

THE TOP 10 IDEAS SHAPING THE WORLD AND YOUR INDUSTRY THIS MONTH

# HERE'S WHAT YOU NEED TO KNOW THIS MONTH...

We are living beyond our means. Last month, a study led by environmental scientist Johan Rockström was published in the journal Nature. This identified eight earth system boundaries and the extent to which we have exceeded them. Rockstöm led the original group of international, interdisciplinary scientists who first introduced the concept of planetary boundaries back in 2009.

The new study said that seven out of eight boundaries are beyond safe limits as a result of human activities, including biodiversity, natural ecosystems, and the use of fertlisers. The only boundary not breached everywhere is a safe level of aerosol pollutants.

Global economies continue to be buoyed by a linear 'take, make, use, and throw away' model, but in order to redress the balance and live within planetary boundaries, a regenerative, more circular approach is needed. We need to work with nature not against it.

This report shares thought-provoking ideas around biodiversity and land use, and ahead of Plastic Free July, we challenge you to reconsider what you think you know about plastics. There may be a few surprises.

Remember, change is possible.

### Angela Everitt, Content Director, Springwise

## SPRING WISE

ABOUT FUTURE NOW AND SPRINGWISE

In 2020, The United Nations dubbed this the 'decade of action' in order to foster greater urgency around meeting the Sustainable Development Goals by 2030. Decisions that drive change can no longer be kicked down the road. The future is now.

Solutions require innovation, and the hunt for those that make a real impact is the lifeblood of Springwise. We publish three new innovations every day across our ecosystem. And each month we curate 10 of the most pertinent for your industry to create this report, Future Now, which is designed to inspire and catalyse action.



# BIODIVERSITY



### **ATTACHING FINANCIAL VALUE TO BIODIVERSITY**

## What if you could bake protecting wildlife and biodiversity into your investment or broader ESG strategy?

Endangered Wildlife OÜ has developed a new, multidisciplinary technique for providing credible and reliable financial values for biodiversity. This delivers a total conservation value for an individual species that is composed of a broad range of considerations, from carbon value and aesthetic value to species existence value, among others. And, crucially, this value is applied to species within a specific location.

How these valuations are used depends on the needs of the organisation. But, to name one example, a municipality calculating the ROI of an investment in green space could add the financial value of the species supported by such a space to other considerations, such as carbon sequestration.

Another tangible example came in 2022, when Endangered Wildlife OÜ worked with non-profit organisation Shark Allies to calculate the financial value of wild, living sharks in the entertainment industry.

Organisations receive biodiversity valuations through Endangered Wildlife OÜ's consulting services. And, on top of this, the startup has been developing a machine learning software solution – called the Biodiversity Valuator – that is also used as a tool to calculate the financial value of biodiversity.





### MONITORING BIODIVERSITY WITH SOUNDSCAPES

How are the impacts of your supply chain on biodiversity being measured? Growing pressure both from consumers and legislation requires full visibility on supply chains, which is not always easy to achieve.

Dr. Sarab Sethi from the University of Cambridge is using sound to help solve this challenge. His groundbreaking work is based on the premise that soundscapes can tell us a lot about the health of an ecosystem. By monitoring a soundscape over time, we can get an early warning of changes in habitat health or the species present.

Dr Sethi has developed a device that records soundscapes over long time frames, with minimal human intervention. The technology, which is low-cost and open-source, consists of a network of sound recorders that are scattered across a landscape. These recorders collect audio data 24 hours a day, seven days a week. The data is then uploaded to the cloud, where it is automatically processed by a number of advanced machine learning algorithms.

The device is currently being used to monitor the biodiversity of different ecosystems under different human pressures as part of a trial of the technology. In Borneo, for example, the devices are being used to monitor sounds across a 'landscape degradation gradient' – from old growth forest, to logged forest, and then to oil palm plantation. Scientists will then use the data to study how this gradient, and the different levels of environmental degradation, affects biodiversity.

Sethi's soundscape-monitoring device could have a major impact on the field of ecology. By providing real-time data on changes in the soundscape, it would allow field ecologists to focus their efforts, saving time and money.



### A REPLACEMENT FOR VEGETABLE OIL MADE USING MICROBES

US startup Zero Acre Farms is developing a promising alternative to vegetable oils. The company is harnessing a well-known natural process that is more readily associated with alcohol production: fermentation. This process involves feeding microbes that, in turn, produce a useful by-product. Fermentation has many applications across industries, and microbes are carefully chosen for what they produce. In the case of brewing, the chosen microbe – yeast – produces ethanol. For the Zero Acre Farms process, microbes are chosen that produce oil and fat.

The end-product is an oil that can be used in place of vegetable oils. And what is more impressive is that it can be easily subbed into your favourite meal without needing to change the recipe. US fast food chain Chipotle has invested as part of its Cultivate Next Venture.

