The All-Island Climate and Biodiversity Research Network

Leveraging Ireland's R&D for Successfully Tackling the Climate and Biodiversity Emergency

Executive summary

- The climate and biodiversity emergency is a massively complicated challenge that requires an unprecedented diverse, yet integrated, range of solutions from all sectors of society.
- There are shared drivers, important feedbacks between, and solutions for, the climate and biodiversity systems that require them to be tackled together.
- A wide range of global, EU and national policies and action plans require rapid progress towards climate neutrality, reduced greenhouse gas emissions and the halting of ecosystem degradation and biodiversity loss.
- A massive research and innovation effort is required to meet the ambitions of the governments, to ensure the solutions are strongly evidence-based and to provide maximum benefits for the lowest possible cost.
- Most of the building blocks to understand climate science, to solve the societal challenges of mitigating climate change while also adapting to committed changes and to protect and restore biodiversity already exist in Ireland across academia, the public sector and industry.
- Current research efforts are insufficiently funded and are dispersed across a number of teams working apart leading to redundancy of effort and under-exploitation of synergies.
- The All-Island Climate and Biodiversity Research Network (AICBRN) brings together researchers from a wide range of disciplines across the island of Ireland who are undertaking research in climate and biodiversity topics.
- The network can address key challenges in climate science, climate mitigation, climate adaptation, biodiversity change and just societal transition if resourced sufficiently.
- The ambition of the AICBRN is to develop a large-scale research and innovation initiative to improve public good policy and management decisions, underpin business and enterprise strategies and strengthen societal capacity to address the climate and biodiversity emergencies.
- Co-creation of research with decision makers, citizens, communities and business can deliver economic activity and jobs, increase public literacy on climate and biodiversity as well as societal engagement on climate change and biodiversity and also improve quality of life for citizens.
- This climate and biodiversity research initiative will require substantial and sustained new funding support to deliver innovative science and solutions at scale arising from interdisciplinary and inter-institutional collaboration.
- New funding could support a range of different programmes and schemes. A minimum of €10 million of new research expenditure per year for at least 10 years if required to adequately address the current challenges.
- Without this initiative, Ireland risks facing irreversible environmental damage and significant costs associated with remaining at the wrong end of league tables in Europe in climate and biodiversity action.

Introduction

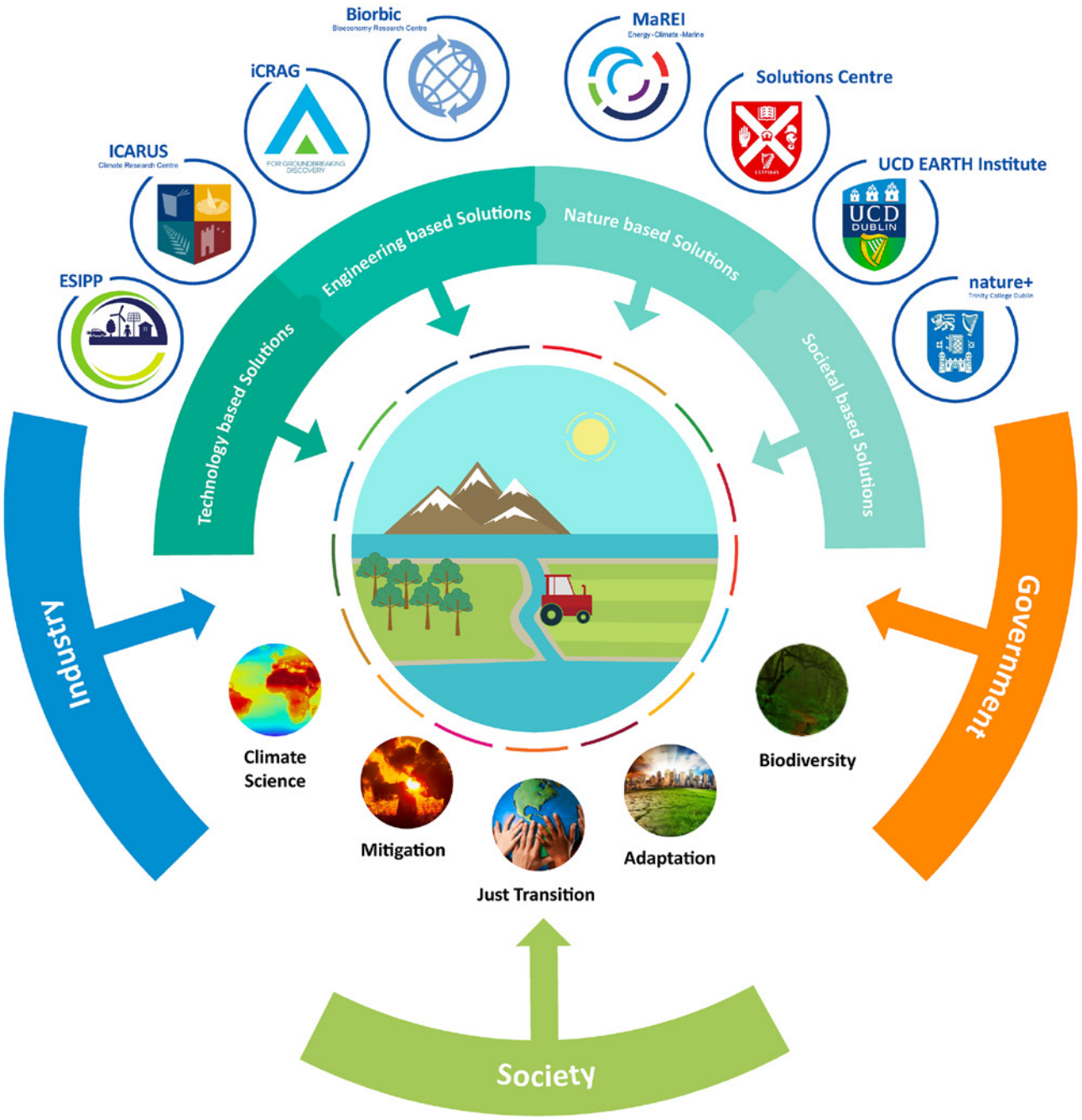
According to the Intergovernmental Panel on Climate Change, "Climate change is unequivocal" and "human influence is clear". The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services has highlighted that "Nature and its vital contributions to people, which together embody biodiversity and ecosystem functions and services, are deteriorating worldwide" (IPBES report).

