



A replica of cave paintings in Chauvet cave, France, created around 36,000 years ago. More than 178 species of megafauna are estimated to have been driven to extinction between 52,000 and 9,000BC. Photograph: Patrick Aventurier/Getty Images

# Humans v nature: our long and destructive journey to the age of extinction

The story of the damage done to the world's biodiversity is a tale of decline spanning thousands of years. Can the world seize its chance to change the narrative?

by **Phoebe Weston**

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he story of the biodiversity crisis starts with a cold-case murder mystery that is tens of thousands of years old. When humans started spreading across the globe they discovered a world full of huge, mythical-sounding mammals called “megafauna”, but by **the end of the Pleistocene**, one by one, these large animals had disappeared. There is no smoking gun and evidence from ancient crime scenes is – unsurprisingly – patchy. But what investigators have learned suggests a prime suspect: humans.

Take the case of **Genyornis**, one of the world’s heaviest birds, which was more than 2 metres tall and weighed in excess of 200kg. It lived in Australia until, along with many other megafauna, it went extinct 50,000 years ago. In North America, giant beavers weighing the same as a fridge and an armadillo-like creature called a glyptodon, which was the size of a small car, existed until about 12,000 years ago, when they, too, went extinct. In all, **more than 178 species** of the world’s largest mammals are estimated to have been driven to extinction between 52,000 and 9,000BC.

For a long time, these extinctions were thought to be linked to natural changes in the environment – until 1966, when palaeontologist Paul S Martin put forward his controversial “**overkill hypothesis**” that humans were responsible for the extinctions of megafauna, destroying the romantic vision of early humans living in harmony with nature.



A replica painting from the Cave of Altamira in Cantabria, Spain, painted by Paleo human settlers between 35,000 and 11,000 BC. Photograph: Universal History Archive/Universal Images Group/Getty Images

Prof Mark Maslin, from University College London (UCL), suggests that the unsustainable hunting of megafauna may have been one of the driving forces that led humans to domesticate plants and animals. People started farming in at least 14 different places, independently of each other, from about 10,500 years ago. “Weirdly enough, I think the first biodiversity crisis was at the end of the last ice age, when early humans had slaughtered the megafauna and therefore they’d sort of run out of food, and that precipitated, in many places, a switch to agriculture,” he says.

Although the debate is far from settled, it appears ancient humans took thousands of years to wipe out species in a way modern humans would do in decades. Fast forward to today and we are not just killing megafauna but destroying whole landscapes, often in just a few years. Farming is the **primary driver of destruction** and, of **all mammals on Earth**, 96% are either livestock or

humans. The UN estimates as many as **one million plant and animal species are at risk of extinction.**

After the spread of farming and significant population increases, it was European expansion that would be the next big blow to the planet's biodiversity. While Indigenous peoples across the world lived mostly within the limits set by nature, recognising their dependency on it and protecting it, while hunting to survive, all that was about to change.



A man stands on a pile of buffalo skulls as another rests his foot on one at a glue factory in Rougeville, Michigan, 1892. Photograph: AP

Spanish explorers and settlers arrived in central and southern America in the 15th and 16th centuries. In *The Human Planet: How We Created the Anthropocene*, Maslin and Prof Simon Lewis, also from UCL, describe maps of that time showing large tracts of lands with not much on them. These places already had names, but the Europeans claimed them for themselves. “Religion and notions of the superiority of Europeans loomed large as justifiers of both the conquest of land and the names themselves. The heyday of geologists

naming vast portions of Earth's history was also the European colonial era," they write.

Their arrival also heralded the displacement, persecution and killing of Indigenous peoples. Researchers **from UCL, including Maslin and Lewis**, found the European colonisation of the Americas caused the death of 56 million people by 1600 – 90% of the Indigenous population. Today, Indigenous people make up just 6% of the world's population but **protect 80%** of the planet's biodiversity.

## **Humans use everything up without renewing anything** **Georges-Louis Leclerc, French naturalist, 1778**

European scientists' interest in the diversity of life peaked in the Victorian era. Great natural history museums are testament to this excitement of discovery – they wanted to show off the exotic animals and plants collected from all over the British empire to the public at home. For the first time, they began to understand the immense diversity of the natural world and that humans were destroying it.