### PRE AND PROBIOTICS IMPROVE SOIL HEALTH AND CROP RESILIENCE

Using organic elements that plants already use, such as hydrogen, proteins, and fungi, startup Gaïago has developed various products that encourage the fertility of the soil and therefore the growing environment of crops.

'Nutrigeo' is a soil prebiotic that stimulates the growth of humidifying fungi. Two different probiotics provide additional nitrogen to the roots, and a foliar prebiotic, 'Stimulus', supports plants in resisting environmental stressors. And for the plants themselves, Gaïago has created 'Vitam'in', a prebiotic for seeds that boosts general vigour at germination to help maximise full genetic growth. Improvements in the fertility of soil can be seen in as little as six months, and when integrated into a regenerative style of farming, will have long term environmental, health, and biodiversity benefits.



The increasing use of microorganisms shows that there are innovative ways to rethink food production processes, even when it comes to hard-to-avoid ingredients such as canola and palm oil, which have a significant environmental impact.

For example, the World Wildlife Fund reports that palm oil is in nearly 50 per cent of processed food products found in supermarkets. And, in Malaysian Borneo, it is estimated that expansion of oil palm cultivation is responsible for 50 per cent of <u>deforestation</u>.





### CULTIVATING DESERT LAND FOR AGRICULTURE

The world loses almost six million hectares of forest each year to deforestation, and, according to startup From Sand to Green (FSG), around 14 per cent of deforestation is driven by consumers in the world's richest countries, for products such as a beef, vegetable oils, cocoa, coffee, and paper.

To respond to this problem, FSG has developed a nature-based solution for cultivating deserts. This involves a three-pronged approach that utilises customised desalination modules that run on solar energy, adapted tree plantations and crops that refertilise the soil and produce food, and agroforestry software to effectively create and manage plantations in arid environments.

One of FSG's first projects is the Domaine de Nzaha, a 20-hectare agricultural farm in Morocco that uses permaculture and agroforestry techniques to produce organic vegetables and fruits.

The organisation's projects deploy nurseries of native species and harness microalgae to recycle the salty wastewater produced during desalination. Drip irrigation and biochar are used to retain water and store carbon,

In addition to revitalising soils and growing food, FSG's methods create carbon sinks, preserve biodiversity, and help local communities.

### **KEY CONSIDERATION**

Are you in line with your competitive set? Regenerative farming is going mainstream. General Mills, Unilever, PepsiCo, and Nestlé are among the major food companies pledging largescale support for this type of farming.

A 90,000-hectare regenerative farming project in Iowa, USA, spearheaded by Unilever and PepsiCo, has resulted in a 27 per cent drop in greenhouse gas emissions since 2021.

Elsewhere, Carlsberg is building a traceable responsible supply chain based on regenerative agriculture across its barley farming networks in the UK, Finland, and France. And last year, Nestlé launched its Nescafé Plan 2030 to help its coffee growers transition to regenerative agriculture.



## **PLASTICS**



### SMART CHEMISTRY OFFERS A SOLUTION FOR HARD-TO-RECYCLE PLASTICS

Some plastics, such as those used in flexible packaging, are very difficult to recycle. This is driving innovation in 'advanced recycling' – a catch-all term for a number of processes that turn plastic polymers back into their original molecules.

Advanced recycling makes it possible to recycle plastic items that aren't suitable for traditional recycling methods, raising the prospect of a closed-loop system for plastics management. The challenge now is to scale-up advanced-recycling processes.

At the end of last year, INEOS Olefins & Polymers Europe and Plastic Energy announced a partnership with the INEOS Grangemouth facility in Scotland to trial a pioneering process for advanced recycling. The Plastic Energy team has been working on 'pyrolysis', which converts end-of-life plastics – that would otherwise be sent to landfill or burnt – into a liquid raw material called TACOIL. This liquid is then used to make just-like-new food-grade plastics. At Grangemouth, petroleum-based oil will be replaced by the TACOIL, which refining company Petroineos will incorporate into existing refinery processes.

The goal is to build a new recycling plant capable of handling commercial volumes of waste to produce 'closed-loop' plastics for use in sweets, biscuits, and pet food packaging. Plastic Energy's process already has a successful track record at two recycling plants in Spain.



## A BREAKTHROUGH PLASTIC UPCYCLING PROCESS

Is the term 'circular economy' a buzz word in your organisation or is there a will to 'close the loop'?

A collaboration of scientists from American universities is pioneering a new technology that may help to reduce the environmental impact of plastic pollution while also providing a financial incentive for recycling.

The process, which is the fruit of a joint effort between the University of Illinois Urbana-Champaign, the University of California, Santa Barbara, and chemical giant Dow, involves breaking down the long chain molecules of polyethylene (PE) into much shorter molecules.



These can then be used to create polypropylene (PP). PE is used in a range of products, from packaging to bottles, while PP is found in items such as car parts and Tupperware. The team behind the research believes that this could provide a valuable incentive for companies to recycle their plastic waste, as they would be able to sell it on at a higher price.

