



Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil



EPA Research Programme 2021-2030 EPA Research Call 2021 – Technical Description Document

May 2021 – Version 2 (25/05/2021)

The EPA Research Programme is a Government of Ireland initiative funded by the Department of the Environment, Climate and Communications.



Summary of Changes

The hyperlinks linking to the EPA website have been updated due to the launch of the new EPA website on the 25th May 2021

Correction:

Page 11: “NE-Topic-5: Water quality improvements arising from the enhanced restoration” replaced by: “Protecting and Restoring our Natural Environment 2021 Call Topic 5”

EPA Research Call 2021

This document provides the Technical Description for the Environmental Protection Agency (EPA) Research Call 2021. Applicants should read the following carefully and consult the other documentation provided (e.g. 2021 Guidelines and Terms & Conditions).

Important: The new EPA website will be launched in late May/early June 2021. This will affect all www.epa.ie hyperlinks included in this document. The EPA Research Call 2021 documentation will be re-published with amended hyperlinks on the new EPA website.

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Introduction

EPA Research 2030¹ is the ten-year high-level framework for the EPA's research programme (2021-2030), designed to be agile, responsive and flexible. EPA-funded research is essential to:

- Supporting the monitoring, assessment, reporting and regulatory activities of the EPA.
- Generating evidence crucial in assisting Ireland in meeting its commitments and requirements under the various international, EU and national policies and strategies.
- Generating the evidence base that supports decision making, behaviour change and policy development.
- Addressing knowledge gaps, providing the evidence-base and responding to priority challenges.
- Supporting multi-disciplinary, cross-sectoral and multi-stakeholder partnership projects.
- Developing environmental research capacity in Ireland, recognising the importance of not only sustaining the research-base but also of building and training the researchers in specific areas.

Environmental policies must be underpinned by an in-depth level of knowledge that needs to be delivered through a systematic programme of environmental research and assessment. Research can play an important role by generating evidence that will support the design and implementation of effective and robust policy, evaluate its outcomes, and demonstrate its value. EPA Research 2030 will further our understanding of our environmental and natural systems. It will enable the outcomes from research to be put in action to protect and improve our natural and built environment.

Thematic Research Approach

EPA Research 2030 thematic structure comprises four interconnected hubs that bring an integrated and cross-sectoral approach, enabling holistic management and protection of our environment.

Addressing Climate Change Evidence Needs

Climate change is already having an impact in Ireland, and strong mitigation and adaptation measures are needed. Research is essential in providing the evidence necessary to improve our knowledge systems and inform policy decisions that will advance our ambitions to be carbon neutral and resilient to climate disruption.

Facilitating a Green and Circular Economy

Environmental and sustainability challenges are inextricably linked to economic activities and lifestyles. Research under this hub will contribute to the mainstreaming of sustainable management of natural resources and waste, unlocking the potential of the circular and bio-economies, and boosting competitiveness, through resource efficiency and deployment of innovative technologies and solutions.

¹ <https://www.epa.ie/our-services/research/epa-research-2030/>

Delivering a Healthy Environment

A clean, vibrant and safe environment is a prerequisite for good health and wellbeing. Environmental degradation, pollution, as well as known and emerging substances of concern threaten our health and that of our supporting ecosystems. Research under this hub will contribute to understanding the risks and benefits, and to identifying appropriate policy and behavioural responses.

Protecting and Restoring our Natural Environment

Our natural environment provides us with clean air and water, food and the raw materials to sustain us and our economy. Research is required to inform and support a cross-sectoral approach to managing our natural environment and for the development of policies relating to the regulation of emissions and activities, and the protection of our water, land, and ecosystems.

Funding Structure

Proposals can be Desk Studies, Medium Scale Projects, Large Scale Projects or Research Fellowships:

Desk Studies will typically last from 9 to 12 months with an indicative cost of up to €100,000

Medium Scale Projects will typically last from 24 to 36 months, with an indicative cost of up to €350,000

Large Scale Projects will typically last from 36-48 months, with an indicative cost of up to €1,000,000

Research Fellowships will typically last from 24-36 months, with an indicative cost of up to €300,000

Co-funding and Partnerships

The EPA is pleased to announce that the EPA Research Call 2021 involves co-funding partnerships with the following organisations:



**An Roinn Talmhaíochta,
Bia agus Mara**
Department of Agriculture,
Food and the Marine

The **Department of Agriculture, Food and the Marine (DAFM)** mission is to lead the sustainable development of a competitive, consumer focused agri-food-forest sectors and to contribute to a vibrant rural economy and society. The Department undertakes a variety of functions, including: to promote and safeguard public, animal and plant health and animal welfare for the benefit of consumers, producers and wider society; provide income and market supports to underpin the rural economy; and to provide the optimum policy framework for the sustainable development of the agri-food-forest sectors in order to deliver a sustainable, growth-driven sector focused on competitiveness and innovation, driven by a skilled workforce delivering value added products in line with market demands maintain, and to develop the strategic, operational, regulatory and technical capacity of the sectors to achieve operational excellence .



An Roinn Iompair
Department of Transport

As a central Government Department, serving the Government and the people of Ireland, the mission of the **Department of Transport (DoT)** is to shape the safe and sustainable development of transport, to support economic growth and social progress. A Climate Change

Unit was established in 2016 to co-ordinate the Department's policy response to the challenge of climate change. The Department will play a significant role in the national objective to reduce emissions and in achieving a cost-effective reduction pathway to a low carbon and resilient transport system by 2050. In this role, the Department will encourage and support transport networks and services that are environmentally, economically and socially sustainable. The Department will also be responsible for supporting the necessary adaptation of our critical transport infrastructure and services in response to Ireland's changing climate.



Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Geological Survey Ireland (GSI) Founded in 1845, Geological Survey Ireland is Ireland's public earth science knowledge centre and is a division of the Department of the Environment, Climate and Communications. GSI is committed to providing free, open and accurate data and maps on Ireland's subsurface to

landowners, the public, industry, and all other stakeholders. GSI also acts as a project partner in leading international projects providing expertise, data and developing models and viewers in a diverse array of topics including geological mapping, geothermal energy, groundwater, seabed mapping, natural hazards, and public health risks.



Oifig an
Rialaitheora Pleanála
Office of the
Planning Regulator

The **Office of the Planning Regulator (OPR)** was established in 2019 and has three main functions. Firstly, to oversee consistent implementation of Government planning policy and legislation by local authorities and An Bord Pleanála; secondly to ensure effectiveness of the systems and procedures used by planning authorities and finally to implement research, training and public

awareness programmes to strengthen the planning process. The OPR seeks to support and enhance Ireland's planning system by driving innovation and learning for all those that are stakeholders in the planning process.

Application Process

Making an Application

Applications **must** be made online at <https://epa.smartsimple.ie>

You will also need to refer to the following documentation, which is available to download from the EPA's Online Grant Management and Application Portal or from the EPA website²:

1. 2021 Guidelines and Terms & Conditions; and
2. EPA Online Grant Management and Application Portal System User Guides.

² <http://www.epa.ie/our-services/research/>

IMPORTANT

Please refer carefully to the Technical Description Document and ensure that you choose the correct Call Topic Reference when creating your application on the EPA's Grant Management and Application Portal as **mistakes will not be rectified**.

For all co-funded topics, **researchers may not apply for or participate in projects that are to be co-funded by their organisation, even if their organisation would not be in receipt of funding.**

Deadlines

It is the responsibility of the Applicant to ensure that proposals are submitted before the call deadline, and the responsibility of the relevant Research Proposal Authoriser (i.e. Research Offices/Managing Directors for companies) to ensure that proposals are authorised before the organisational approval deadline. Deadlines are absolute and are enforced by the system automatically. Discussion WILL NOT be entered into in the case of late submissions and/or approvals, how-so ever caused. The EPA's decision in this matter will be FINAL.

FAILURE TO MEET EITHER OF THE DEADLINES OUTLINED MEANS THAT YOUR PROPOSAL WILL NOT BE CONSIDERED FOR FUNDING.

Eligibility Criteria

- Proposals that exceed the maximum duration and/or request funding in excess of the maximum specified in the Technical Description for the call topic will be deemed invalid and will not proceed to the evaluation stage.
- Proposals which do not use the correct templates will be deemed invalid and will not proceed to the evaluation stage.
- Proposals which do not address the scope of the call topic under which they are submitted, will be deemed invalid and will not proceed to the evaluation stage.
- Applications for funding will only be considered where the lead applicant organisation is located³ on the island of Ireland.