In the 18th century, one of the most significant missions to understand the diversity of life on Earth was that of the Swedish natural philosopher Carl Linnaeus. He is known as the “father of taxonomy”, naming more than 12,000 species of plants and animals. His *Systema Naturae*, published in 1735, still shapes how we classify flora and fauna today. Modestly, he is said to have commented: “God created, but Linnaeus organised.” To be fair, he was pretty much right.

The 18th century was also when people realised humans were having big local impacts on the climate and environment. In 1778, the French naturalist Georges-Louis Leclerc noted the decimation of fish populations and destruction of forests, warning that humans “use everything up without renewing anything”, according to one account in **Elephant Treaties: The Colonial Legacy of the Biodiversity Crisis**, by Rachele Adam.



Radeau de la Rivière de Guayaquil by Alexander von Humboldt, an explorer who recognised human destruction of nature. Photograph: Alexander von Humboldt/Wellcome collection

At the end of the century, the explorer Alexander von Humboldt was on the loose. He was writing at a time when nature was generally seen as something that humans had to control, but he saw that it was humans **who had the power to damage ecosystems** and the climate through activities such as deforestation, mining and water extraction.

His work was a great inspiration for Charles Darwin. The British naturalist did not use the term biodiversity (which wouldn't be coined for another 150 years) but he had worked out a key premise of it – that all species are linked and can be traced back to a single origin, as most notably laid out in **On the Origin of Species**, published in 1859. The decline of specific species was turning into an understanding about the broader, more far-reaching impacts of ecosystem decline, because of this premise that everything is connected.

In 1881, Darwin **published a book about earthworms** in which he showed how they aerate the soil, breaking down organic matter into nutrients that can be used by plants. He proved agriculture – and, therefore, our food supply – is heavily dependent on the amount of worms that we have. “That kind of analysis

was already there,” says Ted Benton, emeritus professor of sociology at the University of Essex. “But there is a distinction between the analysis being there and how far it is widely understood. And furthermore, how far that understanding filters into government action. That’s what makes a difference.”

Neither Humboldt nor Darwin were activists, unlike Darwin’s collaborator, Alfred Wallace. In his book *Island Life*, published in 1880, Wallace criticised the “reckless destruction of forests, and with them of countless species of plants and animals”.



A lithograph depicting 17th-century explorer Jacob Cornelis van Neck’s voyage to Mauritius, showing the soon-to-be extinct dodo bird. Photograph: Album/Alamy

Although often critical of colonialism, slavery and the destruction of ecosystems, these early explorer scientists were products of that world. The colonialists needed people capable of deciphering the ecology of new territories, for commercial interests and for the health and safety of those onboard the ships.

Scientists **are still debating** the official start of the Anthropocene, but some argue that it began towards the end of the 18th century with the advent of the industrial revolution. The majority believe it was more like the 1950s, with the

testing of nuclear weapons and the start of the “Great Acceleration”, when destructive human activity surged across the planet. It marks a period when humans (“anthropo”) have altered the planetary boundaries to such a degree it has its own geological epoch.

In the 20th century, a series of natural crises made people more aware nature was under threat, as the planet started being damaged at a faster rate than ever before. The “roaring 20s” gave way to the “dirty 30s” with a decade of dust storms in the US and south-east Australia. In 1935, the dramatic dust clouds of the American midwest loomed over New York and left three-quarters of western states parched. They were caused by a combination of extreme weather – heatwaves and drought – and unsustainable farming practices, which replaced native prairie vegetation.



An abandoned farm in the dust bowl near Dalhart, Texas, June 1938. Photograph: Dorothea Lange/FSA/OWI Collection/Courtesy of Library of Congress

Ecologist Francis Ratcliffe **was sent from London in 1929** to find out more about what was going on in Australia and later wrote **Flying Fox and Drifting Sand**. He



described soil erosion as a “creeping mortal sickness” and said the only solution was to reduce the number of farmers in the area. In response to his reports, **soil conservation bodies were created** in New South Wales in 1938 and Victoria in 1940.

After the second world war, amateur naturalists started documenting a decline in birds and butterflies. In the US, populations of the bald eagle – the national bird – were rapidly falling. Synthetic pesticides developed during the war, including DDT (dichloro-diphenyl-trichloroethane), used to prevent insect-borne diseases such as typhoid and malaria, were identified as the culprits as more insecticides were used in the push to intensify agriculture.



