

THE EARTHSLOT PRIZE 2022 FINALISTS



THE
EARTHSLOT
PRIZE

STORIES BY
**SPRING
WISE**
TM

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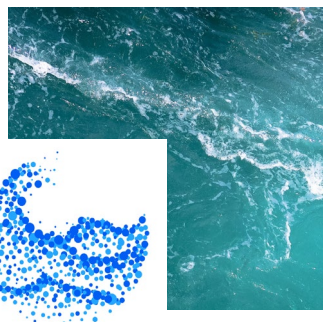


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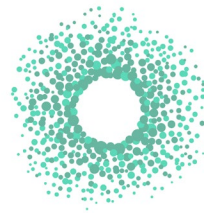
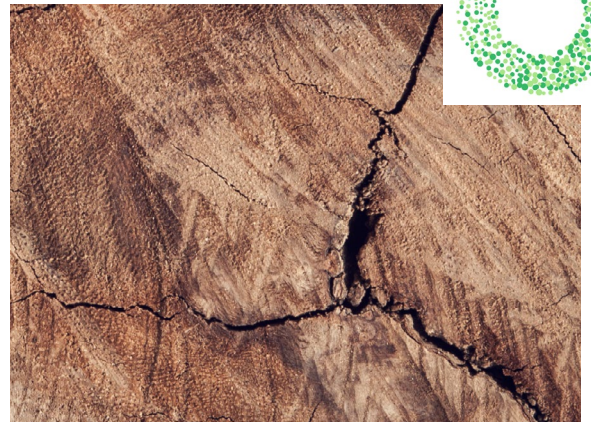
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A better future is possible

AS THE FINALISTS OF THIS YEAR'S EARTHSHOT PRIZE PROVE, INNOVATION IS MORE VITAL THAN EVER IF WE WANT TO RAPIDLY CREATE A BETTER WORLD

The world is at a tipping point. From the collapse of polar ice sheets to the destruction of coral reefs and the thawing of Siberian permafrost, we are coming perilously close to inflicting irreversible damage on the planet. And as a [major study](#) published this September demonstrates, we are running out of time if we are to avoid a whole host of environmental catastrophes with serious implications for humanity. Our choice is stark: act now or live with the consequences.

The 2030s are the decade to embrace ingenuity if we are to avert disaster and keep alive our hopes of meeting the targets set by the Paris Agreement. Put simply,

carbon emissions [need to halve](#) this decade if we are to stay within the global carbon budget – the total amount of carbon dioxide that humans can emit if we are to meet our climate targets.

But boiling the climate crisis down to an emissions figure glosses over the complexity and interconnectedness of the issues we need to address if we are to repair our planet. In addition to fixing our climate, we must protect and restore nature, revive our oceans, clean our air, and build a waste-free world. ➤



Biodiversity is [declining faster](#) than at any time in human history, and more than [41,000 species](#) are threatened with extinction, including 21 per cent of reptiles and 27 per cent of mammals. This loss of species threatens our human livelihoods. [Three-quarters](#) of our crops depend on pollinators, and many species of pollinating insect are in decline. Our global food system is the [primary driver](#) of biodiversity loss, so it is essential that we find new ways to feed our growing population.

It is not just our land-based eco-systems that are under threat. Beneath the waves, a third of reef corals, and 37 per cent of shark and ray species are [facing extinction](#). And while animal species are declining, ocean plastic is booming. If we don't change our ways, by 2040, the amount of plastic waste entering aquatic ecosystems could [nearly triple](#). But all is not doom and gloom. [According](#) to the United Nations, oceans are 'the world's greatest ally against climate change'. Around 25 per cent of carbon emissions are absorbed by the ocean, with marine eco-systems such as seagrass meadows, mangrove swamps, and kelp forests acting as potent carbon sinks.

Back on land, CO2 is not the only pollutant we need to worry about. Carbon emissions may harm our planet, but emissions of nitrogen oxides, ozone, and particulate matter harm our health. According to the World Health Organization, [almost everyone on earth](#) – 99 per cent of the global population to be precise – breathes air that contains high levels of pollutants. And the combined effects of air pollution, both outside and within the home, are associated with [7 million](#) premature deaths each year.

Underlying many of our man-made woes is the fact that our lifestyles and consumption habits are extremely wasteful. One-third of the food produced for human consumption is [wasted or lost](#) annually. Meanwhile, single-use plastics account for [40 per cent](#) of the plastic produced each year, and globally only [9 per cent](#) of ➤



MATILDA KHOO

“

When it comes to repairing our planet, there's no time for delay. Thankfully, the 2022 finalists of The Earthshot Prize are demonstrating that ingenious solutions already exist to drive the change we need this decade.”

James Bidwell, CEO, Springwise

”

WE CARE ABOUT THE FUTURE

plastic waste is recycled. All in all, the economic growth of the past century has moved in lockstep with increased resource consumption.

The scale of the challenges we face today may seem overwhelming. But humans have an amazing capacity for innovation and problem-solving. And this ingenuity and resourcefulness is embodied by the 2022 finalists of The Earthshot Prize. Drawn from across the globe, the solutions they've developed give us hope that the 2030s will indeed be a decade of action.

To step back from the brink of climate collapse, innovators around the world will take inspiration from their leadership as we take the bold action needed to repair our planet.

THE SPRINGWISE TEAM

ABOUT SPRINGWISE

Springwise is the leading global platform for innovation and positive change.

For the last 20 years, we've been discovering and publishing the world's newest, most important innovation solutions for positive change and the transition economy.

With a global community of more than 2 million, we're essential reading for CEOs, innovators, investors,

educators, and corporates in all sectors and geographies.

