

Towards a net zero and nature positive future

Summary for policymakers involved in COP27, COP15 and beyond

We are facing a planetary emergency of our own making. As the climate heats and biodiversity declines, we need scientific evidence, financial flows and political will to act. Globally, we need to act now and act together, and the UK has the science base to be a leader and convenor on the international stage, building on the legacy from hosting COP26 in Glasgow.

In autumn 2022, the Natural History Museum and the Science Museum joined forces to bring together ~50 leaders in science, technology, policy, finance and business¹. The ambition was to look ahead to the UN conferences on climate change (COP27) and biodiversity (COP15), take stock of the UK's legacy from the presidency of COP26, and highlight priorities towards meeting the Paris Agreement on climate change. The three themes discussed were:

- Climate change and biodiversity: interlinkages in science and policy;
- Resourcing and financing the green economy; and
- Harnessing the power of innovation and data-driven technology for a net zero and nature-positive future.

From this, we have distilled eight key insights to inform UK policymakers.

1. Climate change and biodiversity loss are interconnected crises that should be understood and addressed together.

The interlinkages between climate and biodiversity are widely understood, having their roots in Earth Systems Science. As recent reports by the UN Intergovernmental Panel on Climate Change make clear, climate change is a significant driver of biodiversity loss, and every 1 degree of warming brings a 10% increase in extinction risk². Ecosystems also influence the climate, and measures taken to mitigate climate change influence ecosystems in turn.

Yet these interlinkages are not reflected in the structure of our institutions. Domestically, responsibility sits with BEIS and Defra respectively. Internationally, this division is echoed with twin-track negotiations under the UN Framework Convention on Climate Change (UNFCCC) and UN Convention on Biological Diversity (UNCBD), and their respective COPs.

Orienting research efforts towards solutions to both crises and placing greater emphasis on the co-benefits of policy actions would help join up these two agendas. The UK Government's investment in the Global Centre on Biodiversity for Climate is a step in the right direction.

¹ Speakers included: Sir Ian Blatchford, Dame Mary Archer, Prince Hussain Aga Khan, Dr Tamsin Edwards, Richard Deverell, Alan Whitehead MP, Dr Rhian-Mari Thomas, Adam Matthews, Professor Richard Herrington, Professor Cameron Hepburn, Mark Girolami, Professor Andy Purvis, Professor Tim Lenton, Sir Patrick Vallance and Dr Doug Gurr, with video messages from Alok Sharma MP and Zac Goldsmith MP.

² IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., doi:10.1017/9781009325844

2. Biodiversity needs to be more prominent in policy thinking and action, including at COP27.

As we undergo a sixth mass extinction, biodiversity is rapid decline, with 1 million species now at risk of extinction³. It has been something of a poor relation to climate change, arguably lagging 10 years behind in terms of public understanding and political profile.

And yet biodiversity can be a ‘solution multiplier’. By working with nature, we can not only halt biodiversity loss but also tackle climate change and support sustainable livelihoods, health and wellbeing. Ultimately, we need to better align our societies and economies with the natural systems on which they depend. The Dasgupta Review on the Economics of Biodiversity⁴ has begun to shift thinking, but there is further to go – whether by pricing nature into our activities and commodities or by accounting in other ways for its contribution to people.

COP15, at which a new global agreement will be struck, presents a once-in-a-decade opportunity to halt and reverse biodiversity loss and to give the crisis the attention it deserves.

3. Biodiversity metrics are a critical piece of the puzzle.

While climate change is measured in carbon and against a 1.5 degree temperature goal, there is no common currency or single metric for biodiversity. Despite rapid advances in our ability to monitor biodiversity, there remains disagreement over what to measure – though one helpful distinction is between metrics that convey extinction risk and those that convey the state and functionality of ecosystems.

Governments and businesses need metrics that are scientifically robust, easy to interpret, and applicable at multiple scales. They need to be sufficiently sophisticated to reflect the complexity of nature and yet sufficiently simple to be used.

The Natural History Museum’s Biodiversity Intactness Index (BII)⁵ is one such metric. It conveys the percentage of the original number of species that remain, and their abundance, in any given area. Unlike most indicators, including the vast majority currently being considered under the UNCBD’s Global Biodiversity Framework, the BII can tell us what is likely to happen in the future rather than simply what has happened to date. Being based on models, it can act as a ‘sat nav’ for nature.

