

The climate and biodiversity crises that threaten our way of life are fundamentally connected and operate beyond national borders. Solutions require fair and just societal transition and transformation. Large-scale, collaborative research across disciplines in both jurisdictions on the island of Ireland is needed to develop joined-up solutions to the crises.

Connected crises

Biodiversity and climate systems worldwide continue to be degraded, with life-altering consequences for societies and people around the world (Pörtner et al., 2021). The drivers and consequences of Earth system degradation transcend borders and jurisdictions. The crises do not respect geopolitical boundaries, and therefore responses need to be collaborative and coordinated – particularly on an island with shared natural capital and flows of ecosystem processes, goods, and services.

Significant commitments to combat climate change have been agreed by governments worldwide (UN / Framework Convention on Climate Change, 2015), and there is increasing ambition for tackling biodiversity loss (European Commission, 2020). 2021 is a critical year for biodiversity and climate issues, with the UN Biodiversity Conference (COP15) to outline a post-2020 global biodiversity framework and the UN Climate Change Conference (COP26) to accelerate action on existing climate commitments.

There are parallels between how we understand and tackle climate change and biodiversity loss. Importantly, there are also critical intersections and feedbacks between them. Some of the same activities, rooted in accelerating anthropogenic alterations of Earth systems, are driving climate and biodiversity change, and some solutions could result in trade-offs or synergies between climate and biodiversity actions.

Adapting to and mitigating climate change will not necessarily come at the expense of biodiversity. There are undoubtedly win-win outcomes that benefit biodiversity and at the same time provide nature-based solutions to help us mitigate and adapt to climate change. These links mean that the two crises should be tackled together.

For example, vast tree-planting programmes – a nature-based solution – have been proposed

Joined-Up Thinking to Tackle the Climate and Biodiversity Crises

Shared research needs for a green-knowledge-based future



Yvonne M. Buckley

Nature+: Trinity Centre for Biodiversity & Sustainable Nature-based Solutions, Trinity College Dublin

Mark Emmerson

School of Biological Sciences and Institute for Global Food Security, Belfast

Derek Jackson

School of Geography and Environmental Sciences, Ulster University (Coleraine campus)

Peter Thorne

ICARUS, Department of Geography, NUI Maynooth

Murray Hitzman

iCRAG, University College Dublin

Anna Davies

Nature+: Trinity Centre for Biodiversity & Sustainable Nature-based Solutions, Trinity College Dublin

to sequester carbon and reduce the effects of climate change. But while forest restoration has the potential to support biodiversity, if implemented incorrectly it could have the opposite effect and may also fail to achieve its carbon-sequestration targets (Veldman et al., 2019). At the same time, biodiversity, and its role in providing nature-based solutions, is just part of the solution space needed for climate change.

Combining capabilities

Different groups in society have common but differentiated responsibilities to act, for example through policy levers, innovations in the built and physical environments, and development of technology in combination with nature to provide solutions to the crises. Mechanisms for a just transition are needed to recognise and reduce power imbalances among stakeholders. There needs to be joined-up thinking across disciplines, focused on the climate and biodiversity crises, leading to better outcomes for both.

The island of Ireland contains many critical ecosystems that underpin a wide range of services vital for the economy and society, including grasslands, forests, wetlands, peatlands, agricultural lands, and freshwater, coastal, and marine habitats. The island's natural capital and industrial and land-use profiles, together with political, economic, demographic, cultural, and societal features, present unique challenges and opportunities for ensuring that societal transitions to net-zero carbon are fair and just, leaving no-one behind (UNSDG, 2019), while protecting and restoring biodiversity and associated habitats to prevent further degradation.

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The All-Island Climate and Biodiversity Research Network (AICBRN) was established in December 2019 to leverage the combined research and development capability across the two jurisdictions on the island of Ireland and help tackle the climate and biodiversity emergencies (AICBRN, 2021). It draws together researchers from disciplines across the natural sciences, social sciences, engineering, and humanities, and has identified the need for enhanced research on climate, biodiversity, and the just transition required to implement solutions fairly across society.

The AICBRN brings together researchers to optimise existing research investments, identify critically needed infrastructure, and develop teams capable of not only addressing the challenges but also combining expertise to secure research funding, including European and private-sector funding, adding further value to national and internationally funded research programmes (Buckley et al., 2021).

Policy base

There is a strengthening policy base for climate action in both jurisdictions in Ireland. The Climate Action and Low Carbon Development (Amendment) Bill in the Republic of Ireland sets legally binding targets for the transition to a climate-resilient, biodiversity-rich, environmentally sustainable, and climate-neutral economy by 2050 (Government of Ireland, 2021). The National Adaptation Framework sets out Ireland's strategy to reduce vulnerability to the negative effects of climate change and avail of positive

impacts (Government of Ireland, 2018). Actions across multiple sectors are set out in the Climate Action Plan (Government of Ireland, 2019).

The UK Climate Change Act 2008 has recently resulted in the Northern Ireland Climate Change Adaptation Programme (2019–2024) (NICCAP), where the Department of Agriculture, Environment and Rural Affairs (DAERA) coordinates a cross-departmental response to risks and opportunities relevant to NI in the UK Climate Change Risk Assessment.