We're also the trusted innovation and sustainability content partner for many leading global brands and organisations – using our storytelling powers to make sense of global innovation and sustainability for diverse audiences.

Committed to positive change and innovation that matters, we're proud to be a member

of 1% for the Planet and a certified B Corporation – part of a growing community of businesses committed to redefining their role in society as a force for good.



Want to join the Springwise global community and receive our insightful innovation digests, direct to your inbox every week-day? Visit us at springwise.com and sign up for our free newsletter.

A close-up photograph of several green fern fronds, showing the intricate, feathery structure of the leaves. The fronds are layered, with some in sharp focus and others slightly blurred in the background, creating a sense of depth. The overall color is a vibrant green.

PROTECT & RESTORE NATURE

THE
EARTHSHOT
PRIZE

STORIES BY
SPRING
— WISE

FINALIST
DESERT
AGRICULTURAL
TRANSFORMATION
CHINA

THE EARTHSHOT PRIZE: WALTER FREHNER



WHAT

Technology to turn sand into soil

WHO

Chongqing Jiaotong University

WHERE

China

IN THEIR OWN WORDS

"Our solution transforms dry plains into productive pastures. We think we have found a solution to rising food insecurity."

CONTACT

desert.cqjtu.edu.cn

TRANSFORMING DESERTS INTO FARMLAND

'Desert soilization' technology can tackle desertification and strengthen food security

When China's Han Emperors sat on the throne between 202 BCE and 8 CE, the Ulan Buh Desert was a [fertile land](#). Today, the region in Inner Mongolia is notorious for its sandstorms. This dramatic transformation is just one example of 'desertification' – a process whereby land in dry areas is degraded.

Healthy soil matters. Its most obvious role is in agriculture, but it also supports biodiversity and alleviates flooding and drought. And in our climate-stressed times, soil is an important carbon store. For these reasons, loss of soil is a cause for concern, and desertification and soil erosion threaten food supplies, eco-systems, and peoples' livelihoods. In fact, by 2050, the number

of people displaced by issues related to scarce land resources could be as high as [700 million](#).

How can we prevent the livelihoods of billions being destroyed? A team of researchers from Chongqing Jiaotong University, led by Professor Yi Zhijian, has developed Desert Agricultural Transformation – a technology solution that turns desert sand into soil. Through the addition of a plant-based bonding agent, sand particles gain the characteristics of soil, including the ability to hold water and support plant growth.

The solution is low-cost and has so far been successfully demonstrated in China, Niger, and the United Arab Emirates.



TAKEAWAY

Desert Agricultural Transformation could potentially boost international efforts on a range of issues, not just desertification control. Since the project began in 2016, desert soilization has shown significant co-benefits – both for people and nature. Poverty alleviation, biological conservation, food security, and efforts to mitigate climate change could all receive a boost from the technology. Ultimately, Desert

Agricultural Transformation could deliver more living space for a growing global population.



FINALIST

KHEYTI
GREENHOUSE
-IN-A-BOX
INDIA**WHAT**

A modular greenhouse for small farmers

WHO

Kheyti

WHERE

India

IN THEIR OWN WORDS

"The world depends on its small-hold farmers and yet their lives are amongst the hardest on Earth. Our Greenhouse-in-a-Box is empowering farmers in India today."

CONTACT

kheyti.com

PROTECTING FARMERS FROM THE EFFECTS OF EXTREME WEATHER

Modular greenhouses protect crops from rain, heat, and pests

India is home to 100 million farming families managing small plots of land. For them, extreme weather can be disastrous. And as the climate heats up, the costs associated with mitigating the effects of the elements are increasing. All this means that smallholders have little control over their incomes and are particularly vulnerable to climate change.

What can be done to help these families achieve a dependable income in the midst of a climate crisis? The answer may come in the shape of a 'Greenhouse-in-a-Box'. Created by startup Kheyti, the modular greenhouse design is just half the cost of a regular greenhouse, and takes up only a small fraction of a farmer's land. Kheyti

installs the greenhouse for the farmers while also providing bundles of seed and fertiliser.

Installation is not the end of the story, however, as the Greenhouse-in-a-Box is accompanied by a full stack of services that help the farmer get the most out of the technology. Farmers receive mobile technology training and the company's field officers support them with advice. Growing crops in the greenhouse protects them from pests and adverse weather, reducing the environmental risk for farmers.

The startup is working with 1,000 farmers across six Indian states but has set an ambitious target to reach 50,000 farmers by 2027.



TAKEAWAY

How can the Greenhouse-in-a-Box help farmers? Most immediately, it provides them with income stability. In fact, Kheyti claims that its solution provides a farm with an additional \$1,200 per year – a 200 per cent increase in income. It also improves farmers' livelihoods by enabling farm workers to swap arduous tasks in the open fields with smarter work in the greenhouse.

And it's not just the farmers themselves that benefit –

Kheyti's solution also has benefits for food security and the environment.

For example, using the greenhouse, small farmers can grow seven times more food with 90 per cent less water.



FINALIST

HUTAN

MALAYSIA

THE EARTHSHOT PRIZE; EDGAR WINKLER



WHAT

Passageways that let orangutans pass through palm oil plantations

WHO

Hutan

WHERE

Malaysia

IN THEIR OWN WORDS

“We forge strong partnerships and develop innovative solutions for a more harmonious coexistence between wildlife and people.”

CONTACT

hutan.org.my

CREATING PASSAGEWAYS FOR ORANGUTANS THROUGH PALM OIL PLANTATIONS

A project in Borneo shows that, with the right policies, orangutans and plantations can co-exist

Having once occupied vast swathes of South China and Southeast Asia, orangutans are now found only on the islands of Borneo and Sumatra. And even here their numbers are under threat. What can we do to protect these magnificent creatures?