Drivers of climate and biodiversity deterioration have accelerated over the past 50 years. The world's current trajectory is unsustainable and will lead to existential crises in some parts of the globe and severe impacts for health, wellbeing, economic sustainability and governance everywhere. The climate and biodiversity crises provide significant challenges, as well as opportunities, for developing sustainable solutions to maintain and enhance climate and ecosystem services as well as economic sustainability & wellbeing. These challenges and opportunities cut across many sectors of our economy and society.

In Ireland, the direct effects of climate change and biodiversity deterioration are being, and will continue to be, felt through rising sea levels, coastal erosion, changes in seasonality for agriculture, increasing threats to fragile wetland ecosystems from climate and pressure for increased agricultural land among others. While much work is being done internationally, we need to urgently develop radical responses to the climate and biodiversity crises that are tailored to our particular situation. Ireland has unique vulnerabilities and opportunities due to our economic reliance on agriculture, ICT, and tourism, our significant marine area, and our coming reliance on offshore wind energy.

The recent IPCC Special Report on the Paris Agreement 1.5C goal concluded that to stay below 1.5C globally requires emissions to halve by 2030 and reach net zero no later than 2050. Switching to carbon neutral energy alone will not be sufficient to meet our goals and the Island must also address methane (CH_4) and nitrous oxide (N_2O) emissions. As it is unlikely that agriculture and waste treatment will be climate neutral, Ireland will need to adopt more aggressive capture and storage options biologically and/or geologically.

The All-Island Climate and Biodiversity Research Network (AICBRN) brings together researchers from across the island of Ireland who are undertaking research in the climate and biodiversity fields. The diversity of disciplinarity and expertise of members across the physical, natural and social sciences, engineering, and humanities enables this network to cooperatively undertake the essential fundamental and challenge-based research required for Ireland to successfully address the climate and biodiversity emergency. The network was instigated in late 2019 and the concept has been developed by an initial core group from across institutions north and south. The network is intended to be inclusive in nature and substantial efforts to expand membership are underway and planned to continue into the future.


Biorbic
Bioeconomy Research Centre
MaREI
Energy - Climate - Marine
iCRAG
FOR GROUNDBREAKING DISCOVERY
Solutions Centre
ICARUS
Climate Research Centre
UCD EARTH Institute
UCD DUBLIN
ESIPP
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Trinity College Dublin
Engineering based Solutions
Nature based Solutions
Technology based Solutions
Societal based Solutions
Industry
Government
Climate Science
Biodiversity
Mitigation
Adaptation
Just Transition
Society

Policy context

Global, EU and national policies and action plans (Paris Agreement, EU biodiversity strategy, EU Green Deal, Farm to Fork Strategy, Climate Action Plan, Common Agricultural Policy (CAP), Common Fisheries Policy, CFP, Programme for Government, New Decade New Approach) all point to the need to become carbon neutral, reduce GHGs and improve biodiversity. All policies aim for increased sustainable jobs, improved quality of life, regional and rural development. There is the potential for policy initiatives to change sectors from being part of the problem to part of the solution (e.g. Green Deal, CAP). Ireland has a unique set of challenges that require bespoke policies (and thus scientific evidence). Including scientific evidence to inform policy has led to many positive outcomes to date. Examples include climate monitoring, better water quality, better characterisation of building materials reducing hazards, costs and environmental impacts from iCRAG, low carbon energy roadmap from MaREI underpinning Climate Action legislation, Agriculture MACC from Teagasc informing Climate Action Plan, MaREI Climate Ireland research informing National Climate Adaptation Plan, Nature+ pollinator research underpinning the All Ireland Pollinator Plan, development of the CAP4Nature ecological evidence base to inform the future of the Common Agricultural Policy in Ireland.