Northern Ireland currently has two climate change bills under consideration. The first aims to mitigate the impact of climate change in NI, by establishing legally binding net-zero-carbon targets, and will establish an NI Climate Office with an associated Climate Commissioner who will have appropriate powers to implement change. The bill also includes legally binding targets for water quality, soil quality, and biodiversity.

The second bill focuses exclusively on climate. It aims to set targets for 2030, 2040, and 2050 for the reduction of greenhouse gas emissions and to provide for a carbon budgeting system that can enable reporting against those targets and imposes climate-change reporting duties on public sector bodies.

Research scope

A strong research ecosystem is needed to support policy and action for the societal transitions in decarbonisation and maintenance and restoration of biodiversity needed to underpin future economic activity. Research across multiple disciplines has several roles to play in the biodiversity and climate emergency:

1. To understand the mechanisms driving climate and biodiversity change and the consequences of the climate and biodiversity crises, and to better understand past and present Earth systems and the interaction of human societies with the natural world.
2. To use this understanding to develop narrative and digital models of Earth and societal systems, and to use these models to forecast or explore potential future scenarios.
3. To develop integrated solutions to mitigate climate and biodiversity change.
4. To develop solutions to adapt to the consequences of biodiversity and climate change.

To make progress on national and international requirements for biodiversity and climate research over the next decade, we must expand our research ambition, funding, and capacity. Opportunities for an interdisciplinary, collaborative, solution-based approach to the crises include: turning bogs from carbon sources to carbon sinks, multi-purpose forest plantings, biodiverse grasslands, a livestock industry based on year-round grazing on permanent pasture, ailing water infrastructure, high coast-to-inland ratio, and extensive marine areas.

Solutions to challenges, and responses to opportunities, require engaged research to develop creative and just-research-based solutions together with their uptake and impact. Ireland presents an ideal opportunity because of its relatively small size and position in the North Atlantic, a region increasingly impacted by climate change, yet possessing an array of critical ecosystems shared with multiple jurisdictions. This provides a platform to demonstrate and test solutions that are globally relevant. The AICBRN aims to enable and direct the cross-jurisdictional collaboration and activity that places sustainability-based research on a globally relevant footing.

Although a range of exciting, innovative, and useful research programmes relevant to the climate and biodiversity crises are under way, these are currently funded via different mechanisms and schemes. Expertise, infrastructure, and capacity in relevant fields are separated by disciplinary boundaries and dispersed across multiple research-performing organisations. Research groups largely work apart, leading to redundancies and under-exploitation of the synergies required to solve large-scale research challenges. Funding models support short-term piecemeal research when they should support collaborative research to realise significant progress on ambitious objectives.

“ **Despite the unprecedented scale and urgency of the challenge in addressing the climate and biodiversity crises, we do not currently have a centralised or coordinated national capability in biodiversity and climate research.** ”

Multi-, inter-, and transdisciplinary approaches are necessary to develop the understandings that are needed to design systemic solutions through to practical application and social acceptance. Despite the unprecedented scale and urgency of the challenge in addressing the climate and biodiversity crises, we do not currently have a centralised or coordinated national capability in biodiversity and climate research.

There are several international models for building excellent national capability in climate and biodiversity research. One is the Helmholtz Earth and Environment research programme ‘Changing Earth – Sustaining our Future’. Helmholtz is Germany’s largest research organisation and operates a unified programme of research across seven Helmholtz Centres.

The Earth and Environment programme has an annual basic funding budget of ca. €525 million, which rises to €744m through the capture of additional third-party funds (Helmholtz, 2021). Given the disparity in population size between the island of Ireland (6.8 million) and Germany (83 million), this would be the equivalent of a €43m basic annual budget if a similar per capita level of investment was available across the island. In comparison, funding from the Environmental Protection Agency in Ireland in 2019 for new grants across all areas of environmental research was €10m (EPA, 2020) and comprised short-term grants to individual research groups or small consortia.

Other research funding organisations do not have dedicated biodiversity and climate research funding. This low level of funding for climate and biodiversity research is matched by a lack of coordination and collaboration between research groups. There is presently little incentive to work in

larger multi-, inter-, or transdisciplinary consortia on more ambitious projects that address the challenges at appropriate scales.

Conclusion

An all-island research capability in climate and biodiversity research is needed to capitalise on the opportunities brought about by a shift to a more sustainable economy. There is a first-mover advantage in developing and rolling out solutions, particularly for industries and businesses that need local-context-dependent solutions to decarbonisation and biodiversity conservation and restoration.

Both jurisdictions have relatively unique sectoral structures, with strong reliance on natural-capital-intensive industries (agriculture, tourism, marine) and a long and shared history of human-modified landscapes, presenting globally unique challenges. The island's marine resources are important economically, politically, and as a source of solutions to the climate and biodiversity crises.

The next decades will see unprecedented changes to the world's socio-economic and environmental systems. It is clear we need to switch to a green-knowledge-based economy, and researchers throughout Ireland must respond to emerging knowledge needs. The research sector, like others, needs to change business models, invent new ways of operating, and find new opportunities for sustainable development. Research across the island has the potential to underpin our shared economic, social, and environmental transitions in a way that is globally relevant.

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Peter Brown, Director of the Irish Research Council (IRC), with the winners of the IRC Researcher of the Year Award: Professor Yvonne Buckley and Dr Kathy Ruddy Trinity College Dublin, and Professor Michelle Norris University College Dublin.