An increase in the number of palm oil plantations is contributing to the decline in Borneo's orangutan population. Annual palm oil production has increased from [2 million tonnes](#) in 1970 to 71 million tonnes in 2018. As the number of plantations has increased, orangutans have been forced to cross private land as they move between fragmented areas of forest.

Because they can cause expensive damage, many landowners have historically killed them to

prevent economic losses.

And while it was long thought that orangutans need pristine forests to survive, research by conservation group Hutan shows that orangutans can live in degraded forests – adapting how they eat, move through the landscape, and even find a mate.

Hutan's findings show that a policy of zero killings and removals is essential. The organisation has therefore established the Kinabatangan Orangutan Conservation Programme (or KOCP) to create 'passageways' for animals to pass through fragmented forests safely. KOCP then educates landowners about the importance of these passageways.



TAKEAWAY

How does KOCP maximise its chances of protecting orangutans and other forms of wildlife? Stakeholder buy-in is essential, and the organisation has worked hard to earn the trust of plantation owners. In part it has done this by offering them free wildlife management plans – something they need to be certified as sustainable. And their education efforts have also borne fruit. For example, one plantation owner removed the trenches and fences they had in place to prevent animal access.

As a result, they benefited from a substantial reduction in damage caused by animals forcing themselves onto land. With palm oil found in a large proportion of supermarket products around the world, efforts to promote the co-existence of wildlife and plantations are extremely important.



CLEAN OUR AIR

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FINALIST

MUKURU
CLEAN STOVES

KENYA

THE EARTHSHOT PRIZE: GUNNAR MALLON



WHAT

Clean stoves for domestic cooking

WHO

Mukuru Clean Stoves

WHERE

Kenya

IN THEIR OWN WORDS

"Today, we have an opportunity to transform the lives of millions, with cheaper, safer, and more sustainable cookstoves and fuels."

CONTACT

mukurustoves.org

PROVIDING LOW-INCOME FAMILIES WITH CLEAN, SAFE, AND AFFORDABLE COOKSTOVES

Made from recycled material, Mukuru's stoves reduce air pollution and fuel consumption

Household air pollution is a major threat to public health – particularly in low- and middle-income countries. In total, the World Health Organization reports that [one-third](#) of the global population cooks using either open fires or inefficient stoves. This releases pollutants that cause a range of health issues from strokes and heart disease to lung cancer.

Charlot Magayi became aware of the issue in 2012. At the time she was researching safer stove designs after her daughter was burned by an overturned cookstove. She had also felt the effects of household air pollution firsthand – with she and her daughter suffering repeated respiratory tract infections as the result of only being able to afford

charcoal fuel.

Inspired to make a difference, she founded Mukuru Clean Stoves. The organisation designs and manufactures cookstoves for low-income families in East Africa. The use of recycled materials ensures that the stoves are affordable for this target market. Moreover, the stoves use processed biomass in the form of wood, charcoal, or sugarcane waste briquettes or pellets. This feedstock burns cleaner and more efficiently than both open fires and traditional cookstoves.

After manufacturing is complete, Mukuru Clean Stoves takes a community-led approach to distribution – tapping into women's community groups across Kenya. It has 125,000 users to date.



TAKEAWAY

The benefits of clean cookstoves are clear. Mukuru Clean Stoves highlights that they reduce fuel consumption by 30-60 per cent and toxic smoke emissions by 50-90 per cent. They also lower the risk of burns in children, while reducing carbon emissions.

Moreover, the organisation's approach to clean domestic cooking reduces fuel costs by 50 per cent, while saving users time they would otherwise spend collecting firewood. And the key feature of the stoves is their affordability, which ensures they can be accessed by low-income communities.



FINALIST

AMPD
ENERTAINER

China

THE EARTHSHOT PRIZE: ANAMUL REZWAN



WHAT

A battery energy storage system for construction

WHO

Ampd Energy

WHERE

China

IN THEIR OWN WORDS

"The Enertainer eliminates the need for direct use of fossil fuels on construction sites."

CONTACT

ampd.energy

REPLACING DIESEL GENERATORS ON CONSTRUCTION SITES

A battery energy system reduces the noise, carbon emissions, and air pollution generated by building projects

What powers all the cranes, hoists, and welders you see on a construction site? The answer is almost always diesel. Most sites run on noisy, polluting generators – one of the reasons why the construction sector is responsible for [11 per cent](#) of global carbon emissions. These diesel generators also damage the health of local people – particularly in the tightly packed urban areas where most projects take place.

But diesel power no longer needs to be the default for the construction sector. Based in Hong Kong, Ampd Energy sees an 'emissions-free future for construction', and the startup has developed a compact and connected battery energy system to make this vision a reality. Called the 'Enertainer', the

software-driven system can power anything electrical, but it is most effective for high-power equipment such as cranes and pumps.

It uses lithium-ion batteries similar to those found in electric vehicles. The system is designed to accept any input power source but, most often, it is plugged into a temporary power connection provided by the local utility company. Accompanying the physical system is a monitoring and data platform accessible through a phone or laptop.

Over 100 Enertainers are currently in use across 70 major construction projects, and the system is available in China, Singapore, Australia, and the UK.



TAKEAWAY

So, what impact does the Enertainer have? First, it can reduce a site's carbon footprint, with all the Enertainer systems currently in use collectively abating 12,000 tonnes of carbon dioxide emissions per year. Even if the system is charged using a small diesel generator, it can still achieve carbon savings compared to machinery directly powered by diesel. Second, it can lead to improvements in local air quality, and it can be used even at sites with poor ventilation. Each year, the Enertainer fleet prevents air pollution equivalent to 25,000 cars. Third, the Enertainer is nearly 32 times quieter than a diesel generator – improving the wellbeing of local people and workers. Finally, for construction companies, the Enertainer requires less maintenance than diesel generators and is less of a fire risk.