Policy makers need appropriate information communicated to them in an effective manner to make improved and better informed policy decisions. The network will develop new approaches to build capacity - through joint researcher / civil servant workshops and training, improved communication of policy insights from research results by researchers, secondments of researchers to Government Departments, secondments of civil servants to the network and identification of areas where new talent should be drawn from outside Ireland. Policy-relevant information from R&D can aid policymakers to create new opportunities, identify how the island of Ireland can achieve a competitive edge, and avoid decisions that may have unintended negative impacts with regards to climate and biodiversity.

The all island approach adopted by the network is timely. Climate change is a major issue for both governments and requires all island solutions. The ambitions of the Paris Agreement on Climate Action of the EU Green Deal are reflected in both the Northern Ireland Executive 'New Decade, New Approach' agreement and in the Republic of Ireland Programme for Government. The Northern Ireland Executive commits to tackle climate change head on with a strategy to address the immediate and longer term impacts of climate change, while the Programme for Government includes a Green New Deal Mission and commits to a 51% reduction in GHG emissions by 2030. Both policy documents also commit to increased all-island research collaboration and highlight the benefits of this in particular in the context of Brexit. The strength of our existing all island network across academia, the public sector and industry offers opportunities to lead the way as an example of EU and UK collaboration post-Brexit.

Putting the pieces together - building on existing capacities

The climate and biodiversity emergency is a hugely complicated challenge that requires a diverse range of solutions from across all sectors of society. A massive research and innovation effort is required to ensure the solutions are strongly evidence-based and will deliver maximum benefits. Ireland contains a number of critical ecosystems, including grasslands, forests, wetlands, peatlands, agricultural lands, and both freshwater and marine habitats, which present both challenges and opportunities for the maintenance of ecosystem services and support of industries in a rapidly changing climate. Most of the building blocks to understand climate science, to solve the societal challenges of mitigating climate change while also adapting to change and to improve biodiversity already exist in Ireland across academia, the public sector and industry (e.g. New Horizons for Nature 2019). However, the glue to bring these elements together is currently lacking. There is a significant opportunity to bring together the many high-quality researchers working in this space across the island of Ireland in a co-ordinated and cohesive way to address these problems. Currently these pieces are to often separated into relatively small groups working apart, leading to both redundancy of effort and under-exploitation of synergies. The result is competitive rather than cooperative research, driven in part by funding models that support short-term piecemeal research. A more joined up approach could lead to a longer term, more sustainable solutions with the potential for more effective spending of research funds.

Knitting together the network of researchers from across Ireland can optimise existing research investments, identify critically needed infrastructure, and develop teams capable of not only addressing the challenges but becoming more successful in securing research funding, including both European and industrial funding adding further value. A more collaborative approach will also help to identify true gaps in our existing expertise and capability and enable these to be filled. Collaborative research is crucial for both critical Irish industries - intelligent efficiency, renewable energy, IT, agriculture, raw materials, tourism, health, and marine resources - as well as ecosystems which support both economic and public goods. Ireland has unique challenges and opportunities for development and deployment of interdisciplinary and collaborative solution-based approaches, such as turning bogs from carbon sources to carbon sinks, minimizing the carbon footprint of close to year round grazed permanent pasture, restoring multiple benefits from biodiversity in different land uses and securing the necessary water resources for agriculture, industry and personal use while also constructing a sustainable water infrastructure. Many such solutions once developed and proven can be exported internationally.

AICBRN draws from and builds upon current research capabilities in the areas of climate science, climate mitigation, climate adaptation, biodiversity, nature-based solutions, knowledge exchange and just societal transitions in Ireland. However, AICBRN as an informal network of collaborating researchers is not currently sufficient to address the many facets of all these challenges. This paper outlines an aspiration to identify the opportunities for greater collaboration and integration within AICBRN. It also highlights the strengths of shared values and goals in addressing the key issues and the risks of missing this opportunity.

Stronger together - the whole is greater than the sum of the parts

The All-Island Climate and Biodiversity Research Network was established in 2019 to address research questions that cannot be answered individually by existing research centres or groups. Addressing and ultimately solving Ireland's biodiversity and climate crises requires targeted research and innovation built upon integration of a broad array of disciplines, including individuals and existing research groups from academia, the public sector, and other sectors of society. Climate and biodiversity are two sides of the same coin. They need to be analysed, monitored, and managed together if we are to deliver an Ireland to future generations that is at least as good as the one we ourselves inherited, and preferably one that is better. No one discipline or institution can do this alone and it will require sustained support.