4. A green transition requires financing models that make clear business sense.

Green finance – the direct application of science to financial decision making – has come a long way. But it still faces significant challenges. One is the growing pushback from those who consider green investment to be ‘indulgent’. Another is competing taxonomies and definitions of what counts as ‘green’, which make it hard to judge whether a company is doing a good job or not. There is also the fundamental issue that most companies will only act in the interest of the planet if it makes business sense to do so – i.e. if it will make them money. It is against this backdrop that trillions of pounds in bank lending for fossil fuels took place between the adoption of the Paris Agreement and the Glasgow Climate Pact.

Governments can help create incentives for businesses and individuals to make better choices. The UK government has an opportunity to lead the way towards COP27 and beyond. In turn, companies need to innovate to provide greener, cheaper, more desirable products. Across the public and private

³ IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. <https://doi.org/10.5281/zenodo.3831673>

⁴ Dasgupta, P. 2021 *The Economics of Biodiversity: The Dasgupta Review*. HM Treasury, London. <https://www.gov.uk/government/collections/the-economics-of-biodiversity-the-dasgupta-review>

⁵ Natural History Museum, *About the Biodiversity Intactness Index*. [https://www.nhm.ac.uk/our-science/data/biodiversity-indicators/about-the-biodiversity-intactness-index.html#:~:text=The%20Biodiversity%20Intactness%20Index%20\(BII,given%20area%2C%20despite%20human%20impact](https://www.nhm.ac.uk/our-science/data/biodiversity-indicators/about-the-biodiversity-intactness-index.html#:~:text=The%20Biodiversity%20Intactness%20Index%20(BII,given%20area%2C%20despite%20human%20impact)

sectors, we should support each other in celebrating genuine success stories that combine social and environmental wins with reliable financial returns. One new study suggests that achieving a zero-carbon energy system by around 2050 is possible and profitable, and a transition to a decarbonised global energy system over the next three decades will save the planet at least US\$12 trillion compared to continuing to rely on expensive, insecure and environmentally damaging fossil fuels⁶.

5. A green transition requires a ‘mineral revolution’⁷ that meets resource needs sustainably and equitably.

The low-carbon technologies that will enable the net-zero transition are mineral-hungry, and recycling alone will not keep pace with demand. The amount of copper needed between now and 2050 (e.g. for electrical wires) is more than all the copper we have mined since 1900⁸. Production needs to double by 2050, even with optimistic levels of recycling and material substitution. In the same period, the production of ‘critical’ minerals such as lithium, cobalt and graphite (e.g. for batteries) needs to increase by a staggering 500%.

How to deal with the burgeoning demand for mineral resources is a matter of urgency. Many manufacturers are unlikely to have secured their supply beyond a few years. However, a rush to extract these resources must be done in a way that ensures positive outcomes for nature and people. With mining potentially impacting up to 50 million square kilometres of the Earth’s land surface, we need informed public debate on thorny questions such as whether mining in rainforests, deep oceans or other areas is more palatable. We also need an entirely new approach that builds ‘cradle to cradle’ circularity into future resourcing models, drawing on innovation in recycling and bioremediation of mining sites⁹.

6. Data and data-driven technologies promise major insights for decision-makers.

The big data revolution has created unprecedented volumes of increasingly precise data about the natural world. In turn, data-driven technologies such as artificial intelligence (AI) and machine learning are helping businesses and governments to understand their environmental impacts and dependencies, and ultimately to make better decisions.

One promising application is using satellite data combined with AI to spot early signs of ‘tipping points’ in the natural world – i.e. points beyond which significant or irreversible change is expected. For example, we are observing the Amazon taking longer to recover following periods of drought, indicating it is closer to a tipping point where it could rapidly turn into savannah. Data can help us move beyond simply observing environmental damage to anticipating it and halting it in its tracks. Conversely, data can also help us to understand positive tipping points, where reinforcing feedbacks (e.g. economies of scale) accelerate positive change (e.g. the shift to renewable energy).

However, the full potential of data is yet to be realised and we should be wary of overstating it. Datasets are diverse, which makes them difficult to combine and interpret. Access to data is also variable across the world, with developing countries and indigenous groups worst served. Data is also carbon intensive thanks to the energy required to train AI to spot patterns in big data.