Rachel Carson, author of *Silent Spring*, a book which led to the establishment of the US Environmental Protection Agency. Photograph: Erich Harthann/Magnum

But it was probably not until the publication of Rachel Carson's *Silent Spring* in 1962 that the wider public began to understand the implications of the loss of nature. She wrote about how DDT and other chemicals were damaging ecosystems, killing insects and birds and eventually reaching humans.

Immediately there was great public interest. She was sued by American chemical giants who **launched a publicity campaign** that criticised her for being an unmarried, hysterical and unscientific woman who kept cats and loved birds. Oil and gas giants used similar tactics **to distort science** on the climate crisis from the 1980s onwards.

In 1972, DDT was banned in the US, and today a ban on its use in agriculture is worldwide. Carson's book led to numerous laws being passed to protect the environment as well as the creation of the US Environmental Protection Agency. In 1969, Friends of the Earth was set up in the US and two years later Greenpeace was founded in Canada. Awareness about the environment was at an all-time high.

Meanwhile, in the UK, a popular TV presenter was seen lying down beside a mountain gorilla, called Poppy, in Rwanda. It was 1979 and the presenter was David Attenborough, whose series *Life on Earth* was watched by 25 million people. For the first time, huge swathes of the public witnessed lifeforms they never could have imagined and learned about wildlife far away.

"I think that was an iconic moment, particularly in the UK," says Maslin. "It starts off as the importance of these as species ... I don't think it was until much later that we realised that ecosystems are essential for the functioning of the biosphere."



David Attenborough on location with mountain gorillas during the filming of *Life on Earth* in Rwanda, 1979. Photograph: John Sparks/NPL

In 1989, the then prime minister, Margaret Thatcher, made a **30-minute speech to the UN** about the importance of the environment. She spoke about the ozone layer, acid rain and climate change and mainstreamed issues previously associated with “**tree-hugging weirdos**”.

A trio of biodiversity researchers – Richard Leakey, Edward O Wilson and Thomas Lovejoy, **who all died** in the space of 10 days over Christmas and new year 2021 – were key in driving forward an awareness about threats to the natural world. Lovejoy persuaded famous people such as Tom Cruise to go the Amazon to raise awareness of its immense diversity and why it needs protection.

**We may well witness the summary demise of ... one half of our fellow species**

**Norman Myers, the Guardian, 1987**

The term “biological diversity” appears to have been used for the first time in 1916 in an article by J Arthur Harris titled **The Variable Desert**, but it was not

until 1980 that Lovejoy used the term in scientific work. It was picked up rapidly and contracted to biodiversity in the mid-80s, although there is some dispute about the exact date. Scientists found the term useful to communicate the fundamental problem of the decline of nature – the loss of natural variety.

In 1986, nine prominent US scientists attending the National Academy of Sciences forum on biodiversity warned that species loss was the most serious challenge facing the world, “second only to the threat of thermonuclear war”. The first mention of “biodiversity” in the Guardian was a write-up of that conference.

Libby Robin, emeritus professor at the Australian National University, notes that this was before the public had picked up that the climate crisis was an issue. She says: “Climate scientists (physicists) elsewhere were starting to be concerned about carbon/global warming but this emphasis came later in the public mind, particularly with James Hansen’s message to the American Congress at the height of the hot ‘greenhouse’ summer in 1988.”

Looking back at Guardian coverage, it is clear scientists were communicating how alarming the situation was 50 years ago. In 1972, American biologist Barry Commoner was quoted as saying that the “rate of exploitation of the ecosystem, which generates economic growth, cannot increase indefinitely without overdriving the system and pushing it to the point of collapse”.

Many ideas we perceive as “new” are not. In 1980, Prof Norman Moore wrote a piece about “biological diversity” in the Guardian (the first time the term appeared in the paper) about how to make compromises that would promote productive farming and conservation, which sounds very familiar to current discussions about the British government’s proposed subsidy system (**environmental land management schemes**, or Elms) to encourage nature-friendly farming.



Moore wrote: "Generalised statements about the desirability of conserving wildlife will have no effect unless we can order our affairs so that the individual farmer can be helped to conserve wildlife on particular bits of ground." He suggested the best agricultural land should be used for farming, while less productive places should be given over to wildlife.