FINALIST

ROAM

KENYA

THE EARTHSHOT PRIZE: CHUTTERSNAPE



WHAT

Electric vehicles tailored to the African market

WHO

Roam

WHERE

Kenya

IN THEIR OWN WORDS

"The company builds motorcycles and buses tailored to the market with affordability and reliability at the forefront. We want to help the environment, and drivers' pockets."

CONTACT

roammotors.com

ACCELERATING THE ELECTRIC VEHICLE TRANSITION IN EAST AFRICA

A tech company provides electric motorbikes and buses tailored to the needs of the African market

The International Energy Agency estimates that, globally, [13 per cent](#) of new cars sold in 2022 will be electric.

But in the transition to electric vehicles (EVs), sub-Saharan Africa faces challenges. These [include](#) an unreliable electricity supply, low vehicle affordability, and the dominance of used vehicles. At the same time, transport makes up [10 per cent](#) of Africa's total greenhouse gas emissions, so there is a need for change.

Spotting a gap in the EV market, Kenyan-Swedish company Roam is offering solutions for the African transport sector. The company's solutions are underpinned by practicality, and one of the key features of the Roam offer is the conversion of

existing vehicles to electric power.

Roam has two key business propositions. The first, Roam Air, is an electric motorcycle that is tailored for commercial use. This is important in East Africa where four to six per cent of the population relies on motorcycles for income.

Roam also offers two electric bus models that can be charged through a solar power system or the grid. Costs are kept low through localisation and an ownership model where initial investment in an electric bus is the same as for a diesel equivalent. Buyers then pay off the remaining cost through operational savings that come from the lower maintenance requirements of an EV.



TAKEAWAY

The benefits of EVs in terms of carbon dioxide emissions and air pollution are well-established. So, what makes Roam more than just another EV company? The company's approach is underpinned by top university research that changes our understanding of the best way to deploy EVs.

And the focus on all-electric conversion kits for fleet vehicles shows how the company is thinking about the problem differently. By focusing on affordability and tailoring solutions to local needs, Roam is improving the scalability of EVs in East Africa.





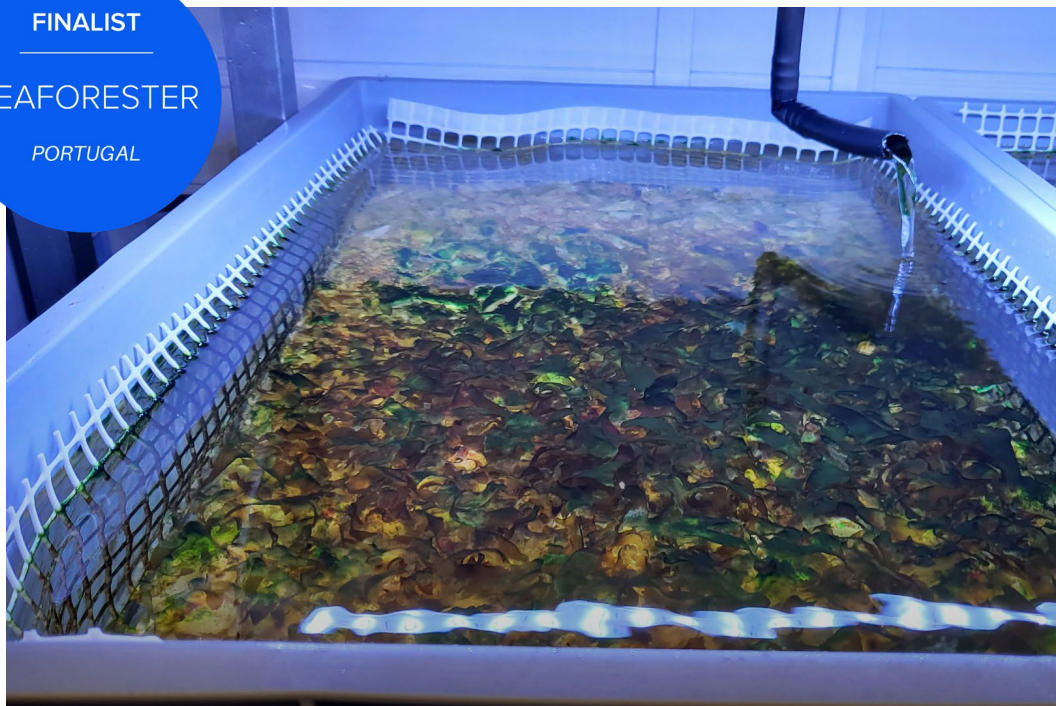
REVIVE OUR OCEANS

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FINALIST
SEAFORESTER
PORTUGAL

THE EARTHSHOT PRIZE: KINDEL MEDIA



WHAT

Seaweed stones reverse underwater deforestation

WHO

SeaForester

WHERE

Portugal

IN THEIR OWN WORDS

"Our solution aims to restore what has been destroyed. Reforesting our seas will help reverse ocean acidification, build up fish stocks, and curtail climate change."

CONTACT

seeforester.org

REVIVING THE OCEAN'S 'FORGOTTEN FORESTS'

A cost-effective solution tackles the issue of underwater deforestation

What do you picture when you think of deforestation? The burning of the Amazon perhaps? Deforestation on land captures our imagination, but the ocean has its own version. Every year, three million hectares of marine vegetation is lost. And over the past 50 years, there has been a 50 per cent decline in the world's kelp forests.