The AICBRN aims to develop a large-scale research initiative to provide data and know-how necessary for underpinning policy decisions, industry strategies and opportunities with a direct benefit to society. Together, the research we undertake will:

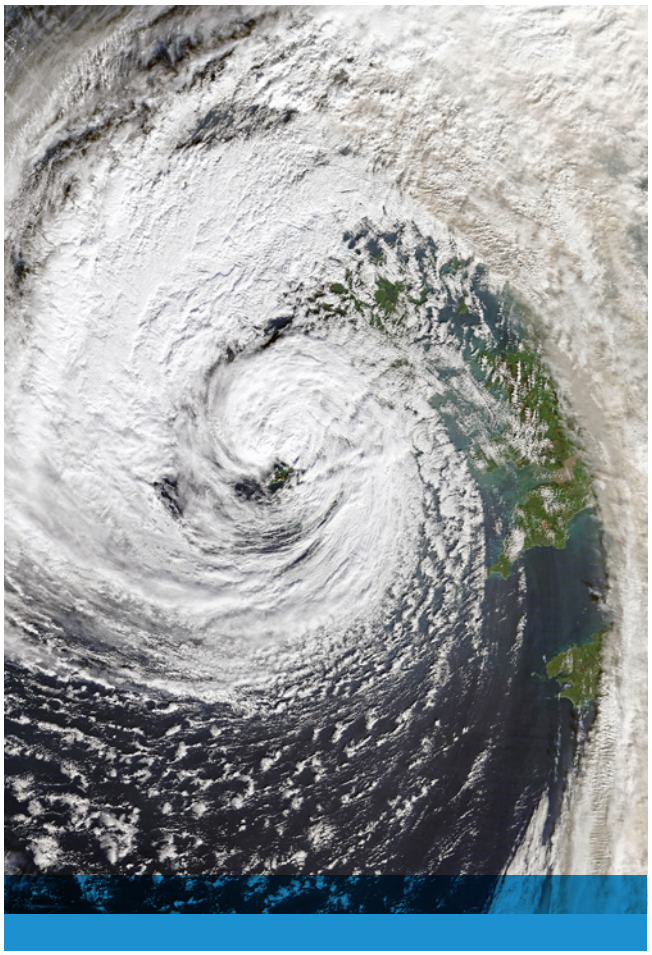
- Provide the knowledge base required to maintain and enhance the existing services that climate and ecosystems provide Irish society;
- Strengthen the capacity of individuals, communities, businesses, civil society and governments across the island of Ireland to mitigate and adapt to the climate and biodiversity crises; and
- Ensure Ireland is able to accurately monitor the effects of climate change on biodiversity and the environment and integrate the results into broader European and global models and databases.

In order to achieve these goals, the AICBRN will establish a research ecosystem that builds on the existing strengths of the members' diverse backgrounds, encouraging both inter- and trans-disciplinary approaches involving for example engineers, physical, mathematical, biological and environmental scientists, social scientists, humanities and allied disciplines. We will establish new, and strengthen existing, collaborations between institutions and across jurisdictions, with a particular focus on an all-island approach. We envisage the network enabling research on shared challenges, leading large Horizon Europe challenge-based projects and collaborations with the UK (N/S and E/W), development of large joint infrastructure platforms on the island and engagement with government, industry and society to develop evidence-based options for addressing and solving the climate and biodiversity challenges.

Network aims and objectives

The AICBRN will help spur development of innovative and transformative solutions to contribute to the mitigation obligations that government, society and industry have committed to. Ireland needs to undertake ongoing adaptation responses to equip industry, agriculture and society with the needed responses to changing drivers and pressures. The direct effects of climate and biodiversity change need adaptation solutions and the indirect effects, our mitigation and adaptation options, will also need responsive action. A national coordinated research effort is required to address these challenges.

The fundamental need is for an integrated interdisciplinary ecosystem of researchers and institutions capable of developing and supporting uptake of innovative evidence-based solutions to climate and biodiversity challenges. By working across institutions, jurisdictions on the island of Ireland and across disciplines we can tackle problems at the scale needed for transformative change. A small example of how effective this can be has been provided by the R&D response to the COVID-19 crisis from across the Irish research community.



Climate Science challenges

That Ireland is warming along with the rest of the world and that humans are responsible is clear and unambiguous. There is, however, much more to climate science in service to society than these basic facts.

Improved monitoring and analysis of historical records. Both adaptation and mitigation can only be effective if there is a robust understanding of the climate system and its changes across the island of Ireland at both regional and local scales. The network will improve monitoring capabilities and renew efforts to recover and share records of already observed changes. These data will then be analysed to underpin action by government, industry and society.

Better understanding of changes in the deep past. There is a need to better identify and exploit available palaeo climate information from across the island of Ireland. Of key interest are signals related to prior high sea level stands in previous interglacials and the Mid-Pleistocene Warm Period. We know that sea-level rise is a multi-millennial process and the network will seek to understand what the long-term committed change is so that we can adapt appropriately across a range of timescales.

Quantification of uncertainty in projections. The network can undertake substantially improved modelling of past and possible future climates using Earth System Models such as EC-EARTH and regional models. To ensure optimal decision making under uncertainty it is essential that we fully sample the range of possible future states arising both from choice of emissions pathways moving forwards (emissions scenarios) and model uncertainty. This requires developing large ensembles and use of statistical emulators.