⁶ Way, R *et al.* 2022 Empirically grounded technology forecasts and the energy transition. *Joule* 6(9), 2057-2082. [https://www.cell.com/joule/fulltext/S2542-4351\(22\)00410-X](https://www.cell.com/joule/fulltext/S2542-4351(22)00410-X)

⁷ Gloaguen, R *et al.* 2022 Mineral revolution for the wellbeing economy. *Global Sustainability* 5, E15. doi:10.1017/sus.2022.13

⁸ The Future of Copper, S&P Global July 2022 p46 <https://press.spglobal.com/2022-07-14-Looming-Copper-Supply-Shortfalls-Present-a-Challenge-to-Achieving-Net-Zero-2050-Goals,-S-P-Global-Study-Finds>

⁹ Herrington, R & Tibbett, M 2022 Cradle-to-cradle mining: a future concept for inherently reconstructive mine systems?, in AB Fourie, M Tibbett & G Boggs (eds), *Mine Closure 2022: 15th International Conference on Mine Closure*, Australian Centre for Geomechanics, Perth, 19-28, https://doi.org/10.36487/ACG_repo/2215_0.02

7. We need to bridge the gap between policy and delivery.

Policy commitments such as the Glasgow Climate Pact are necessary but not sufficient. The negotiations at COP27 will not only need to avoid countries reneging on their Nationally Determined Contributions in response to the near-term energy crisis, but they will also need to encourage more ambitious pledges and focus firmly on delivery. Delivering on the commitments already made requires sufficient finance to be in place and for low-carbon technologies to be researched, developed and deployed at sufficient scale and pace. Similarly, at COP15, the deal that is struck will only be successful if it is underpinned by the resources required to implement it.

The overriding challenge is not one of understanding or ambition, but rather one of delivery. Both green finance and metrics that allow us to track progress and keep ourselves and others accountable can help here.

8. With urgent action, collaboration, finance and leadership, we can still meet the Paris Agreement and strike an ambitious global deal for nature.

The interconnected crises of climate change and biodiversity loss are complex systems problems. There is no silver bullet. Legislation that tackles only the tangible or easily resourced parts of the Earth system should be resisted. Instead, we need a multitude of expertise and leadership from a raft of sectors. Businesses look to governments for regulatory certainty, and governments often need bold signals from leaders elsewhere before they feel empowered to act. For too long the narrative has been one of collective burden sharing rather than one of collective opportunity.

Young people have an essential role to play. They have already pushed the debate forward and are channelling their passion and creativity into viable solutions for the future. We need to create more opportunities for their innovative ideas to reach those in positions of power. Given the planetary emergency we find ourselves in, and the reasons for it, we also need to demonstrate that we are worthy of their trust.

In simple terms, we understand the problem, we possess the scientific and technical expertise to fix it and to hold ourselves accountable, and we see examples of leadership around the world. These are reasons to be hopeful.

The Natural History Museum and Science Museum are world-leading museums with the convening power to bring together leaders in science, policy and industry to debate the global challenges impacting our planet and humanity. Our aim is to continue to deploy our trusted voice for climate science and nature with senior policymakers, young changemakers and a public audience of millions globally.

The Natural History Museum is a world-class visitor attraction and leading science research centre. We use our unique collections and unrivalled expertise to tackle the biggest challenges facing the world today. We care for more than 80 million objects spanning billions of years and welcome more than five million visitors annually. One of our ambitions is to increase our sphere of influence among policymakers in the UK and globally, drawing on our scientific expertise and public reach to engage those with the power to make and shape important decisions about the future. We were also the first museum in the world to set a science-based carbon reduction target.

The Science Museum is part of the Science Museum Group of five world-class museums, four of which are in the North of England, with an audience of 5.5 million visitors annually. In 2020 we published our Sustainability Policy which sets out our aim to be a leader in public engagement around the science of climate change via our ambitious public programme of exhibitions and galleries and through igniting curiosity around some of the 7 million items in our collection. In announcing our commitment to achieve net zero by 2033 which follows the Science Based target initiative in line with Paris Agreement, we became the first UK museum group to set a target for decarbonising all 3 scopes of carbon emissions including our supply chain.