Seaweed plays an important role in the planet's climate by capturing and storing carbon. In fact, around [200 million tonnes](#) of carbon dioxide is sequestered by seaweed each year across the globe. That's equivalent to the annual emissions of the US state of New York. But coastal development, ocean warming, pollution, overgrazing, and heatwaves are all eating into this vital carbon sink.

One person who has not forgotten the world's seaweed forests is Pål Bakken, founder and CEO of SeaForester. As the son of a seaweed farmer, he knows all about the decline in marine vegetation. Driven by its founder's mission to bring life back to the ocean, SeaForester has developed a revolutionary low-cost technique for restoring kelp forests.

This cost-effective solution involves seeding stones with seaweed spores. The seaweed is then grown on land in special 'seaweed nurseries'. Once the seaweed has grown sufficiently, the stones are scattered from boats into shallow coastal waters where vegetation can harness the power of the sun.



TAKEAWAY

What are the benefits of underwater reforestation? First, seaweed forests are a potent natural tool for fighting climate change, capturing carbon at least five times more efficiently than tropical rainforests. And the area of shallow sea suitable for seaweed growth is the size of the United States or the whole of Europe – roughly equivalent to the space taken up by all of the world's tropical forests. Beyond carbon

sequestration, seaweed forests also offer other benefits. As a habitat, they can support large numbers of fish, helping to restore depleted fish stocks. Moreover, seaweed cleans seawater and helps to reverse the effects of ocean acidification.

SeaForester's containerised nursery can be scaled up and replicated, bringing these benefits to coastlines around the world.

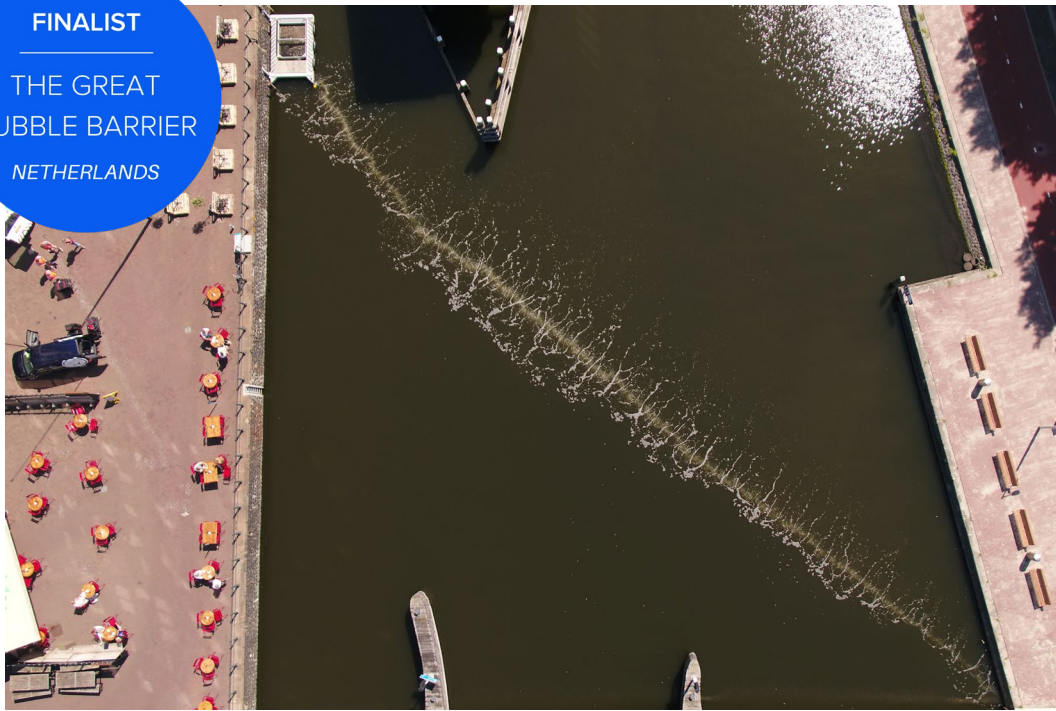


FINALIST

THE GREAT
BUBBLE BARRIER

NETHERLANDS

THE EARTHSHOT PRIZE: BRIAN YURASITS



WHAT

Bubble curtains remove river plastic

WHO

The Great Bubble Barrier

WHERE

Netherlands

IN THEIR OWN WORDS

"Rivers are the highway to our oceans, transporting pollution all the way there. The Great Bubble Barrier stops plastic from reaching the sea."

CONTACT

thegreatbubblebarrier.com

USING BUBBLES TO REMOVE PLASTIC FROM RIVERS

'Bubble curtains' remove 86 per cent of river plastic before it reaches the sea

Our seas are choking on plastic. According to the United Nations Environment Programme, there is currently [75 to 199 million tonnes](#) of plastic in the ocean. How does it get there?

A large proportion comes from the world's rivers, with 1.8 billion kilograms of plastic swept from rivers to the sea each year. And this flow of pollution is expected to triple by 2040.

For this reason, Netherlands-based startup The Great Bubble Barrier is focusing on removing plastic before it ever reaches the ocean. Its solution is to create a 'bubble curtain' by pumping air through a tube that runs along the riverbed. The upward current pushes plastic to the surface, and the flow of

the river, combined with the diagonal placement of the curtains, funnels the plastic waste into a catchment area where it can be recovered.

The plastic is then collected, processed, and re-used.

The bubble curtain is created using electric compressors, and the company aims to power these with renewable energy wherever possible. The system runs 24 hours a day without an operator and can be monitored remotely.

