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Affect of Climate Change on Biodiversity

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ABSTRACT

Biodiversity — the variety of all life, from genes and species to ecosystems — is intimately linked to Earth's climate and, inevitably, to climate change. Biodiversity and poverty are also inextricably connected. For instance, changes to natural ecosystems influence both climate change and people's ability to cope with some of its damaging impacts. And in their turn climate change, as well as people's responses to it, affect biodiversity. Unpicking all these strands clearly shows that conserving and managing biodiversity can help natural systems and vulnerable people cope with a shifting global climate. Yet compared to activities such as forest conservation and afforestation — widely noted as a way of sequestering carbon and cutting greenhouse gas emissions — biodiversity conservation is a neglected area. That must change: urgent support is needed for local solutions to biodiversity loss that provide benefits on all counts.

KEYWORDS: *climate change, biodiversity, earth, greenhouse gas, conservation, natural, impact, damaging*

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INTRODUCTION

The consequences for biodiversity of human-driven climate change cannot be ignored. The rate at which the earth is warming is accelerating, and it is likely to take centuries for the climate system to sync back to a natural climate cycle, regardless of the mitigation policies implemented. The quantity of greenhouse gases in our atmosphere is such that climate change can now no longer be considered a 'future threat'.[1] Across the planet we are already witnessing, among other things, change in species' phenology, distributions and abundance, mass coral bleaching events, changes in fire frequency, and the loss of ecosystems due to rapid de-glaciation and sea-level rise. The current projection for biodiversity is grim. In a recent report by the United Nations, an international coalition of scientists concluded that within the next 80 years, we are on track to lose over one million known species. That is one species in eight. In addition, the populations of individuals species have plunged.[2] Tigers have lost 97% of their populations, migratory birds are estimated to have lost approximately 70% of their populations. In the span of only a few decades, the biomass of humans and our livestock has come to total 24x more than that of all other wild mammals![3]

The single biggest threat to biodiversity is habitat loss, linked to food production on land and in the sea. Biodiversity needs space to survive. Every animal needs a home. That home is wilderness. When we remove wild lands and convert them into industrial production spaces, we simultaneously subtract the landscapes needed for life production. The landscapes we depend on are for our own survival.

When we lose biodiversity, we reduce our ability to fight climate change, grow sustainable and healthy crops, have access to clean and abundant water, prevent pandemics, and plan for a future for our children and grandchildren.[4]

Humans need biodiversity. And because the decline in biodiversity is caused by humans, biodiversity now needs us to transform our behavior.

Humans need wild nature in order to survive. The best solution for fighting climate change and ending the extinction crisis is to set aside enough space for nature to support healthy biodiversity. That means protecting at least half the planet's land and and seas. Scientists conclude that if we do so by 2030 we can successfully avert the worst of the climate and extinction emergencies. (In some cases, we need more than half. Fragile ecosystems, like rainforests,

need up to 80% protected or stewarded by local, sustainable communities.)[5]

Protecting the planet at that scale may seem like a huge task, but in fact, this is a historic opportunity for us to transform the way we live with nature. Because we must protect half the entire planet, that means every region, every community, every individual is on the frontlines of conservation. You are on the frontlines of conservation, and you can make a difference.[6]

The challenge is that while we need biodiversity and biodiversity needs us, most people around the world still don't know about the critical importance of wildlands and the biodiversity they support. The main driver of biodiversity loss remains humans' use of land – primarily for food production. Human activity has already altered over 70 per cent of all ice-free land. When land is converted for agriculture, some animal and plant species may lose their habitat and face extinction. But climate change is playing an increasingly important role in the decline of biodiversity. Climate change has altered marine, terrestrial, and freshwater ecosystems around the world. It has caused the loss of local species, increased diseases,[7] and driven mass mortality of plants and animals, resulting in the first climate-driven extinctions. On land, higher temperatures have forced animals and plants to move to higher elevations or higher latitudes, many moving towards the Earth's poles, with far-reaching consequences for ecosystems. The risk of species extinction increases with every degree of warming. Overall, climate change affects the health of ecosystems, influencing shifts in the distribution of plants, viruses, animals, and even human settlements. This can create increased opportunities for animals to spread diseases [8]and for viruses to spill over to humans. Human health can also be affected by reduced ecosystem services, such as the loss of food, medicine and livelihoods provided by nature. Climate change and biodiversity loss (as well as pollution) are part of an interlinked triple planetary crisis the world is facing today. They need to be tackled together if we are to advance the Sustainable Development Goals and secure a viable future on this planet. Governments deal with climate change and biodiversity through two different international agreements[9] – the UN Framework Convention on Climate Change (UNFCCC) and the UN Convention on Biological Diversity (CBD), both established at the 1992 Rio Earth Summit. Similar to the historic Paris Agreement made in 2015 under the UNFCCC, parties to the Biodiversity Convention in December 2022 adopted an agreement for nature, known as the Kunming-Montreal Global Biodiversity Framework, which succeeds the Aichi Biodiversity Targets adopted in 2010.[10]