Elucidating the role of variability. While the long-term climate trajectory is determined by external forcings, our short-term trajectory is set by internal climate variability. The network will improve understanding of the role of the North Atlantic and its variability to inform planning on seasonal to decadal timescales. This will require a combination of long-term monitoring and modelling work.

Climate Adaptation challenges

Climate change will have wide-ranging effects on all aspects of Ireland's society, environment and economy. This is particularly the case for Ireland's urban areas that are located on the coast and are at risk from sea level rise and extreme weather events. These areas are considered to be at particular risk (e.g. flooding, droughts and excess heat) because of processes of urbanisation. With urbanisation set to continue and intensify in terms of both density and extent, planned adaptation of these areas is now a priority.

Modelling uncertainty is a key focus of the network planned research activity - this includes uncertainty regarding the exposure to and impacts of climate change, but also the vulnerability and instigating and propagating a robust framework for decision making under uncertainty in our adaptation planning work nationally. A key part of this will be better understanding of how society understands and reacts to uncertainty.

Quantifying and improving resilience of infrastructure to climate change including decision support schemes for structural systems and cheaper and quicker means to identify hazards to infrastructure.

Modelling and forecasting of storm surges. This requires increasing the earth, ocean, and atmosphere observations (including from MACE Head), remote observations and In-situ observations.

Development of (Marine, Surface, Airborne) Service and SAR Robotics technology capability for operations in more severe weather conditions.

Improve flood risk assessment and management due to climate change including automated early flood warning systems and inland and coastal flood management using nature-based solutions.

Adapting to changes in critical ecosystem services provided by plant and animal populations due to altered weather patterns and climate, including for food production, parasite regulation, nutrient cycling and cultural services.

Climate Mitigation challenges

The scale of the short-term mitigation challenge is immense. The UN Environment Programme Emissions Gap Report 2019 concludes that global greenhouse gas emissions need to be 55 per cent lower than 2018 levels by 2030 to put the world on the least-cost pathway to limiting global warming to below 1.5°C. The research undertaken by this network will focus on the challenges facing Ireland and the opportunities for Ireland arising from climate mitigation. It will focus on the adoption of existing solutions as well as the development of new solutions.

Intelligent efficiency. Significant reductions in emissions can be achieved by improving the efficiency of processes associated with manufacturing, warming our homes and moving people and goods. The network will focus research on the urgent need for deep retrofitting of buildings, more efficient transportation systems and lean manufacturing processes including the raw materials required to accomplish these goals.

Electric heating and transport. The network will focus on addressing the challenges associated with increased electric vehicle deployment and charging, replacing oil and solid fuel heating with heat-pumps in buildings and ensuring the increased electricity usage from data centres will be delivered with zero emissions.

Renewable energy. Ireland has a huge untapped off-shore wind energy resource and a target to achieve 70% renewable share of electricity by 2030. The network will focus on the role of interconnection, batteries, hydrogen and smart grids and explore and develop solutions for the monitoring and mitigation of biodiversity impacts of installations. Renewable gaseous fuels including biogas, biomethane and hydrogen have great potential for mitigation in key sectors such as agriculture, food and beverage and freight transport. The network will focus on technologies such as anaerobic digestion, gasification, pyrolysis and power to gas systems and sustainable solutions that fit into circular bioeconomy processes and consider multiple ecosystem services (water quality, pollination services, biodiversity support). Renewable liquid fuels including hydrotreated vegetable oil and biokerosene represent a key opportunity for key sectors including aviation, shipping and long distance haulage. Geothermal energy for heating/cooling and possibly for electricity generation can play an important role in meeting Ireland's energy and GHG reduction needs. The network will focus on identifying the resources, technologies, and government policies required for this clean energy source to become a significant player.

Negative emissions solutions form an essential part of the solution space to achieving net zero emissions by 2050. Research will focus on carbon capture and storage technologies both geologically and through changing agricultural practices, direct air capture technologies and nature-based solutions including bog rewetting, soil organic carbon, forestry, permanent pasture and blue carbon.

Field to fork. Agriculture, land use and land use management provide very distinct opportunities and challenges. The network will focus on technical and nature-based solutions to belching cattle, slurry storage, production of grains, biofertiliser, operation of dairies, distilleries, and biorefineries, in addition to linking natural capital (incl. biodiversity) to the services provided (pollination for better quality food products, water quality, etc.).

Biodiversity challenges

The biodiversity crisis presents a fundamental threat to society and requires urgent action. There is widespread species decline in marine, terrestrial and freshwater habitats at local, national and global scales. Loss of species and degradation of habitats and ecosystems threaten the spectrum of ecosystem services upon which we depend, such as regulation of climate and water quality and provision of food, raw materials and environments for recreation, health and cultural enrichment. There is a real risk that badly damaged ecosystems will not fully recover without timely restoration interventions.