Rivers come in a range of shapes and sizes – from canals to tideways – and are used by humans in a variety of different ways. Each bubble barrier system is therefore tailored to the local conditions of the river where it is deployed.



TAKEAWAY

There are many different litter traps and booms in use around the world. So, what makes The Great Bubble Barrier different?

First, it is the only system able to cover the full width and depth of a waterway without disrupting river traffic or wildlife. Ships can pass through the bubble curtain unhindered, as can migrating fish. Second, the system is extremely versatile, meaning it is suitable for a wide range of locations without major changes to existing infrastructure. And finally, the bubbles themselves boost the aquatic environment by increasing the level of dissolved oxygen.



FINALIST

INDIGENOUS
WOMEN OF THE
GREAT BARRIER REEF
AUSTRALIA



WHAT

Empowering indigenous women to protect the Great Barrier Reef

WHO

The Queensland Indigenous Womens Ranger Network

WHERE

Australia

IN THEIR OWN WORDS

"This place has always been our home, but today we risk losing it and the unique culture that has existed here for millennia."

CONTACT

qiwrn.com.au

LEVERAGING THE KNOWLEDGE OF INDIGENOUS WOMEN TO PROTECT VITAL ECOSYSTEMS

Initially focused on the Great Barrier Reef, a programme combines the traditional knowledge of indigenous women with technical training

According to archaeologists, indigenous people have inhabited Australia for at least [65,000 years](#), building up a body of knowledge that amounts to one of the oldest continuous civilisations on earth. Indigenous people themselves traditionally believe their ancestors have been in their country since the time of creation.

A reciprocal relationship with the land is fundamental to the way of life of indigenous communities. For example, the Yuku Baja Muliku people are the Traditional Custodians of Archer Point in North Queensland, Australia. Their lands border one of the world's most important ecosystems: the Great Barrier Reef.

Famed for its biodiversity, the Great Barrier Reef is severely threatened

by climate change. In 2022, 91 per cent of reefs surveyed on the Great Barrier Reef were affected by coral bleaching.

Now, a programme is putting local indigenous communities at the heart of the solution to this issue. Larissa Hale, a Yuku Baja Muliku woman, leads The Queensland Indigenous Womens Ranger Network, which empowers indigenous women to use their traditional knowledge while training in digital technologies, geospatial information, automation, and robotics.

This combination of technical training and traditional knowledge is vital, as Indigenous Rangers serve on the frontline of land and sea management and protection.



TAKEAWAY

Why is The Queensland Indigenous Womens Ranger Network so important? Today, less than 20 per cent of Indigenous Rangers are women. And the programme is based on the idea that if the level of female participation in conservation can be increased, there will be benefits both for nature and the local communities who may rely on it for income.

And while the initial focus is on the Great Barrier Reef, the core principle of the programme – the combination of modern technology with the traditional knowledge of indigenous women – could be replicated in other communities around the world.





BUILD A WASTE- FREE WORLD

THE
EARTHSHOT
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STORIES BY
SPRING
— WISE

FINALIST

NOTPLA

UK

THE EARTHSHOT PRIZE: KIER IN SIGHT



WHAT

Biodegradable packaging made from seaweed

WHO

Notpla

WHERE

UK

IN THEIR OWN WORDS

"Fourteen million tonnes of plastic enter our oceans each year. We founded Notpla when we discovered the solution lies in our oceans too."

CONTACT

notpla.com

REPLACING SINGLE-USE PLASTIC WITH A SEAWEED-BASED PACKAGING

A 100 per cent compostable packaging material breaks down like fruit peel

The first fully synthetic plastic was invented in 1907 – before the Titanic sank. But it wasn't until the 1970s that plastic production really took off. And nearly half of all the plastic ever made was produced since the year 2000, while annual plastic production today runs at nearly [400 million tonnes](#).

What is the ultimate fate of all this synthetic material? Only [nine per cent](#) of all the plastic we've produced has been recycled, while 12 per cent has been incinerated. The rest has been sent to landfill or informally dumped.

Bioplastics made from plant-based sources such as vegetable oil are often touted as a potential solution to this problem. But they represent just one per cent of the plastic

produced annually, and their use tends to be confined to a small number of consumer applications. But what if the ocean offered an alternative?

UK-based Notpla is turning to seaweed as a solution to the plastic problem. The company uses seaweed waste to create biodegradable alternatives to traditional plastic packaging. Its latest product – currently in development – is Notpla Hard Material, a solid packaging solution that is suitable for moulding.

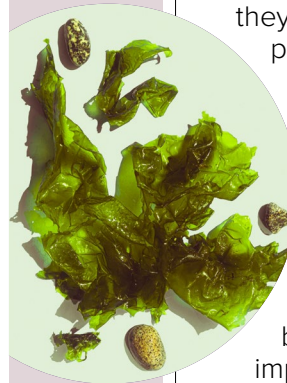
Notpla's mission is to 'make packaging disappear', and all its products are completely home compostable, chemical-free, and formulated to break down harmlessly.



TAKEAWAY

What makes seaweed so promising for packaging? The brown variety Notpla uses is one of the most renewable resources on earth. It grows extremely fast, at a rate of one metre per day. Moreover, seaweed doesn't compete with food crops, nor does it require fresh water or fertilisers. In fact, forests of fast-growing seaweed act as a huge carbon sink. Even if Notpla's products end up in the environment, they will not stay there for long periods as they biodegrade within four to six weeks.

They also do not shed harmful micro-plastics, and the fact that they can be composted at home sets them apart from packaging made from PLA – a common type of bioplastic. In terms of social impact, the seaweed farms Notpla partners with employ many women in East Africa.