The framework includes wide-ranging steps to tackle the causes of biodiversity loss worldwide, including climate change and pollution. "An ambitious and effective post-2020 global biodiversity framework, with clear targets and benchmarks, can put nature and people back on track," the UN Secretary-General said, adding that, "this framework should work in synergy with the Paris Agreement on climate change and other multilateral agreements on forests,[11] desertification and oceans." In December 2022, governments met in Montreal, Canada to agree on the new framework to secure an ambitious and transformative global plan to set humanity on a path to living in harmony with nature. "Delivering on the framework will contribute to the climate agenda, while full delivery of the Paris Agreement is needed to allow the framework to succeed," said Inger Andersen, the head of the UN Environment Programme. "We can't work in isolation if we are to end the triple planetary crises."[12]

Discussion

Since the Industrial Revolution, human activities, such as logging, pollution, commercial fishing and the development of large urban settlements, have damaged and degraded precious landscapes. Today, the destruction of forests and grasslands for agriculture is the single biggest driver of biodiversity loss. Every minute, deforestation destroys a wooded area the size of 27 football pitches. Climate change is currently the second biggest cause of biodiversity loss in the ocean and the fourth biggest cause on land, though it's likely to play a greater role in the future. Forests like this area of the Xingu Indigenous Park, Brazil, are cleared for agricultural purposes, such as growing soybean to feed livestock[13]. If the current trends in biodiversity loss continue, one million animal and plant species will be threatened with extinction - more than at any other point in human history. This trend is so stark, some are calling it the sixth mass extinction. This ecological crisis is already impacting millions of people around the world. Overfishing is affecting food supplies and livelihoods in coastal communities, air pollution contributes to 7 million deaths every year and human disturbance of ecosystems can help infectious diseases spread more easily[14]. Coastal habitats, which can help reduce the impact of extreme weather events, are also being lost, putting 100-300 million people at an increased risk of floods and hurricanes. Often, the places and communities suffering the most because of this biodiversity crisis - poorer countries, island nations, Indigenous peoples and the polar regions - are not those most responsible for causing it. Species and ecosystems have evolved to thrive under specific conditions,[15] from the range of temperatures a species can withstand, which is called the species' climate

envelope, to the seasons that govern their mating and migration patterns. Global temperatures are likely to rise by more than 1.5°C within the next 20 years. This is a very sudden and serious shock for many species and will either force them to adapt, if they can, or push them towards extinction.[16]

Adriana explains, 'Climate change affects biodiversity because species are being forced to move out of areas where they've evolved for millions of years. Climate change is making those areas uninhabitable for them.[17]"Species are trying to move to places where they can take refuge from the increasing temperatures, for example by moving up mountains or travelling north. But because we've already taken away so much space from nature, sometimes they have nowhere to run. 'Populations that can't migrate or adapt, such as some plant and insect species, are at risk of becoming locally extinct. In turn, this will reduce the genetic diversity of the entire species, making it more vulnerable to pests, diseases and other pressures. If this happens to a food crop that we rely on, it could damage our food system,[18] putting millions at risk of malnutrition and famine. While many species will be negatively affected by climate change, some species may find the range of available habitat increases. This, coupled with the increased movement of people and goods around the world, is leading to an increase in the number of species being introduced and becoming established outside of their natural range. Some of these species, which are called invasive species, aggressively compete with the local native species for resources, negatively affecting the biodiversity of the area.[19]

It's not just the rising temperatures caused by global warming that present a risk to biodiversity. The mounting climate crisis is causing ice and snow to melt, raising sea levels and eroding vital coastal ecosystems. Extreme weather events, such as hurricanes, are happening more frequently, in some cases causing catastrophic flooding that sweeps away homes and vegetation and threatens the lives of humans and animals. Wildfires are also becoming worse. Climate change is warming our oceans, leading to rises in sea levels and changes in the ocean currents that species rely on for food and reproduction. The high levels of carbon dioxide in the atmosphere are dissolving into the ocean, leading to ocean acidification. This is making it harder for creatures such as crabs and sea urchins to make their shells and exoskeletons. Coral reefs are responding to the stress of higher temperatures by expelling the colourful algae they depend on for food, which can ultimately cause the coral to die.[20]

'We are the blue planet and the marine system is hugely important for providing us with a liveable planet,' says Adriana. 'It's also very fragile and sensitive to climate change. "Coral reefs are like the rainforests of the sea. But they are very vulnerable to warming sea temperatures, and once you lose corals, you've then lost everything else that depends on them. 'Marine ecosystems are more sensitive to climate change than life on land, possibly because land species have more options for adaptation, such as migrating to higher altitudes. [21]

