

Climate Emergency and Biodiversity Crisis: The Facts and Figures

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CIEEM

THE CHARTERED INSTITUTE OF ECOLOGY AND ENVIRONMENTAL MANAGEMENT (CIEEM) IS THE PROFESSIONAL BODY FOR ECOLOGISTS AND ENVIRONMENTAL MANAGERS WORKING TO MANAGE AND ENHANCE THE NATURAL ENVIRONMENT IN THE UK AND IRELAND.



Human activities which result in the release of greenhouse gases are estimated to have caused 1°C of global heating above pre-industrial levels¹. As a result, there have already been sea level rises, increased likelihoods of extreme weather events and melting of sea ice and permafrost². This has direct and devastating impacts on society, including land loss³; increased severity and occurrence of wildfires⁴; drought; and difficulties producing food⁵.

Alongside this, there have been unprecedented declines in global biodiversity, with the average abundance of native species in most major land-based habitats falling by at least 20%, mostly since 1900⁶. The quality of habitats which support this biodiversity has also declined, with a 30% reduction in global terrestrial habitat integrity caused by habitat loss, fragmentation and deterioration.

Biodiversity is essential both to humans, through the provision of ecosystem services such as food, fuel, flood prevention and enjoyment; and in its own right as part of the natural world.

The recent *Global Assessment Report on Biodiversity and Ecosystem Services* by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)⁷ states that the key drivers of biodiversity decline are:

- Changes in land and sea use
- Direct exploitation of organisms
- Climate change
- Pollution
- Invasive alien species

The combined effects of these human activities have put an estimated one million species at risk of extinction⁸, threatening the stability of ecosystems and the services we receive from them. For example, more than 75% of global food crop types



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rely on animal pollination⁹, meaning declines in pollinator diversity and abundance have severe implications for human food production.

There is already evidence that biodiversity has been affected by the 1°C rise in global average temperature. Poleward and upwards shifts in species' distribution have been recorded in Britain¹⁰ and Ireland¹¹, and on a global scale¹². In some cases, changes in migration¹³, breeding¹⁴ and flowering dates¹⁵ have resulted in a mismatch between predator and prey species, resulting in species having difficulties finding food¹⁶.

Temperature rises are also affecting entire ecosystems, with heatwaves in the central Indian Ocean responsible for the death of more than two-thirds of corals in two years¹⁷.

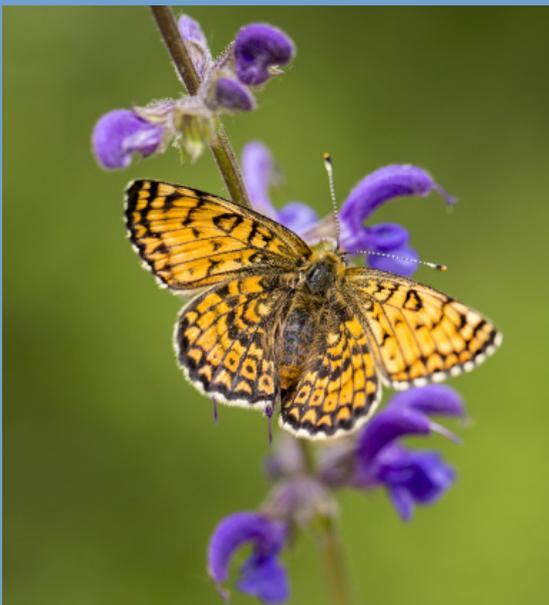
Models predict further temperature increases of between 1.8°C and 3.6°C by 2100 under a range of scenarios of human activity. The recent Intergovernmental Panel on Climate Change (IPCC) *Special Report: Global Warming of 1.5°C*¹⁸ clearly outlined the need to limit warming to 1.5°C, and the severe impacts just an additional 0.5°C rise could have on biodiversity. For example, coral reefs would decline by 70-90% with global warming of 1.5°C, whereas 99% would be lost with 2°C. The likelihood of an Arctic Ocean free of sea ice in summer would be once per century with global warming of 1.5°C, compared with at least once per decade with 2°C. This would have devastating implications for species which rely on sea ice to hunt.

