Rescue plan for nature: How to fix the biodiversity crisis

We've been ravaging the planet's ecosystems for too long, but crucial decisions this year could be the turning point that help us restore our relationship with nature

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Jack Dykinga/naturepl.com

WE HAVE repeatedly been pressing the snooze button on the issue, but covid-19 has provided perhaps the final wake-up call. "2021 must be the year to reconcile humanity with nature," said António Guterres, the UN secretary general, in an address to the One Planet Summit of global leaders in Paris last month. "Until now, we have been destroying our planet. We have been abusing it as if we have a spare one."

The numbers are stark, whichever ones you choose. More than 70 per cent of ice-free land is now under human control and increasingly degraded. The mass of human-made infrastructure exceeds all biomass. Humans and domesticated animals make up more than 90 per cent of the mammalian mass on the planet. Our actions threaten about a million species – 1 in 8 – with extinction (see "Biodiversity: A status report").

All that has happened in a blink of an eye, geologically speaking. "If you compare Earth's history to a calendar year, we have used one-third of its natural resources in the last 0.2 seconds," Guterres said in Paris.

Following a lost decade, and a year-long pandemic-induced delay to negotiations, a new international agreement to conserve the world's biodiversity is due to be signed later this year, with many other initiatives also starting up. The signs are that covid-19, a scourge caused by our dismissive regard for nature, might finally have focused minds. The question is, what needs to be done – and can we do enough in time?

Our relationship with nature started to sour around the start of the industrial revolution, but only really veered off the rails as the Great Acceleration kicked in after the second world war. In this period, booming population and trade and higher levels of prosperity led to an exponential growth of pretty much every measure of humanity's planetary impact: resource extraction, agricultural production, infrastructure development, pollution, and habitat and biodiversity loss.

This plundering was a gamble that has long since ceased paying out. Degraded land already adversely affects the well-being of 3.2 billion people and costs more than 10 per cent of annual GDP in lost yields, poorer health and other negative impacts. Those are only going to increase. In a recent paper in the journal *Frontiers in Conservation Science*, an international group of scientists warn that the planet is facing a "ghastly future of mass extinction, declining health, and climate-disruption upheavals… this century".

“The world is facing three major crises today: the loss of biodiversity, climate change and the pandemic,” says biologist Cristián Samper at the Wildlife Conservation Society in New York. “They are all interrelated, with many of the same causes and solutions.”

“The science is so dramatic,” says Johan Rockström at the Potsdam Institute for Climate Impact Research in Germany. In 2009, he and his colleagues developed the “planetary boundaries” concept, which aimed to delineate a safe operating space for humanity, and quantify how we were overstepping it. In a 10th anniversary update in 2019, they suggested that we have already crossed four of nine boundaries – including, crucially, in our impact on biodiversity. “For the first time, we have to consider the real risk of destabilising the entire planet,” says Rockström.

“If we fail to act now, future generations will ask, why did we not act to save the Earth given all of the scientific evidence we have?” says Bob Watson, former chair of the Intergovernmental Panel on Climate Change and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), a UN-mandated body that assesses the latest research on biodiversity.

It isn’t that we have lacked good intentions in the past. In 2010, the Convention on Biological Diversity – one of three UN bodies to emerge from the 1992 Rio Earth Summit, along with the Framework Convention on Climate Change and the Convention to Combat Desertification – met in Aichi, Japan. It agreed 20 biodiversity targets to be met by 2020, from phasing out subsidies for activities that harm biodiversity to ensuring the genetic diversity of farmed and wild plant and animal species. Come 2020, and the final score was biodiversity nil, environmental destruction 20.

Take a key target on the amount of land to be given over to nature. It mandated protection for 17 per cent of land and fresh water and 10 per cent of the oceans by the end of 2020. Some progress was made, says Samper, but neither goal was reached, with the current numbers being about 15 per cent and just over 7.5 per cent. Those areas that are protected are often poorly managed, too small and don’t cover the full richness of Earth’s environments: only some 42 per cent of 867 distinct types of ecosystem so far categorised ought to be well-protected.

"Science tells us that we must expand protected areas to cover at least 30 per cent of the land and sea by 2030," Samper told the Paris summit. A new group, the High Ambition Coalition for Nature and People, comprising more than 50 countries co-chaired by France, Costa Rica and the UK, is now aiming to secure international agreement for this "30 by 30" pledge.

Beyond conservation

In parallel, on 5 June – World Environment Day – the UN will launch its Decade on Ecosystem Restoration. "The main aim is to prevent, halt and reverse the degradation of ecosystems worldwide," says Tim Christophersen at the UN Environment Programme (UNEP), who will be coordinating the initiative. "Nothing more, nothing less. A little bit of a daunting task."