Results

Just as climate change alters habitats and ecosystems, loss of biodiversity contributes to climate change and intensifies its effects. Adriana explains, 'Loss of biodiversity affects climate change because there are incredible ecosystems throughout the world, from trees to soils to peat lands, that are huge carbon sinks. This means they are incredibly important for pulling emissions out of the atmosphere and slowing climate change. "The more we deforest, the more we degrade our peat lands and erode our soils, the less nature is able to help us mitigate against climate change. 'A recent study has found that sections of the Amazon rainforest,[22] the world's largest single carbon store on land, are now releasing more carbon than they are able to store due to deforestation and climate change. This relationship between the climate crisis and biodiversity loss is creating what is called a positive feedback loop or, in this case, a vicious circle. For example, the high temperatures caused by climate change have made our forests drier and more vulnerable to wildfires. In turn, those wildfires release yet more carbon into the atmosphere, speeding up the greenhouse effect even further[23]. The dual environmental crises of climate change and biodiversity loss are daunting, but we can do something about them if we act now. Governments set out their plans to tackle this crisis at COP15, the most recent meeting of the United Nations Convention on Biological Diversity. It look place in Montreal, Canada, from 7 to 19 December 2022.We need to act not only to limit or prevent further climate change and biodiversity loss, but to adapt to changes that we can no longer stop. For example, we can take actions to make the impact of these changes less severe, known as mitigation, such as developing better flood prevention to help coastal communities and ecosystems withstand rising sea levels and more frequent and severe flooding[24].We need to understand the trends and patterns affecting biodiversity loss. To help with this, our scientists have developed the Biodiversity Trends Explorer tool, which allows people around the world to track biodiversity changes between 2000 and 2050. It's helping policymakers,

including representatives at COP15, to compare the state of local ecosystem biodiversity among countries and explore the factors driving regional biodiversity loss.[25]Some climate change mitigation options, such as increased production of biofuel, could change land-use patterns and threaten biodiversity. So, it's important that ecosystem protection is considered when developing policies to address climate change. Protecting nature through habitat restoration and conservation can help tackle the climate crisis while also having amazing benefits for biodiversity.[26] For instance, rewilding is the process of allowing a landscape to regrow and replenish itself without any human interference. Rewilded spaces can help lock in more carbon, restore biodiversity and support the reintroduction of lost or endangered native species. If woodlands, peat bogs, grasslands and other natural environments in the UK were restored, for example, they could lock away more than a tenth of the country's greenhouse gas emissions a year.[27]Roughly 190 countries have committed to a '30x30' target, which would protect at least 30 percent of the planet's land and ocean by 2030. If reached, this goal would be a powerful contribution to addressing biodiversity and climate change.[28]

Conclusions

Interventions that both support nature and help us to tackle or adapt to climate change are called nature-based solutions, or natural climate solutions. Experts have estimated that nature-based solutions can contribute 20-37% to keeping temperature increases below 2°C.Nature-based solutions include helping rainforests and mangrove forests to recover and regrow, protecting carbon-storing peat lands and restoring our ocean's sea grass meadows and kelp forests. Bringing nature into cities by creating green roofs and bio diverse parkland areas is another example of a nature-based solution[29]. As well as the benefits these green areas have for our mental health, they can also moderate the impact of heat waves in urban areas, reduce pollution and help with water drainage. We can also have a positive impact by taking better care of our many rare and precious ecosystems here in the UK, says Adriana. 'The UK has peat lands and ancient woodlands, both of which are hugely important for capturing and storing tonnes of carbon dioxide. They are really unique and precious systems that are supporting our climate, but they are in need of restoration.[30] 'Nature restoration makes good financial sense too. Every $1 spent on ecosystem restoration gives a return of around $30 in economic benefits, as well as being a source of employment. Tree planting has attracted a lot of optimism as a nature-based solution to the climate crisis. But while planting a fast-growing tree species, such as eucalyptus, over a vast area can capture and store carbon - also called carbon sequestration - a monoculture plantation like this won't provide a home for a rich variety of species. In addition, if a pest or disease swept through the landscape, it could wipe out the entire plantation. Growing a mix of native tree species alongside rivers, on the other hand, can capture carbon whilst also helping to manage flooding and prevent landslides.[31] Restoring mangrove forests along coastlines can reduce the impact of extreme storms on local communities and economies and provide a valuable natural habitat for fish, birds and other plants. It's important to consider not only what trees to plant, but where to plant them. Planting on grasslands, peat lands or tundra - naturally treeless Arctic regions - can actually increase the amount of carbon dioxide in the atmosphere and enhance global warming. Whereas planting garden, park and street trees can help cool the local environment and increase urban biodiversity. Their contribution to carbon sequestration, though relatively small, can be significant. Scientists estimate that urban trees in the USA capture about 20 million tonnes of carbon dioxide each year. Agroforestry, where trees are grown among crops and livestock, is another nature-based solution. It provides benefits such as protecting the soil from erosion and degradation, creating a favourable microclimate and encouraging biodiversity, which in turn can help with pest control.[32] Humans are largely responsible for the dual ecological crises of climate change and biodiversity loss, and we can't expect the natural world to fix everything for us. Nature-based solutions must be combined with slashing our global greenhouse gas emissions.[33] This will include dramatically reducing our consumption and moving from fossil fuels to clean and renewable energy sources, such as wind and solar. Well-designed offshore wind installations can even imitate reefs and provide habitats for marine species at the same time. But taking a more holistic approach by tackling the climate and biodiversity crisis together will benefit both and offers us the best chance for a future where the planet can support us.[34]

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