solar companies to postpone rooftop installations and sales visits.

“The industry needed installations to be speeding up rather than slowing down at this point” for countries to bring carbon-cutting realities into line with their promises under the Paris Agreement, said Logan Goldie-Scot, head of clean power research at analysis firm BloombergNEF (BNEF). “Anything that makes that gap bigger is hugely problematic from an emissions perspective.”

BNEF has scaled back its projections for 2020 installations by 12 percent for wind and 8 percent for solar, compared to what it anticipated before the pandemic. Renewables growth has been steady in recent years, and last fall, the International Energy Agency (IEA) predicted the world’s renewable power supply would grow by 50 percent over the next five years, adding new power generation equivalent to the entire existing electricity capacity of the United States.

“We were expecting a boom year” in 2020, said Heymi Bahar, the IEA’s senior renewables analyst. “So this becomes very bad timing.”

The bigger question, experts say, is what happens as countries reopen. With cash tight, and economic troubles expected to keep energy demand below pre-Covid-19 levels, new wind and solar projects may find financing hard to come by.

Auctions in which companies bid to build such projects have been postponed. Altogether, more than 40 percent of wind and solar capacity that was scheduled to be commissioned from April to the end of this year has been delayed, said Goldie-Scot. “That’s an immediate setback.”

Home solar took a bigger hit than utility-scale projects. Those rooftop sales are likely to continue struggling, as the slowdown forces homeowners and

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small businesses to restrict spending on big-ticket items like solar arrays, even if, in the long run, they generate substantial savings.

Still, analysts agree the renewable energy sector’s fundamentals are strong. A lot has changed since the last global meltdown, the financial crisis of 2007-08. Technologies have matured and prices dropped, to the point where renewables in most cases provide cheaper energy than fossil fuels. Battery storage, key to making clean power steady and reliable, is improving rapidly.

“Renewable generation sources have become extraordinarily competitive from an economic standpoint,” said Dan Shreve, head of global wind energy research at consulting firm Wood Mackenzie. “It’s a terrific story. Do we expect any of that to change in the near term? No, I don’t think so.”

Indeed, with oil companies in a tailspin, clean energy’s steadiness also increases its appeal to investors, in Shreve’s view. “Folks looking for a safe haven in a very turbulent market may continue to turn to this sector,” he said.

Even the breathtaking drops in oil and gas prices may not be enough to undermine wind and solar. While oil is central to transportation, it doesn’t play a direct role in power generation. And its low price will mean drilling is scaled back. Since natural gas — which does go up against wind and solar in electricity markets — often flows from the ground along with oil, its supply is likely to decline too, bringing its price back up.

“Which means it won’t be competitive with renewables,” said Amy Myers Jaffe, director of the Program on Energy Security and Climate Change at the Council on Foreign Relations.

Indeed, Shreve said nuclear and coal-fired power plants faced far stiffer headwinds than renewables. “That’s been the case for the last five years. It was expected to be the case for the next five years, regardless of the Covid crisis,” he said. Early retirements of such plants, particularly the ones for which finances were already in trouble, could pick up pace, he said.

Another sector likely to take a hit is electric cars. That has less to do with low oil prices than with unemployment slowing sales for all cars, Jaffe said. “If you believe that people were going to have the next car they buy be an electric vehicle, if you delay by two or three years the next time they’re going to buy a new car,” that will slow the transition, she said.

Fewer electric cars means less power demand, which hurts the renewables outlook. But Jaffe said the pandemic could hasten the economy’s

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electrification in other ways, including a long-term increase in remote working, which would likely shift energy demand away from oil-based transportation needs, and toward residential use, which is more heavily electric.

In the bigger picture, what comes next depends on the virus, the economy, and the path governments decide to chart. With vast amounts of stimulus money likely to be poured into economies around the world, clean power advocates say it's a historic opportunity to speed the growth of a sector whose fortunes are central to hopes of stemming climate change. La Camera said the renewable energy sector's big-picture strengths, and its resilience through the crisis so far, make him hopeful.