### **BIOPLASTIC MADE FROM ORGANIC WASTE**

Big business is already tapping into alternatives to fossil-fuel-derived, single-use plastic. Canadian startup Genecis creates pollution-free, totally biodegradable PHA (polyhydroxyalkanoate) – a naturally occurring polymer produced by bacteria when they are fed organic waste like leftover food.

At the end of its usable life, a PHA product will break down safely in the environment without leaving behind microplastics or leaching toxic chemicals. To become even more sustainable in future, the company hopes to use old PHA products as the feedstock for new Genecis bioplastic, creating an entirely closed-loop system and reducing the need for additional resources. Mirroring the versatility of traditional plastic, Genecis' alternative PHA can be used in car interiors, clothing, and packaging. And because the material is natural, it is also safe to use in tools for medical procedures.

Ideally Genecis' PHA would go to compost where it can break down alongside other organic materials, but the company emphasises that even if it ends up in any natural environment – like the soil of landfill or waterways – it will still degrade safely in about a year. And, in using natural waste as a feedstock, the company also assures that its process is cheaper and generates fewer emissions than current bioplastic manufacturing. Genecis is currently working with Amazon on a new generation of packaging solutions.





## A DEVICE WORKS ON POLLUTANTS AS SMALL AS 10 MICROMETRES IN DIAMETER

It's not just big pieces of plastic that are the problem, microplastics are found almost everywhere on earth. These are shed by plastics in use, as well as plastic waste, so finding ways to tackle this issue is crucial.

So far, filtering techniques for removing microplastics from water have proven time-consuming and costly, with the devices often getting clogged with other materials such as sand and debris. Management of the filters frequently requires manual cleaning and removal of the larger items. Professor Yoshitake Akiyama and Professor Hiroshi Moriwaki led a team of researchers in the Faculty of Textile Science and Technology at Shinshu University in using sound to clean microplastics from water. The device uses microfluidity, combined with acoustic focusing, to gather microplastics that range in size from 10 to 200 micrometres in diameter. Ultrasonic waves push the microplastics to the centre of a stream of fluid where the pollutants can be collected.

In tests, 70 to 90 per cent of the microplastics in the fluid were collected, and the scientists believe that a pre-filtration process that removes the biggest pieces could help maintain efficiency of the device. Commercial applications of the device would focus on preventing microplastics from entering the world's waterways.

#### **KEY TAKEAWAYS**

Recent UN talks in Paris to consider a legally binding treaty on plastic pollution concluded with an agreement from the 170 countries present to commit to a draft by November, with a view to something more concrete by 2024. The UN has called for an 80 per cent reduction in plastic waste by 2040. The final treaty could include legally binding targets to get there.

Consumers want to go plastic free. In an Ipsos survey, conducted in partnership with Plastic Free July last year, three quarters of respondents globally want a ban to single use plastic, with 85 per cent saying that it is the responsibility of manufacturers and retailers to reduce, reuse, and recycle plastic packaging.

Current forms of plastic recycling have their limits: Mechanical recycling is costly, and the end product (recycled plastic) is expensive compared to virgin plastic. Mechanical processes also gradually break down the plastic's polymer chains meaning that it can only go through a finite number of 'cycles'. It's also necessary to sort and separate different plastics in traditional recycling processes. Alternatives are out there.





### PLASTIC IS A BURNING ISSUE, BUT SO IS E-WASTE...

According to Statista, more than 50 million metric tonnes of e-waste is generated every year and this is only set to increase. Often, this e-waste ends up in developing countries, and burned, releasing toxic gases.

New Zealand company Mint Innovation has devised an eco-friendly multi-step process for breaking down e-waste. The technology uses low-cost and low-impact biorefineries that extract valuable metals from scrap circuit boards so they may be reused – reducing future need for mined materials. First, electronic circuit boards are ground up. If precious metals can't be retrieved using electrochemistry, Mint dissolves them using its proprietary 'green' chemistry.

The company then recovers metals from the solution with a bioabsorption process, whereby special microbes added to the solution absorb the metals. A centrifuge separates metals from the microbes and these extracted materials are then refined into pure metals, ready to be repurposed and resold as items like jewellery or new electronics.

Although Mint has been focused on recycling electronic devices and scrap circuit boards so far, the technology could also be used n the recycling of batteries and catalysts on a large scale.

### INNOVATORS FEATURED

### **1. Endangered Wildlife OÜ** endangeredwild.life

**2. Soundscapes** cam.ac.uk

**3.Zero Acre** zeroacre.com

**4.Gaïago** gaiago.eu

**5.From Sand to Green** fromsandtogreen.com

6.Plastic Energy plasticenergy.com

**7.Plastic upcycling** illinois.edu

8. Genecis genecis.co

**9.Microfluidity** shinshu-u.ac.jp

**10.Mint Innovation** mint.bio



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Created by Springwise

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