**Bombs do not renew resources**

*The Guardian (1959-2003); Jun 3, 1982; ProQuest Historical Newspapers: The Guardian and The Observer*  
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WE ARE NOW confronting a series of environmental challenges that impinge upon the security interests of many, if not most and possibly all nations. Examples include dislocations of climate and rain, degradation of major water bodies and the upper oceans, desertification, declining fisheries, over-used grasslands, depletion of forests, loss of soil cover and gross decline of biological diversity.

The result is, to quote the Global 2000 Report published by the White House in Washington in 1980, a world that is "more crowded, more polluted, less stable ecologically and more vulnerable to disruption." The linkages to security considerations have been spelled out by another recent major report, the Brandt Commission Report:

"Few threats to peace and survival of the human community are greater than those posed by the prospects of cumulative and irreversible degradation of the biosphere on which human life depends. . . . In the global context, law security cannot be achieved by mounting build-up of weapons (defence in a narrow sense), but only by providing basic conditions for solving non-military problems which threaten them. . . . Our survival depends not only on military balance, but on global cooperation to ensure a sustainable biological environment."

Because of these environmental/security relationships, certain geo-politicians are starting to recognise that security for their nations can no longer be confined to simple concepts of military muscle. It entails a new dimension, which we loosely call the "environmental connection." This being a dimension that comprises various factors of the natural-resource base and the life-support systems of our earth home.

What are these environmental factors? They include ecological relationships of basic sorts, such as photosynthetic cycles and climatic patterns. But environmental factors, in their proper broad sense, can be taken to include natural resources such as soils, water, forests, grasslands, and fisheries, as well as being major resource stocks and ecosystems that underpin our material welfare.

If a nation is denied a fair and assured share of these

environmental supports, its economy will quickly decline, its social fabric will start to disintegrate, and its political structure will fast become destabilised — to put the situation at its best.

In spite of the so-called "awareness" of this dimension through security questions, we should recall that most military conflicts of the past have derived from disputes over natural resources. True, these natural resources have almost always been confined to strategic raw materials such as key minerals. But increasingly they extend to a broader spectrum of resources, such as raw materials for agriculture, fisheries stocks, and the like.

In future we can expect these conflicts will stem from disputes over myriad natural resources, especially an expanding numbers of people seek to sustain themselves from declining resource stocks. We can anticipate an era of resource scarcities and ecological stresses, and in turn, these disruptions will express themselves through economic dislocations such as inflation and other forms of economic instability. When croplands are over-exploited, fisheries are over-harvested, and small producing grasslands are overgrazed, prices in the shopping basket climb ever higher.

In turn again, economic disruptions express themselves through social dislocations and political upheavals, eventually threatening the security of a broader spectrum of nations. In 1970, Poland has suffered one food shortage after another, together with galloping inflation. Result, economic breakdown, leading to civil strife and military confrontation. In Ethiopia, the downfall of Emperor Haile Selassie was precipitated by gross decline of the country's natural-resource — and the violent end of the old regime has triggered disorders of such scale as to compel radical reorientation of political systems in neighbouring countries in the Horn of Africa, with all that implies for the long thin line of oil tankers that lead from the natural resources of industrialised nations of the Western world.

Even the more advanced nations are not immune from environmental backlash. Britain and Iceland have come to

The boss of HMS *Vermouth*, damaged in a collision with an Icelandic gunboat. "All in all, there have been 17 disputes over international fisheries."

# Bombs do not renew resources

Security is not just a matter of having a task force at the ready. Norman Myers argues that if we were to spend just two per cent of the world's military budget on improved agriculture and ecological equilibrium, prospects for a more secure future would be much improved

over cod fisheries in the North Atlantic. This incident, isolated as it has been, may serve as a portent of what could become a frequent phenomenon in the future, in light of the failure of fisheries around the world to produce ever-greater yields from their collective, to match traditional weaponry as created by advanced nations.

All in all, there have been 17 disputes over international fisheries, stopping only just short of outright conflagration, during the past two decades.