Prevent loss of biodiversity. A wide range of conservation measures have been used to mitigate against drivers of biodiversity loss with mixed success. The network will review conservation interventions and their outcomes, as well as the social processes that hindered/supported their success, and so provide the evidence base to help restore degraded ecosystems and put in place effective management and nature-based solutions. In the process we will identify gaps in our evidence base that can be targeted with resources through the network.

Understand and protect natural capital and ecosystem services. Research is required to fully understand the links between biodiversity, ecosystem services, and the benefits provided to different sectors of society so that we can better manage human activities to the benefit of our overall prosperity and well-being under climate change. The network will work with the Irish Forum on Natural Capital to coordinate research to enable the efficient and effective combination of multiple disciplines needed to improve understanding and decision-support by the diverse actors in this space.

Engineer resilience into ecosystems. Ecological resilience is the capacity of systems to absorb, adapt to and recover from perturbations of all kinds. Resilience is often reduced in degraded ecosystems and further damage can cause irreversible declines. The network will focus on quantifying and understanding the fundamental processes that underpin resilience and establishing management interventions that promote resilient systems and are accepted by the relevant stakeholders.

Restore degraded ecosystems. Many ecosystems have been degraded beyond the capacity of the system to repair itself in a time frame which will reinstate critical ecosystem services. Active restoration techniques are needed to re-establish lost species, functions and structure. The network will address in-demand challenges such as the optimal goals, locations and techniques for ecosystem restoration.

Just societal transition challenges

The climate and biodiversity crises will not be addressed unless the solutions are accepted across the whole of society, including citizens, communities, businesses, politicians, public bodies and institutions. The network researchers will co-create solutions with industry and policy partners but will also have a specific focus on engaging with citizens and communities, primary producers and consumers, building on the success of recent initiatives like the Dingle Peninsula 2030 project and several EU-funded multi-actor projects. There will be a strong dual focus on engaged research and citizen engagement.

Societal engagement on climate and biodiversity action. The network will undertake transdisciplinary research with citizens and communities to co-develop new deliberative methods for engaging citizens in climate and biodiversity action exploring topics including distributive, procedural and restorative climate justice.

Societal capacity and infrastructure. The network will undertake research on how response capacity and the capacity for transformation are built and developed within communities, including a focus on understanding social processes and actors including innovation intermediaries, political leaders, local champions, culture and leadership.

Deep institutional innovation. The network will focus on a critique and reimagining of the major social institutions in society – economics, democracy, religion, technology, gender and higher education – and the development of principles, visions and imaginaries for guiding how the climate and biodiversity crises can be addressed.

Just Transition. The network will explore the many dimensions of what constitutes a just transition, including distributive, procedural and restorative justice, avoiding unequally distributed costs and outcomes from the restructuring of the relevant industries and top-down and bottom-up approaches for including and engaging with workers and communities at an early stage of long term planning.

Increasing public literacy and science communication on climate and biodiversity. The network will have a strong focus on engaging with citizens and communities in addition to engaging with the business and policy communities. In addition to outreach activities and translating the research findings into accessible insights, the engagement will focus on conversations rather than presentations and dialogue rather than lectures, i.e. knowledge exchange.

Impacts and outcomes of the AICBRN

The AICBRN can have far reaching impacts and outcomes. The AICBRN can help to ensure that scarce government funds are spent wisely, ensuring the least duplication of research effort, optimal usage of existing analytical facilities, and encouraging collaboration for the best outcome. A broad network enhances leveraging of funding from multiple sources to the greatest extent possible. The network's diverse membership can aid in informing future research funding priorities. An integrated North-South research effort should allow Irish institutions to be more successful in research calls from both the EU or the UK.

The network can provide a structure to enable direct access to high quality evidence-based advice to underpin policy on climate and biodiversity. This assertion is based on an all-island directory of expertise and identified contact-points for specific topics and disciplinary perspectives and a programme of engagement between researchers, policy makers and existing advisory bodies, such as NESC. The network will enable improved knowledge exchange between researchers and policy makers comprising joint researcher / civil servant workshops and training, improved communication by researchers of policy insights from research results, secondments of researchers to Government Departments and secondments of civil servants to the network. This will build on existing examples from network members and lead to improved policy decisions on climate and biodiversity, higher societal benefits, improved dialogue and mutual understanding and more efficient and effective incorporation of emerging evidence into climate and biodiversity policy development, drawing on the full range of relevant expertise on the island of Ireland.

The network will provide improved and accessible decision support for planners and environmental decision makers at state and local levels, integrating biodiversity and climate science with social, economic and cultural perspectives. This is based on interdisciplinary research combining scientists, social scientists and humanities researchers working closely with stakeholders and end-users which will lead to evidence-based environmental decision making that takes better account of the full range of consequences of decisions from environmental, economic, social and cultural perspectives, and is therefore more likely to be effective in achieving desired outcomes.

There will be ever increasing potential through time for company strategies to take advantage of opportunities arising from climate action, biodiversity and natural capital accounting. Striving to meet climate goals should result in new business models and job opportunities in the green economy. This will lead to increased economic activity in sustainable energy, climate services and biodiversity services and increased social enterprise and social innovation. It will underpin the sustainability of our indigenous primary production sectors of agriculture, forestry and the marine.