FINALIST

CITY OF
AMSTERDAM,
CIRCULAR ECONOMY
NETHERLANDS

THE EARTHSHOT PRIZE: JAVIER M



WHAT

A blueprint for a modern circular city

WHO

City of Amsterdam

WHERE

Netherlands

IN THEIR OWN WORDS

"We are pioneering on the circular economy, but realise that we need to work together with residents, companies, and other cities."

CONTACT

amsterdam.nl/en/policy/sustainability/circular-economy

CREATING A CIRCULAR CITY

Amsterdam's circular economy strategy aims to eliminate all need for new materials by 2050

'Material footprint' is defined as the total amount of raw materials extracted to meet the demands of consumers. And the global material footprint is ballooning – increasing at a [faster rate](#) than both population and economic output. In short, humanity is relying on the extraction of more and more raw materials.

How can we reverse this situation? The circular economy is an attempt to re-wire our economic systems by re-using materials over and over again in closed cycles. This reduces waste and, in turn, the demand for new materials.

The City of Amsterdam hopes to be a pioneer in the circular economy through a strategic framework and a policymaking tool called

the 'City Doughnut'. This empowers city officials to understand and track material flows and set policies accordingly. The goal is to halve the use of new raw materials by 2030 and achieve full circularity by 2050.

So, what tools does the city have to deliver this vision? First, it is altering taxation so that repairing a product is cheaper than replacing it. Second, it is requiring those who use raw materials to track what happens with the excess. And third, the city is using its own procurement to set the right example.

Beyond this, the city is also using its influence, involving marginalised communities, and partnering with other stakeholders like the EU.



TAKEAWAY

What is a 'city doughnut'? The idea is rooted in the concept of doughnut economics developed by British economist Kate Raworth. This describes how societies and businesses can develop economically without exceeding the planet's natural boundaries.

In line with this, the Amsterdam City Doughnut acts as an evaluative framework that looks at the city from a social, ecological, local, and global perspective. By adopting this framework as part of its circular strategy, Amsterdam is acting as a model for how a modern city can flourish while respecting the health of both people and planet.



FINALIST

FLEATHER
BY PHOOL

INDIA



WHAT

A leather alternative made of discarded temple flowers

WHO

Phool

WHERE

India

IN THEIR OWN WORDS

"We began life with a simple idea: to clean up India's holiest river. In the process, we've discovered a material growing on our factory floor that could one day replace animal leather."

CONTACT

phool.co

MAKING PLASTIC-FREE LEATHER FROM DISCARDED TEMPLE FLOWERS

A new material prevents harmful chemicals from entering waterways

Ritual offerings of flowers are an important part of Indian daily life. But what happens to temple flowers after religious ceremonies?

Flowers used in religious rituals are considered sacred and are therefore not disposed of in landfill. Instead, rivers such as the Ganges are the ultimate destination for much of the 800 million tonnes of daily floral waste.

Flowers may seem far from threatening. But 96 per cent of them contain pesticides at levels 10,000 times the safe limit. These chemicals wash off in the water and endanger the eco-system by suppressing oxygen levels and forming toxic compounds.

Kanpur-based startup Phool is tackling this problem by turning discarded flowers into

'Fleather' – an alternative to animal and plastic leather. In doing so, it is also reducing another pollution source: toxic waste from leather tanneries.

Temple flowers are collected by a team of 'flowercyclers' and brought to Phool's factory. After non-biodegradable waste is removed, the stems and petals are separated. The stems are used for vermicomposting while the petals are sent to the Indian Institute of Technology (IIT). Here the team encourages natural fungi to grow over an extract prepared from the petals, creating Fleather.

The finished material is then sold to fashion brands to make clothes, shoes, and handbags.



TAKEAWAY

Phool collects 8.4 tonnes of flower waste from temples each day, preventing them from entering rivers. But the environmental benefits of Fleather do not stop there. For fashion brands, Fleather performs like animal leather without the associated environmental costs. Phool's home city of Kanpur, for example, is particularly associated with the leather industry, and its tanneries release toxic chemicals, such as chromium. Moreover, unlike other leather alternatives, Fleather contains no plastic. Beyond the environment, Phool provides full-time employment for local women. And from a commercial perspective, the production cycle for Fleather is 50 times faster than the three years required to source traditional leather.

FIX OUR CLIMATE

THE
EARTHSHOT
PRIZE

STORIES BY
SPRING
—WISER

FINALIST

LOW CARBON MATERIALS

UK

THE EARTHSHOT PRIZE: ANAYA KATLEGO



WHAT

A carbon negative aggregate for concrete blocks

WHO

Low Carbon Materials

WHERE

UK

IN THEIR OWN WORDS

"We've turned concrete net zero and now we need the world to start using it."

CONTACT

lowcarbonmaterials.com

MAKING CONCRETE BLOCKS CARBON ZERO

A lightweight aggregate made from unrecyclable plastic makes traditional concrete blocks net carbon neutral

Concrete is the second most-used material on earth – only water is used by humanity more. Why does this matter?

The cement industry that produces concrete is responsible for [eight per cent](#) of global carbon dioxide emissions. In fact, if concrete [were a country](#), it would rank behind only China and the US in terms of carbon footprint.

What are the options for reducing the impact of concrete? Many solutions are focused on alternative materials or ways to strengthen concrete so that less is needed. But UK-based Low Carbon Materials is taking a different approach. Its solution is to make concrete blocks net carbon neutral by adding a carbon negative lightweight aggregate.

Sand and gravel are common aggregate materials, but Low Carbon Materials has developed its own aggregate called OSTO. This is made from otherwise unrecyclable plastic waste and is considered carbon negative because it 'sucks in carbon from the atmosphere during the curing process.'