Hence a nation's pros for its security lie not only with tanks and bombers. They can also derive from climate, croplands, watersheds, forests, and other seemingly exotic factors that have rarely figured in the minds of generals, but may soon start, in their collectivity, to match traditional weaponry as created by advanced nations.

For a truly esoteric factor in the "environmental connection," let us look briefly at genetic resources. Developed nations of the temperate zones are poor in genetic resources, whereas curtil's main gene reservoirs are to be found in the tropics with their 70 per cent share of earth's species. Result, developed nations are increasingly dependent upon regular supplies of genetic resources from the Tropical Third World, in support of modern agriculture, medicine, industry, and the burgeoning technology of bio-engineering.

But how, one might ask, do genetic resources contribute to agriculture?

Modern crops cannot maintain their productivity, let alone expand it, without constant infusions of fresh germplasm.

In 1970, the US corn crop was struck by a blight, resulting in a 20 per cent loss of the crop, at a cost to farmers and consumers of over \$2 billion. The situation was saved by introduction of blight-resistant strains of corn originating from Mexico.

Similar stories can be told for wheat, rice and most other major food crops. Yet developed nations may soon

face contracting supplies of germplasm, due to political manoeuvring. Third World nations of the tropics are becoming aware that, in their wild gene reservoirs, they possess a stock of resources that is attracting growing demand from the developed nations. Already a few Third World nations recognise that if the flow of these genetic resources is cut off, the economies of developed nations could suffer severe setbacks.

Two of the leading suppliers of germplasm, Ethiopia and Mexico, are looking at ways to exploit the situation. Ethiopia has cut off all supplies to developed nations pending resolution of certain political issues, while Mexico, as evidenced by its monopoly manipulation of diosgenin supplies for contraceptive pills, is inclined to negotiate germplasm trade on its own terms.

A whole further aspect of the "environmental connection" is climatic dislocation. Buildup of carbon dioxide in the global atmosphere will, if it persists as projected, exact plus a couple for the environmental disruptions.

As a result of warmer and drier weather the United States may become less capable of producing outside a mountain of food, whereas Mexico, enjoying warmer and wetter weather, could become a major supplier of surplus food. India may find itself better off in agricultural terms. Pakistan worse off — with all that implies for political relations between these two industries. While thousands of scientists are now working on alternative forms of energy, they are only one-sixth as many as are working on ways for the world to blow itself up. If less money were spent on new weapons systems, and an equivalent amount devoted to new energy systems, might not the world be a better place to live in?

And suppose we were to reallocate a mere 2 per cent of the annual global military budget, i.e. the spending of one week, a trifling \$10 billion, to the environment? If spent on improved agriculture, stabilised climate, and ecological equilibrium in general, surely help our prospects for a more secure future all round.

We all gain together, or we all lose together. *Dr Norman Myers is a one adviser to Environment and Development, based in Nairobi, Kenya.*



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Within this analytic framework, there arises a key question of economic trade-offs. The UN Anti-Desertification Fund, for example, is set at only half a billion dollars — a sound investment to help us bail the loss of croplands and rangelands to creeping desert. Yet the Fund remains only a concept. Less than 5 per cent of the monies required have been subscribed by the community of nations. The sum in question is equivalent to a few fighter planes for NATO and a few for the Warsaw Pact, plus a couple for the rest of the world. Would the global community not face better prospect of a peaceful future if the desertification they start to enjoy better ways for the world to blow itself up. If less money were spent on new weapons systems, and an equivalent amount devoted to new energy systems, might not the world be a better place to live in?

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The Guardian, 3 June 1982: Bombs do not renew resources. Resizable image please zoom in.

In 1982, the Guardian wrote about the Brandt Report, that said: "Few threats to peace and survival of the human community are greater than those posed by the prospects of cumulative and irreversible degradation of the biosphere on which human life depends." In the same article, British environmentalist Norman Myers, who was responsible for a lot of the Guardian's early biodiversity coverage, wrote about the importance of soils, water, forests, grasslands and fisheries as ecosystems that "underpin our material welfare". If a nation lost them "its economy will quickly decline", he said. This is the basic premise of the landmark and much-celebrated **Dasgupta review**, published almost 40 years later, in 2021.