Daunting in particular because in one sense it is already too late. "It's cheaper, of course, to conserve ecosystems, or make sure they don't degrade," says Christophersen. "But we're at a stage now where conservation is no longer enough. We also need to heavily invest in restoration."

Ecosystem restoration will be the key to success or failure over the coming decades. It takes many forms, depending on the ecosystem and how badly degraded it is. At one end of the spectrum is passive rewilding, which simply means getting out of the way and letting nature do its thing. "It's amazing, the capacity that nature has to heal itself," says ecologist Paul Leadley at the University of Paris-Saclay in France, who was a co-author of the 2019 IPBES global assessment report on biodiversity and ecosystem services.

A deforested area near Porto Velho in the Brazilian Amazon
REUTERS

Small-scale rewilding projects such as at Oostvaardersplassen in the Netherlands, where an area of reclaimed polder land has been given over to nature, have shown the way, but the ambition must grow – and is growing. In Europe, the biggest project aims to leave some 35,000 square kilometres of Lapland in northern Sweden and Norway to rewild. In North America, the Wildlands Network aims to link up protected areas in "wildways" in which animals can freely roam spanning Canada, the US and Mexico.

"Every dollar spent on ecosystem restoration accrues between $3 and $75 in return"

At the other end of the restoration spectrum is active engineering of entire landscapes with mass tree planting, removal of alien species and damaging infrastructure such as dams, and reintroductions of species. This can be done. South Korea adopted an active reforestation policy in the 1950s following the Korean War. The total volume of wood in the country's forests increased from some 64 million cubic metres in 1967 to 925 million cubic metres in 2015, and forests now cover some two-thirds of the country. The Green Belt Movement founded in Kenya by Nobel peace laureate Wangari Maathai has planted tens of millions of trees across Africa, and inspired many similar projects.

But while very possible, active restoration brings risks if done unscientifically, says Bernardo Strassburg at the International Institute for Sustainability in Rio de Janeiro, [illegible]. "Any scaled-up restoration needs to be ecologically sound," he says. "It is not just planting trees everywhere, particularly in places where trees didn't belong in the first

place, like grasslands or wetland. That will be detrimental to biodiversity." Different solutions are needed in different places (see "How to restore an ecosystem").

Christophersen thinks the theory and practice of ecological restoration are up to the job. "We have decades of experience with restoration. We know enough. We don't know everything, and we will find out more as we go along. But we know enough to get started. It's one of those situations where you can't let the perfect be the enemy of the good."

The headline target of the UNEP initiative is to restore 3.5 million square kilometres of land over the coming decade – slightly more than the size of India, or just over 2 per cent of the world's land surface. That is "incredibly ambitious", says Strassburg. "If we were to achieve that, it will be the fastest reshaping of [Earth's] surface caused by us." It won't come cheap. According to UNEP, the upfront cost is about $1 trillion, no small change in a post-pandemic recession, although it is an investment with a high rate of return (see "What do ecosystems do for us?").

Farmland encroaches on forest around the Debre Mihret Arbiatu Ensesa church in Ethiopia
Kieran Dodds/Panos Pictures

On paper, at least, it is already in the bag. Annelies Sewell at the Netherlands Environmental Assessment Agency in The Hague and her colleagues totted up commitments to existing restoration projects in 115 countries, encompassing plans to increase protected areas, restore and improve forests, croplands and grasslands, and more. They found that this adds up to about 10 million square kilometres, roughly the size of [illegible] or just under 7 per cent of world land surface area. "There's more than we expected," [illegible] Sewell. "But that doesn't mean that there's enough."