As OSTO makes up 10 per cent of a concrete block, the carbon it removes from the atmosphere offsets the carbon released during the production process, making the block as a whole carbon neutral.

OSTO is designed for use in medium-dense concrete blockwork, and the material is currently being trialled for imminent release into the UK market.



TAKEAWAY

Why is OSTO so exciting? Most obviously, it can be used to achieve a 100 per cent reduction in the carbon footprint of a traditional concrete block. But beyond this, it also puts to use plastic that would otherwise be sent to landfill or end up in the environment, while reducing the industry's reliance on natural resources. Moreover, OSTO is thermally insulating, and 2.5 times lighter than traditional mineral aggregates, which saves emissions associated with transporting heavy concrete. Led by Natasha Boulding, who won Innovate UK's Women in Innovation Award 2021, the passionate team at Low Carbon Materials is raising the profile of young people and women in the STEM and construction industries.

FINALIST

44.01

OMAN

THE EARTHSHOT PRIZE: MAKALU



WHAT

Storing carbon in underground rocks

WHO

44.01

WHERE

Oman

IN THEIR OWN WORDS

"The answers to the problems our planet faces can often be found in the natural world. At 44.01, we have found a natural process that removes carbon and we've accelerated it."

CONTACT

4401.earth

STORING CARBON DIOXIDE IN ROCKS

A startup is permanently storing carbon dioxide deep underground

Where can we safely store the excess carbon dioxide released by humans? The question is of the utmost importance as we attempt to tackle the climate crisis.

Oceans and rainforests are important carbon sinks, but they can only capture around half of the atmospheric CO₂ that needs to be removed if we are to limit warming to just two degrees Celsius. As for the rest, we must avoid using fossil fuels or remove CO₂ through techniques like Direct Air Capture and Storage.

The storage side of this equation is just as important as the capture. If we turn to Direct Air Capture, we must store the captured carbon in a way that is safe and, above all, permanent. For carbon storage startup 44.01, the solution for carbon storage

is a rock called peridotite.

The startup's home country of Oman is rich with peridotite formations, and these react with carbon dioxide, mineralising into serpentine and calcite. This process stores carbon on permanent basis. To speed things along, 44.01 pumps water infused with CO₂ into seams of peridotite deep underground. Here the immense heat and pressure turbocharges the rate at which the carbon is mineralised.

44.01 is focused on carbon storage and does not capture CO₂ itself. Instead, it partners with the world's leading direct air capture companies.



TAKEAWAY

Why is peridotite such a promising candidate for carbon storage? A key benefit of 44.01's solution is its scalability. The startup plans to permanently store 1 billion tonnes of CO₂ by 2040, and that is just the tip of the iceberg when it comes to the potential capacity of the peridotite-based process. 44.01 calculates that its solution could, in theory, sequester 50 trillion tonnes of CO₂ – in Oman alone. That's 1,000 times more than total man-made emissions. All this is essential as the company believes that without large-scale sequestration, we simply cannot lock away enough carbon to stay below 1.5 degrees Celsius of warming.



FINALIST

LANZATECH

USA

THE EARTHSHOT PRIZE: MARTIN STR



WHAT

Sustainable fuel and everyday products made from CO₂

WHO

LanzaTech

WHERE

USA

IN THEIR OWN WORDS

"While industry is still using fossil fuels, we need solutions that capture emissions at source. At LanzaTech, we don't just do that - we also turn those pollutants into products."

CONTACT

lanzatech.com

TRANSFORMING CO₂ INTO EVERYDAY PRODUCTS

One company is hoping to create a circular economy for carbon

The word 'fermentation' conjures bucolic images of wine grapes or hops. But carbon dioxide from industry can also be fermented, as can other forms of agricultural, industrial, and municipal waste. And US-based LanzaTech is leveraging the magic of fermentation to create 'a circular economy where carbon can be infinitely reused'.

The company does this by, in its own words, 'retrofitting a brewery onto an emission source like a steel mill or a landfill site'. However, instead of converting sugar and yeast into beer, LanzaTech's 'breweries' harness bacteria to convert CO₂ and other forms of pollution into sustainable fuel and chemicals used in everyday products.

Through its technology,

LanzaTech acts as a bridge between waste producers who want to clean up their act and earn income from waste, and businesses looking to replace virgin resources with recycled carbon-based materials.

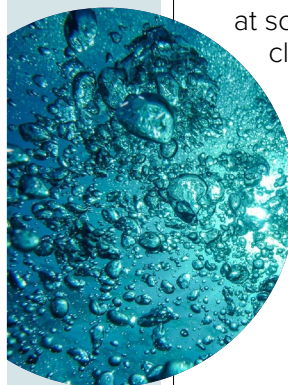
CarbonSmart products are products that are made using LanzaTech's technology. They include clothes, plastic packaging, running shoes, and even fragrances, and the company has worked in partnership with brands such as Lululemon, Zara, Coty beauty, Unilever, and Migros.

In addition, working with its sister company LanzaJet, LanzaTech is helping the global aviation industry reach its target of using 10 per cent Sustainable Aviation Fuel (SAF) by 2030.



TAKEAWAY

In essence, LanzaTech is tackling two related issues: the need to produce sustainable products at scale, and the need to keep fossil fuels in the ground. Its products are helping to wean us off our reliance on fossil fuels while tackling harmful emissions of sulphur dioxide, particulate matter, and nitrogen oxides. And the company's technology and licensing model mean it can deliver positive impact at scale. Already, LanzaTech claims to have abated more than 150,000 megatonnes of CO₂.



THE EARTHSHOT PRIZE 2022 FINALISTS

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