In 1987, Myers wrote that “life may be in its death throes”. He said: “Within the lifetimes of many readers, we may well witness the summary demise of at least one quarter, and possibly one half, of our fellow species.” He wrote about a statement from the US National Academy of Sciences written at the time. “They are unanimous in their view that we already have enough scientific information to urge political leaders and policymakers to get to vigorous grips with the extinction crisis forthwith.”

So people had recognised biodiversity loss, and its importance, but what to do about it?



Dead forest in Poland's Karkonosze mountains, caused by acid rain pollution, 1990. Photograph: Christopher Pillitz/Getty Images

One of the first and most important organisations set up to try to protect biodiversity was the International Union for **Conservation** of Nature (IUCN). It was founded in the French town of Fontainebleau in 1948, and supported the creation of international law to protect the planet's wildlife.

Today, the IUCN is a leading force in shaping international conventions, developing rules and principles for conservation and management of



ecosystems. It first **established its Red List of Threatened Species in 1964**, as a way to mobilise funding and experts to tackle extinction threats. It continues to be the global authority on biodiversity loss, regularly **releasing reports and updates**.

The IUCN helped push through legislation to tackle wildlife loss by creating the first draft of what would become the UN's convention on biological diversity (CBD).

The birth of the CBD was at the Rio conference in 1992, when the UN created the conventions on climate change (IPCC), biodiversity (CBD) and desertification (UNCCD). It was a moment of celebration. The conference involved many world leaders and there was general recognition our form of civilisation was exhausting the world we depend on. The first draft was based firmly on the idea that “biodiversity was a global and common heritage”, writes Adam.



An orangutan seeks refuge from bulldozers as they destroy the forest in Ketapang district, West Borneo. Photograph: International Animal Rescue

The three goals of the CBD are: the preservation of biological diversity; the sustainable use of its components; and fair and equitable sharing of the benefits of genetic resources.

Every 10 years, it aims to set targets on biodiversity for the following decade. But the targets are not legally binding and the world **failed to meet a single one** of the 20 set out at Aichi in Japan in 2010.

Which brings us to today and nature's next big moment – the UN biodiversity conference Cop15, which will be held for two weeks in Montreal, Canada, from 7 December. The more than 20 targets expected to be set **will probably include** preserving 30% of land and sea for nature by 2030, reducing the rate of introduction of invasive species by 50% and cutting pesticides by at least two-thirds.

The meeting comes weeks after the Cop27 climate meeting in Egypt. Ever since the Rio summit, biodiversity has taken second place to the climate on the international stage. But it is increasingly being recognised that **the two crises cannot be separated**.



The effects of soil erosion on farmland in Shottisham, Suffolk, UK. Photograph: Clynt Garnham Environmental/Alamy

Cop26, the UN climate conference held in Glasgow in 2021, included a **special day for nature**, the first time biodiversity and the climate crisis were linked at the international level. Destroying biodiversity by chopping down forests also results in carbon being released, while climate change in the form of extreme weather, such as droughts and heatwaves, damages ecosystems. Some think the two crises never should have been split. “I’m not sure that we should be placing biodiversity loss and climate change in separate boxes; they are all part of the planetary crisis that human activities have caused,” says Adam.

The climate crisis generally gets more media attention because flooding and fires make headline news, whereas biodiversity loss is harder to see.

Victor Anderson, a visiting professor in sustainability at Anglia Ruskin University, also argues biodiversity loss has been seen by some as a middle-class, trivial or even rightwing issue. He says: “There has been a connection between nature conservation and the aristocracy. In the 19th century, the protection of the countryside came about because of responses to rising industry. And then there is also the big game issue. If you look back at the beginning of WWF, it’s really well-off people wanting large African animals to continue, in some cases because they still wanted to hunt them.”

He says the issue continues to be difficult, not least because every aspect of industry is entwined with nature’s destruction. “I think tracing through the causes of biodiversity loss is a bit frightening, because it does lead you to the whole way in which the world economy operates.”

The story of the biodiversity crisis is a tale of decline spanning thousands of years. From hunting huge mammals to extinction to poisoning birdlife with pesticides, humans have treated nature as an inexhaustible resource for too long. Environmentalists, Indigenous peoples and scientists have been sounding the alarm about the biodiversity crisis for more than half a century, and yet no meaningful action has been taken. Much has already been lost, but there is still lots to play for. Cop15 is an opportunity to start to change the narrative.