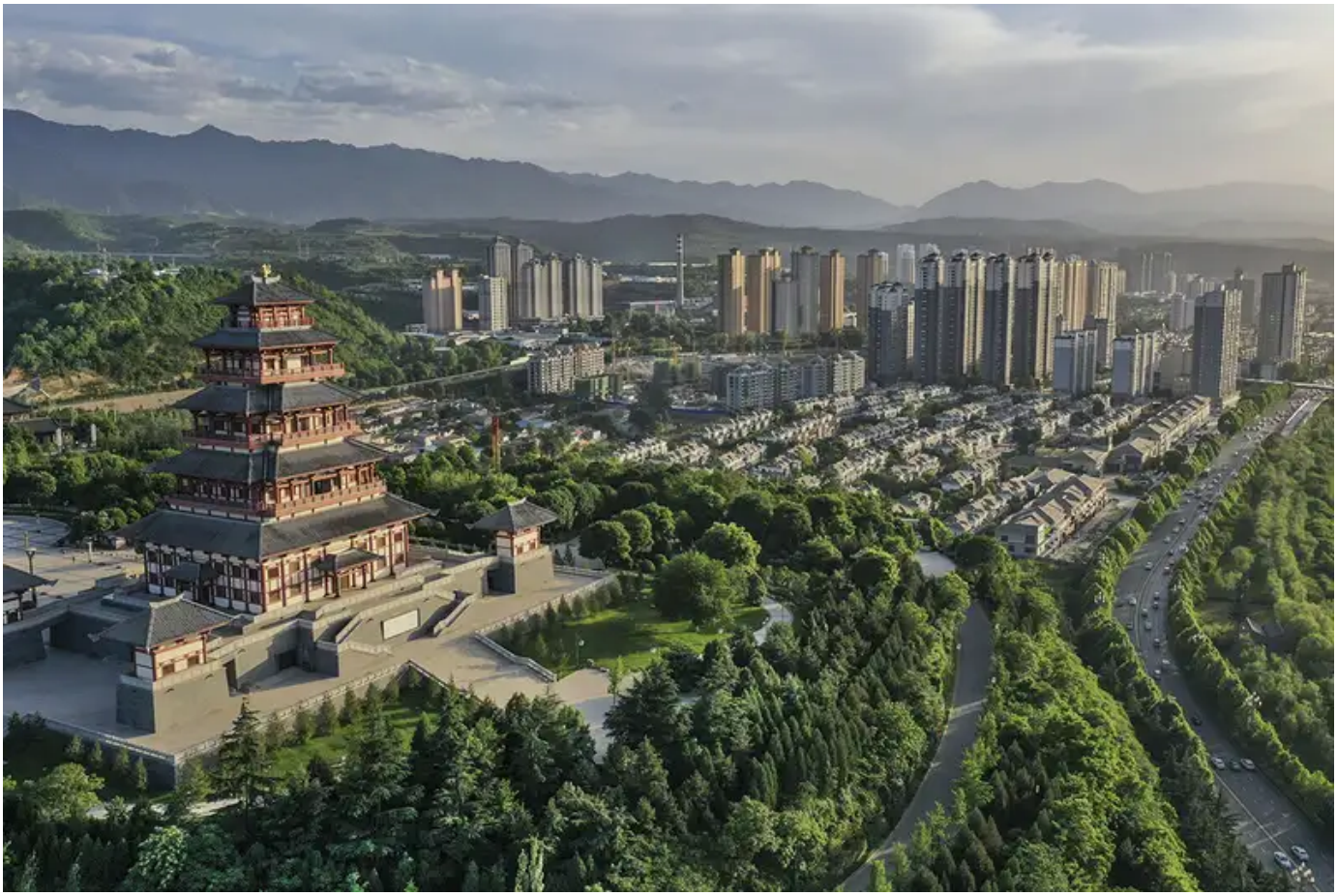
Crunch time

Land conservation and restoration can help solve multiple environmental challenges, but "it won't fix them on its own", says Sewell. Hence a second pillar of 2021: the negotiation of a new suite of biodiversity targets, replacing the Aichi targets, to run alongside the Decade on Ecosystem Restoration. Together these mean the 2020s will be make-or-break time. "This is the decisive decade for humanity's future on Earth," says Rockström.

These targets are due to be thrashed out at a pandemic-delayed crunch meeting of the Convention for Biological Diversity (CBD), now to be held later this year in Kunming, China. According to Elizabeth Mrema, executive secretary of the CBD, lessons have been learned from Aichi, and an international coalition of interests is now invested in making new targets work (see "Elizabeth Mrema interview: We have to be optimistic about biodiversity"). The upfront costs will be more than $700 billion, says Mrema – but, as with ecosystem restoration, they come with a huge pay-off. "Every dollar spent will accrue between $3 and $75 of economic benefits from ecosystem goods and services," she says.

Despite Aichi's overall failure, another lesson of the past decade is that, where governments and other groups commit to protecting biodiversity, change can happen (see "Ten conservation success stories when species came back from the brink"). "I don't want to sugar-coat this because this was not a great result," David Cooper, deputy executive secretary of the CBD, told the World Biodiversity Forum 2021 in January. "But where serious actions have been taken, for example to reduce the rate of deforestation, to improve the state of fisheries, to prevent extinctions where we know the cause, significant progress has been made."

Ultimately, success or failure will depend on progress in another key area: climate change. This year is crunch time here too, and another big, delayed UN summit to forge a way forward is to be held, pandemic permitting, this November in Glasgow, UK. Success or failure in Glasgow and Kunming will be interlinked. "Without addressing climate change, it's not possible to bend the curve of biodiversity loss: all bets would be off," says Cooper.



Rapidly growing cities such as Baoji, China, fragment nature
Xinhua/Shutterstock

But that works two ways: conserving biodiversity and restoring ecosystems will have positive knock-on effects for the climate. “Restoration is one of the most cost-effective tools to mitigate climate change,” says Strassburg: land-use change and increased plant cover can deliver up to a third of the reduction in greenhouse gases that we need.