As the network establishes itself, we envisage Ireland becoming a leader in international integrated climate and biodiversity research. Through highly cited research papers and success on EU Research proposals Ireland would become a centre of gravity for climate and biodiversity research and provide leadership in international networks and organisations.

The most impactful aspect of the network is the benefit to society. Through co-creation of research with citizens, communities and business, there will be an increased public literacy on climate and biodiversity and increased societal engagement on climate change and biodiversity. It will lead to an improved quality of life for citizens (e.g. through increased opportunity to engage with nature), physical health benefits (e.g. through reduced air pollution), improved mental well-being (e.g. through increased active travel and reduced congestion) and reduced inequality (e.g. through reductions in energy poverty achieved via retrofitting).

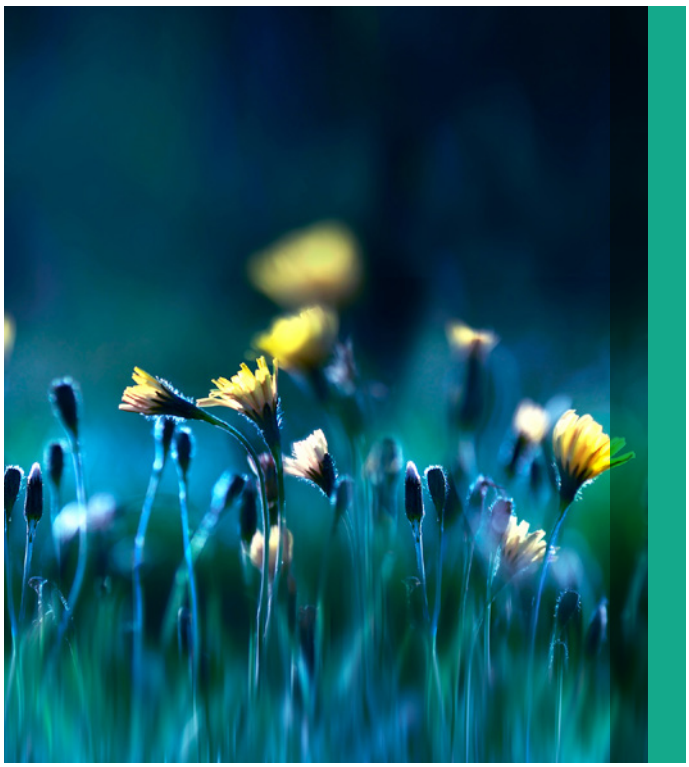
Added value of the network

Going forward Ireland can follow one of three broad scenarios with regards biodiversity and climate research:

Status Quo: Currently the wide range of biodiversity and climate researchers are not well integrated and operate largely in a non-collaborative manner. There is competition between different groups, research centres, organisations, and individuals for fragmented and inadequate funding. This may be resulting in smaller, less competitive and less impactful projects and bids that often lack the involvement of planning policy makers and community.

Limited improved collaboration: More recently we are moving towards developing networks and more collaboration, however, true collaboration is still limited. We do not have a robust understanding of all the potential players in biodiversity and climate research on the Island and there are no sustained or substantive mechanisms for funding truly integrative, collaborative research involving a multiplicity of researchers or research groups.

Sustained collaboration: To take full advantage of Ireland's capabilities we need to move to a fully collaborative approach that utilises all the expertise on the island of Ireland and works to develop new expertise where needed. Funding mechanisms for truly integrative, collaborative research involving a multiplicity of researchers or research groups will need to be developed. Sustained funding will be required to retain and recruit high quality researchers which allow us to monitor and provide sustained high quality advice to policy makers, government and society. Several international exemplars exist which could be used as a blueprint for what a sustained public-good funding multi-institute research centre that leverages both EU and other funding sources in this space could look like including the Tyndall Centre in the UK, Helmholtz Centre for Environmental Research in Germany and the Bjerknes Centre in Norway.



Funding supports

In order to achieve the vision and objectives that are described in this document, sustained public funding is required to create a sustainable collaborative research model across institutions and across disciplines. Several national funders (including SFI, DAFM, Teagasc, EPA, Marine Institute, GSI, DAERA, UKRI, Inland Fisheries Ireland, Loughs Agency) view climate research as a priority, as recognised by the theme of Energy, Climate Action and Sustainability in the National Research Priority Areas 2018-2023.