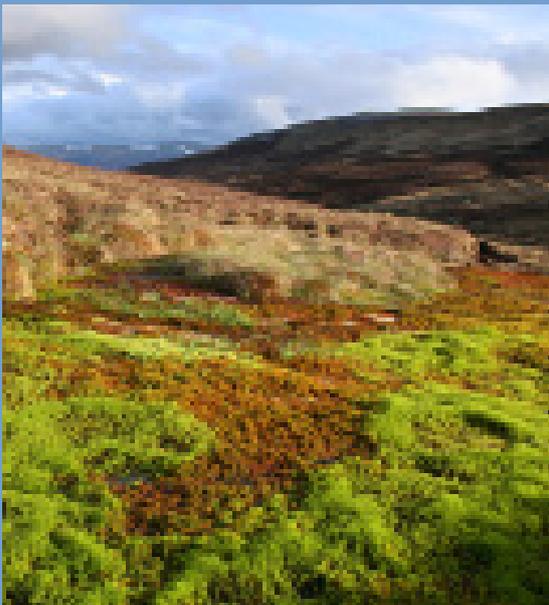
The impacts of climate change on biodiversity are also exacerbated by the other drivers outlined above. For example, loss of habitat and human-created barriers mean species may not be able to shift their ranges to match climate. Climate-related range shifts will also increase the threat of invasive alien species introduction and prevalence of insect-borne diseases such as malaria and West Nile Virus¹⁹.

Conversely, the destruction of biodiverse ecosystems, such as deforestation of tropical rainforests and damage to peat bogs, results in significant production of carbon dioxide and reduces ongoing sequestration, leading to a feedback effect of further climate change.

What Needs to Change?

Models suggest there are just 12 years to limit warming to 1.5°C²⁰. Achieving this, and limiting the impacts on biodiversity, will require fast and strong action globally. We welcome the UK





Government's commitment to net zero emissions by 2050 and the proposed net zero targets in Scotland and Wales. However, this must now be followed with **immediate, ambitious and continued action**.

Models predict that even if drastic action is taken globally, there is still a 50% chance of exceeding an average temperature rise of 2°C²¹. A recent study has also found that committed emissions from existing and proposed energy infrastructure represents more than the entire remaining carbon budget to limit temperature rises to 1.5°C²². Due to the existing and predicted effects this will have on society and biodiversity, there is an urgent need for both **mitigation** to reduce emissions and **adaptation** to minimise detrimental impacts on the natural world and society.

The **climate emergency and biodiversity crisis are inextricably linked** and must be addressed in tandem.

In conjunction with addressing climate change, action is needed by humanity to halt biodiversity decline and begin its restoration. Planning, land use and agricultural systems must be adapted to work with nature. For example, by implementing Biodiversity Net Gain in planning and moving to agricultural systems of 'public funds for public benefit'. Regulators must be strong and independent to address issues of pollution and over-exploitation, and humanity must reduce our global ecological footprint, for example, through decreasing the reliance on rare metals extraction, tropical timber, and crop and animal production, all of which can induce tropical deforestation.

Mitigation

Human consumption of fossil fuels is the primary cause of greenhouse gas emissions²³, meaning **a global shift to low-carbon alternatives is essential**. There is, however, concern that UK Export Finance is undermining the UK's targets for climate by investing £2.5 billion in fossil fuel projects over five years, most of which are in low- and middle-income countries²⁴. We support calls from the Environmental Audit Committee to end this support for fossil fuels and invest in low/zero carbon alternatives. The UK must not export its emissions and should therefore also reduce its reliance on external imports.

Greenhouse gases are also emitted by agricultural practices and waste management, particularly methane, which is 30 times more potent than carbon dioxide, from livestock, fertilisers and landfill. We support the calls from the recent



IPCC report on '*Climate Change and Land*' for sustainable land use, including farming and forestry, and reducing waste²⁵. Future land and waste management schemes must be implemented in a way that tackles the causes of both climate change and biodiversity decline.