"My impression is that we are going to have a future that will be more decarbonized than we could have imagined three months ago," he said. "And in the end, this health and economic crisis will push us to a cleaner path forward." Risks in the other direction include not just direct government support to oil firms, but also regulatory loosening like the Trump administration's decision to essentially suspend enforcement of air and water pollution rules, or to relax limits on mercury and other toxic power plant emissions. Such moves save the industry vast sums it would otherwise have to spend reducing pollution, said Daniel Kammen, professor of energy at the University of California, Berkeley.

Even without a push to help fossil fuel companies, Covid-19 could bump climate change down the list of leaders' priorities.

For now, most governments are still focused on immediate response to the health and jobs crisis. Longer-term measures will come next, and countries including South Korea and New Zealand are already talking about incorporating climate action into recovery plans. The European Union may combine parts of its Green Deal — a plan for transforming nearly every sector of its economy to cut carbon and improve quality of life — with efforts to repair the pandemic's damage. In the U.S., the fate of any ambitious renewables plan depends largely on whether President Trump is reelected in November.

For the most part, countries' interest in green stimulus plans aligns with their pre-coronavirus stance on climate action. "We think they are more likely in countries where there was already broad-based support," such as China and much of Europe, Goldie-Scot said.

What might green recovery efforts entail? Given clean power's competitiveness, companies don't really need direct subsidies anymore,

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experts say. They would benefit from upgrades that make power grids smarter and more flexible, and therefore better able to utilize renewables. Spending to expand electric vehicle charging networks is essential, too, the analysts say.

Access to credit will also be crucial, Bahar said. While it easily competes with fossil fuels on cost, "the renewables industry just doesn't have as deep pockets," added Kammen.

Policy changes matter, as well. National, long-term carbon-cutting commitments would provide some certainty in frightening times. In the shorter term, the U.S. and China both have year-end deadlines when important tax and price incentives expire; extending those would help projects delayed by the pandemic, analysts say.

Green stimulus advocates say climate action is well-suited to creating jobs, and if done right can also help remedy the stark economic, social, and racial inequalities the virus has exposed so vividly, particularly in the U.S.

A shift to cleaner energy promises health gains too. Many have taken note of the better air quality lockdowns have brought, and Shreve said that could help people see the benefits of finding lasting ways to reduce fossil fuel use.

"The one bright spot in this crazy crisis is to have been able to walk outside in places that have been notorious for air pollution, and seeing clean skies, and having a dose of what could be," he said.

Kammen said he is hopeful the pandemic would ultimately speed the move to a cleaner economy.

"Covid gives an opportunity for governments and companies to make that switch more strongly," said Kammen. "I don't think this is going to be an easy goodbye, but I would definitely say we're in the long goodbye to fossil fuels."

e360.yale.edu, 12 May 2020

<https://wee.e360.yale.edu>

They were between 41 million and 54 million years old, and both shared a peculiar feature: a single saber tooth on the upper jaw.

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Saber-toothed anchovies roamed the oceans 45 million years ago

2020-05-12

When dinosaurs and other large predators went extinct some 66 million years ago, lots of creatures evolved to take their place. But unlike the plankton-hunting anchovies we eat in Caesar salads today, some ancient anchovies evolved into fish-eating predators, according to a new study.

Researchers examined a 30-centimeter-long fossil embedded in a rock formation near Chièvres, Belgium, and another partial fossil from Pakistan's Punjab province. They were between 41 million and 54 million years old, and both shared a peculiar feature: a single saber tooth on the upper jaw.

To get high-resolution images of the fish skulls, the researchers used micro-computed tomography—a scaled-down version of the technique doctors use to scan your body in the hospital. The images revealed rows of fangs on the fishes' lower jaws and a pointy saber tooth on the upper jaw. The fossil from Pakistan was a new species, and researchers named it *Monosmilus chureloides* after the churel—a shapeshifting creature with sharp fangs that features in many South Asian legends.

Both specimens are close cousins of today's anchovies, the researchers say. But unlike their docile relatives, these ancient anchovies likely used their fangs to snag their prey (above), the researchers write today in *Royal Society Open Science*.

This unexpected discovery highlights the extraordinary evolutionary tinkering that followed the end-Cretaceous extinction event, the researchers say, with saber-toothed anchovies living alongside familiar fish groups that inhabit today's oceans.

sciencemag.org, 12 May 2020

<https://www.sciencemag.org>

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