Ultimately, says Mrema, the next decade needs to be about synergy, with biodiversity initiatives, efforts to combat climate change and other international programmes such as the UN Sustainable Development Goals converging on the ultimate target: harmony with nature by 2050.

There are still huge obstacles. “We know that the changes that are needed to move to sustainability are huge, they are not going to be easy,” says Cooper. But at least the right noises are being made. In Paris, luminaries including the leaders of Germany, Canada and the UK, Chinese vice-premier Han Zheng and the presidents of the World Bank and the European Central Bank lined up to swear fidelity to the cause of conserving nature. Emmanuel Macron, president of France and convener of the summit, said: “The agenda is now mature and we are ready to act.”

Crucially there is still time, just, to manage the pivot from the Great Acceleration to a Great Restoration, an era when humanity learns again to live sustainably and in harmony with nature. “Things are in dire straits and action is really, really needed now, but we’re n a catastrophic situation – yet,” says Leadley. “If we go towards sustainable consumption and production, set out enough protected areas and handle climate change,

there's no reason why biodiversity can't have a positive outlook. We're not beyond the point of no return."

HOW TO RESTORE AN ECOSYSTEM

How ecosystems are degraded by human activity varies – and ways to restore them differ too

FORESTS

Degraders: Clearance for infrastructure, agriculture and grazing; logging for firewood; pollution, invasive pests and wildfires **Restorers**: Replanting native trees; conservation of plants and animals; rewilding

FRESH WATER

Degraders: Water extraction for irrigation, industry and homes; sand and gravel mining; dams, canalisation and drainage for agriculture; pollution from chemicals, plastics and sewage **Restorers**: Controls on water extraction, fishing and mining; dam removal or redesign, restoring water flows to wetlands; wastewater treatment

OCEANS AND COASTS

Degraders: Overfishing and coastal clearance for aquaculture; plastic and nutrient pollution; wastewater discharge **Restorers**: Sustainable fishing, wastewater treatment, pollution control, management and restoration of coral reefs, mangroves and seagrasses

GRASSLANDS AND SAVANNAH

Degraders: Conversion to cropland and pasture; overgrazing and soil erosion; unsustainable resource extraction; invasive species **Restorers**: Active clearance of woody vegetation; reseeding native grasses and replanting native shrubs and trees; reintroduction and protection of native fauna

MOUNTAINS

Degraders: Forest clearance for agriculture, dams and roads; soil erosion; natural disasters such as avalanches, landslides and floods **Restorers**: Tree planting, better planning of infrastructure, use of low-impact farming techniques such as agroforestry

PEATLAND

Degraders: Peat extraction; drainage for agriculture, infrastructure, mining and fossil fuel exploration; fire, overgrazing, pollution **Restorers**: Re-wetting, conservation

FARMLAND

Degraders: Overgrazing and soil erosion; monocultures; removal of hedges and trees; pollution from fertilisers and pesticides **Restorers**: Crop rotation with more diverse crops, including trees and livestock grazing on cropland after harvest; use of natural fertilisers and pest control

CITIES

Degraders: Urban sprawl; waste and emissions from industry, traffic and homes **Restorers**: Stricter planning laws; clean-up of waterways and former industrial sites; tree planting and creation of green space and urban wetlands

What do ecosystems do for us?

Far from being a luxury that cash-strapped economies can ill afford, spending money on restoring and preserving ecosystems is a sound investment. On average, every $1 spent on ecosystem restoration gives a return of around $10 in ecosystem goods and services.

Some of that is direct monetary returns, such as from sustainable wood, improved agricultural yields and ecotourism revenues. But the greater part is freebies that society would otherwise have to shell out for, such as clean air and water, pollination, pest control, nutrient recycling, carbon sequestration, fewer animal-transmitted diseases and greater resilience to extreme weather and natural disasters.

Think of it as being like building roads and bridges – they don't generate returns themselves, but lay the groundwork for increased economic activity. "It makes sound economic sense with benefits far exceeding the costs," says environmental scientist and diplomat Bob Watson.

Read more on biodiversity

- **Green spaces are good for our mental health**
- **How to repair the damage to biodiversity caused by covid-19**
- **Our abuse of nature makes pandemics more likely**
- **Why saving biodiversity and rescuing climate change go hand in hand**

About this feature

This is the first in a series of five features produced in association with the United Nations Environment Programme and UNEP partner agency GRID-Arendal. *New Scientist* retains full editorial control over, and responsibility for, the content. Part two of the series, on 6 March, will look at the part our abuse of nature played in unleashing the covid-19 pandemic

More on these topics: ENVIRONMENT CLIMATE CHANGE BIODIVERSITY ECOSYSTEMS

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