Nature-based solutions must play a key role in mitigating against and adapting to climate change. Restoration of degraded peat bogs, wetlands, mangrove forests, seagrass beds and woodlands will increase carbon sequestration and storage potential. A recent study found that planting an extra 0.9 billion hectares of forest/tree canopy cover could store 205 gigatonnes of carbon which equates to around two-thirds of the carbon which is in the atmosphere because of human activity²⁶.



Biodiversity must be restored and enhanced both for its intrinsic value and for the tangible benefits that it has for society and the economy. Biodiversity and ecosystem services contribute to clean air, fresh water, crop pollination, food production, soil regeneration, fuel and fibre production, physical and mental health and well-being, and many, many more goods and services for society. Intact ecosystems (i.e. that have a complete assemblage of species) are more resilient to change²⁷ and are better at providing ecosystem services, upon which human life and livelihoods depend.

Adaptation

A recent report by the Committee on Climate Change found the UK Government's National Adaptation Plan (NAP) does not adequately address all the risks and opportunities set out in the UK Climate Change Risk Assessment, with 21 of the 56 risks and opportunities having no formal actions²⁸. This must change. Society and biodiversity must be supported to adapt to the inevitable changes we face with clear actions laid out in the National Adaptation Plan.

Adaptation and mitigation for **climate change must be embedded across all goals in policies for nature recovery and vice versa**. Ecological networks require defining and implementing nationally and regionally to allow species to migrate as the climate changes.

Restoration of degraded ecosystems and habitats will help nature to adapt to climate change by reducing barriers to migration and will have significant benefits for the human population. For example, restoring wetlands and riverbeds can act as natural barriers against flooding, green spaces can





provide refuge from heat extremes in cities, and woodland can help reduce soil erosion²⁹.

Land should be used to offset major impacts of climate change, for example, using Integrated Coastal Zone Management to mitigate against sea level rise. Sustainable flood management should also be required through the planning process.

Action is Needed at All Levels

Every government, every business, every organisation and every individual must play a role in reducing greenhouse gas emissions, assisting in the adaptation to climate change, halting biodiversity loss, and restoring habitats and species. This should be aided through changes in laws and regulations, policies, and behaviours and lifestyles at local and regional levels, as well as the international and national scales.

Governments, nationally and locally, must lead by example to provide the regulatory frameworks that give businesses the confidence to change on a level playing field and that provide incentives to innovate new solutions. Individuals and businesses must step up, through altering behaviours and lifestyles, in ways that clearly indicate to Governments that robust changes in legislation and policy are supported.

Ecologists and environmental managers are at the forefront of the fight against biodiversity loss and climate change adaptation. We must lead the way in restoring degraded habitats and landscapes, ensuring developments and other land, freshwater and marine use practices deliver biodiversity net gain and sharing best practice and evidence, both within the profession and with decision-makers. We must do so with both biodiversity recovery and climate change adaptation and mitigation in mind.

It is vital, as never before, that the work of CIEEM, its members and our profession continue to be at the forefront of targeted action.

The purpose of this briefing paper is to review the most accessible evidence that is relevant to the scope of CIEEM.