The optimal solution that would enable the required step change would be a significant realignment and augmentation of existing funding streams in this area both north and south away from short-term competitive calls to a long-term sustained funding program that facilitates and encourages the required collaboration on an all-island basis and on an ongoing basis. This would need to be underpinned by robust governance that assure that institutional independence was retained and that the distribution of support was equitable across the range of institutions and bodies active in this space. It would also need to ensure synergies with existing funded efforts such as SFI research centres. Such public funding would support the ability to monitor, understand and predict changes in the climate system and biodiversity and their impacts on a sustained basis. Existing similar efforts as discussed in the prior section show the benefits that can accrue from such a funding model. Such an effort would benefit from a range of funding supports which might include an appropriate mixture of the following:

- **Network-wide Doctoral Training Programme:** A structured training programme to underpin infrastructure grants and synthesis groups.
- **Postdoctoral Fellows Scheme:** A fellowship scheme aligned with key identified challenges - senior independent fellows (>5 years post PhD).
- **Infrastructure grants:** Funding novel interdisciplinary projects on joint infrastructures enabling fundamental and applied interdisciplinary projects using existing infrastructural platforms and community projects/platforms and data.
- **Synthesis Groups:** Horizon scanning, Innovation and Evidence groups, Fundamental Science groups, with aligned Fellows, Postdoctoral Researchers and visiting sabbaticals.
- **Visiting Professorship programme:** A program of visiting sabbaticals aligned with working group activities and infrastructure projects and bridging one or more of the themes.
- **Targeted recruitment and retention:** Recruitment and long-term retention of senior researchers to build and sustain national capabilities.
- **Visiting Researcher programme:** International Early Career Researcher focused, e.g. PhD and Postdoc levels focused on collaboration within working groups or availing of physical infrastructure or data.
- **NGO Outreach projects:** Mechanism to facilitate NGO involvement and engagement.

An indicative budget to provide an idea of scope would be as detailed below. This would clearly be subject to revision. An initial commitment of 10-years would be warranted given the scale of the challenges we are facing.

REQUESTED BUDGET (10 YEARS)			
Staff	Description	Per Year	Total
3 x Research Professorships	Create strategically relevant, timely and critically needed posts in the Climate & Biodiversity areas which will be filled by world-class researchers to support national strategic priorities on an All Island basis & assist research bodies in the recruitment of world-leading researchers for Professorial Chairs.	€3m	€30m
50 x Research Fellows	Create an All Island fellowship scheme designed to develop scientific leadership among the most promising early-career Climate & Biodiversity scientists, by giving all fellows up to 10 years' support through a performance-based approach, which will allow them sufficient time to develop their research programmes, gain international recognition, secure ERC awards and EU and International funding.	€4m	€40m
All Island Centre for Research Training (120 x PhD Students)	The CRT PhD programme will provide cohort-based world-class doctoral training covering a wide range of fields in the Climate & Biodiversity areas through inter-/multidisciplinary training programme and cultivate and maintain positive research and development collaborations on an All Island approach.	€2m	€20m
Infrastructure	To provide research groups in the Network with cutting edge infrastructure for the performance of high quality, impactful and innovative research.	€0.5m	€5m
Operations & Management	To provide central running costs of the Network including operational and financial management, governance, communications and public engagement.	€0.5m	€5m
Total		**€10m**	**€100m**

Concluding remarks

In summary, the island of Ireland faces significant challenges and vulnerabilities with respect to climate change and biodiversity. However, Ireland, by virtue of its size and close interconnections between marine and land-use, communities and industries, also provides an excellent platform to trial solutions to address the climate change and biodiversity crises that could become a showcase for an interdisciplinary collaborative solution-based approach which could be adopted globally. The island of Ireland has the potential to assume a leadership role exporting many of the solutions required to address these twin challenges.

The AICBRN is in a unique position to further bring together academia, government and industry from across the island of Ireland to be a strategic and accountable voice for evidence-based solutions for Climate and Biodiversity.

Authors

Prof. Peter Thorne
Director – Irish Climate Analysis and Research UnitS group (ICARUS)
peter.thorne@mu.ie

Prof. Murray Hitzman
Director – Irish Centre for Research in Applied Geoscience (iCRAG)
murray.hitzman@ucd.ie

Prof. Brian Ó Gallachóir
Director – MaREI Centre for Energy, Climate and Marine
b.ogallachoir@ucc.ie

Prof. Jerry Murphy
Director – MaREI Centre for Energy, Climate and Marine
jerry.murphy@ucc.ie

Prof. Yvonne Buckley
co-Director Nature+:
Trinity Centre for Biodiversity & Sustainable Nature-based Solutions
Trinity College Dublin
BUCKLEYY@tcd.ie

Prof. Jennifer McKinley
Director of Research: Environmental Change and Resilience. Director of Centre for GIS & Geomatics, School of Natural and Built Environment
j.mckinley@qub.ac.uk

Prof. Andrew Keane
Director – Energy Systems Integration Partnership Programme
UCD Energy Institute
Andrew.keane@ucd.ie

Prof. Kevin O'Connor
Director – BiOrbic SFI Bioeconomy Research Centre, UCD
kevin.oconnor@ucd.ie

Prof. Tasman Crowe
Director – UCD Earth Institute
tasman.crowe@ucd.ie

Prof. David Rooney
Director of The Bryden Centre
d.rooney@qub.ac.uk

Prof. Mark Emmerson
Director of Research –
School of Biological Sciences
Institute for Global Food Security
m.emmerson@qub.ac.uk

The All-Island Climate and Biodiversity Research Network