References

1. IPCC (2018) *Summary for Policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.
2. IPCC (2014) *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
3. U.S. Environmental Protection Agency (2016) *Climate change indicators in the United States, 2016*. Fourth edition. EPA 430-R-16-004. Available at: www.epa.gov/climate-indicators.
4. Abatzoglou J. T. and Williams A. P. (2016) Impact of anthropogenic climate change on wildfire across western US forests, *PNAS*, 113(42), 11770-11775. DOI: 10.1073/pnas.1607171113
5. Committee on Climate Change (2017) *UK Climate Change Risk Assessment 2017 Synthesis Report: priorities for the next five years*, London: Committee on Climate Change. Available at: <https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Synthesis-Report-Committee-on-Climate-Change.pdf>
6. 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.
7. IPBES (2019) *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science- Policy Platform on Biodiversity and Ecosystem Services*.
8. IPBES (2019) *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science- Policy Platform on Biodiversity and Ecosystem Services*.
9. IPBES (2019) *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science- Policy Platform on Biodiversity and Ecosystem Services*.
10. Gillings S., Balmer D.E. & Fuller R.J. (2014) Directionality of recent bird distribution shifts and climate change in Great Britain, *Global Change Biology*, 21(6), 2155–2168. Available at: <https://onlinelibrary.wiley.com/doi/abs/10.1111/gcb.12823> (accessed: 15/08/2019)
11. Donnelly A. (2018) Climate change: potential implications for Ireland's biodiversity, *International Journal of Biometeorology*, 62(7), 1221-1228. DOI: 10.1007/s00484-018-1526-2.
12. Lenoir J. & Svenning J.C. (2015) Climate-related range shifts – a global multidimensional synthesis and new research directions, *Ecography*, 38(1), 15-28. Available at: <https://onlinelibrary.wiley.com/doi/pdf/10.1111/ecog.00967> (accessed: 15/08/2019)
13. Usui T., Butchart S.H.M. & Phillimore A.B. (2016) Temporal shifts and temperature sensitivity of avian spring migratory phenology: a phylogenetic meta-analysis, *Journal of Animal Ecology*, 86(2): 250-261. DOI: 10.1111/1365-2656.12612
14. Marrot P, Garant D, Charmantier A. (2017) Multiple extreme climatic events strengthen selection for earlier breeding in a wild passerine. *Phil. Trans. R. Soc. B* 372: 20160372. Available at: <https://royalsocietypublishing.org/doi/pdf/10.1098/rstb.2016.0372> (accessed: 15/08/2019)
15. Szabó B., Vincze E. & Czúcz B. (2016) Flowering phenological changes in relation to climate change in Hungary, *International Journal of Biometeorology*, 60(9), 1347–1356. Available at: <https://link.springer.com/article/10.1007/s00484-015-1128-1> (accessed: 15/08/2019)
16. Chevillot X., Drouineau H., Lambert P., Carassou L., Sautour B. & Lobry J. (2017) Toward a phenological mismatch in estuarine pelagic food web?, *PLoS ONE* 12(3): e0173752. Available at: <https://doi.org/10.1371/journal.pone.0173752> (accessed: 15/08/2019)
17. <https://www.newscientist.com/article/2209750-double-heatwave-killed-two-thirds-of-coral-in-central-indian-ocean/>

18. IPCC (2018) *Summary for Policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*
19. Baylis M. (2017) Potential impact of climate change on emerging vector-borne and other infections in the UK, *Environmental Health*, 16(Supple 1): 112. Doi: 10.1186/s12940-017-0326-1
20. IPCC (2018) *Summary for Policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*
21. IPCC (2018) *Summary for Policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*
22. <https://www.nature.com/articles/s41586-019-1364-3>
23. IPCC, 2014: *Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
24. <https://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/news-parliament-2017/uk-export-finance-report-published-17-19/>
25. IPCC (2019) *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, Summary for Policymakers (Approved Draft)*, IPCC. Available at https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf (accessed:15.08.2019)
26. Bastin J.F., Finegold Y., Garcia C., Mollicone D., Rezende M., Routh D., Zohner, C.M., Crowther T.W. (2019) The global tree restoration potential, *Science*, 365(6448): 76-79. DOI: 10.1126/science.aax0848.
27. Martin, T.G. & Watson, J.E.M. (2016) Intact ecosystems provide best defence against climate change. *Nature Climate Change*, 6: 122–124.
28. Committee on Climate Change (2019) *Progress in preparing for climate change 2019 Report to Parliament, London: Committee on Climate Change*. Available at: <https://www.theccc.org.uk/wp-content/uploads/2019/07/CCC-2019-Progress-in-preparing-for-climate-change.pdf>
29. Department for Environment, Food and Rural Affairs (2010) *Natural Environment Adapting To Climate Change*, London: Defra. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69271/pb13323-natural-environment-adaptation-100326.pdf



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