All research proposals must build on findings and recommendations from past and current research⁴ projects (where relevant).

Open Access and Open Data

All projects must comply with the EPA's Open Access Policy available from: <http://www.epa.ie/our-services/research/epa-research-2030/strategies-and-policies/open-access-policy/>

³ For the avoidance of doubt an applicant organisation is considered to be located on the island of Ireland where it has an established legal presence here and is registered for all relevant employee and corporate taxes in the respective jurisdictions of either Northern Ireland or the Republic of Ireland.

⁴ Including EPA-funded, other Irish and EU and international research projects and initiatives/activities.

List of Topics

The EPA invites research proposals under the topics listed in Table 1 for the EPA Research Call 2021.

Up to one award is expected for each of the topics included in the call.

Table 1. List of topics for the EPA Research Call 2021

Call Topic Reference	Research Hub and Call Topic Titles	Max Budget (€) Per Project	Co-funded by
Addressing climate change evidence needs			
Addressing Climate Change Evidence Needs 2021 Call Topic 1	Analysis of terrestrial GHG emissions and removals and wider impacts of land management and peatland restoration on Ireland's Carbon and Nitrogen Cycles. Fellowship 1. Carbon Dioxide	€300,000	DAFM
Addressing Climate Change Evidence Needs 2021 Call Topic 2	Analysis of terrestrial GHG emissions and removals and wider impacts of land management and peatland restoration on Ireland's Carbon and Nitrogen Cycles. Fellowship 2. Methane	€300,000	DAFM
Addressing Climate Change Evidence Needs 2021 Call Topic 3	Analysis of terrestrial GHG emissions and removals and wider impacts of land management and peatland restoration on Ireland's Carbon and Nitrogen Cycles. Fellowship 3. Nitrous Oxide	€300,000	DAFM
Addressing Climate Change Evidence Needs 2021 Call Topic 4	Scenarios analysis to inform pathways for negative emissions to achieve climate neutrality by 2050	€350,000	DAFM
Addressing Climate Change Evidence Needs 2021 Call Topic 5	Critical infrastructure interdependencies and effects of climate change - Design for full-scale study	€100,000	-
Addressing Climate Change Evidence Needs 2021 Call Topic 6	Behaviour change among retail and servicing actors in the transport sector	€100,000	-
Addressing Climate Change Evidence Needs 2021 Call Topic 7	Climate resilient development pathways for Ireland	€250,000	DAFM DoT

Call Topic Reference	Research Hub and Call Topic Titles	Max Budget (€) Per Project	Co-funded by
Addressing Climate Change Evidence Needs 2021 Call Topic 8	Transboundary and International climate impacts and synergies	€100,000	DoT
Addressing Climate Change Evidence Needs 2021 Call Topic 9	Top-down assessment of GHG emissions and removals from agriculture and land using advanced observation systems (Integrated Carbon Observation System, ICOS)	€300,000	DAFM
Addressing Climate Change Evidence Needs 2021 Call Topic 10	Industrial transition and national development in the context of achievement of the 2050 climate neutrality goal	€100,000	n/a
Addressing Climate Change Evidence Needs 2021 Call Topic 11	Development of Ireland specific shared socio-economic pathways (SSPs) in the context of national and EU climate policy and analysis systems using international analysis data	€400,000	DAFM
Addressing Climate Change Evidence Needs 2021 Call Topic 12	Development of Nitrous Oxide emissions verification system for Ireland	€600,000	DAFM
Addressing Climate Change Evidence Needs 2021 Call Topic 13	Factors influencing just resilience and wellbeing	€100,000	DoT
Facilitating a Green and Circular Economy			
Facilitating a Green and Circular Economy 2021 Call Topic 1	Identify the regulatory levers needed to develop new markets for renewable carbon	€100,000	n/a
Facilitating a Green and Circular Economy 2021 Call Topic 2	'By-product' material as a nationally useful secondary raw material via the by-product regulatory mechanism	€100,000	DAFM
Facilitating a Green and Circular Economy 2021 Call Topic 3	Recovered waste as a nationally useful secondary raw material via the end-of-waste regulatory mechanism	€100,000	DAFM
Facilitating a Green and Circular Economy 2021 Call Topic 4	Circular business models for Ireland	€350,000	n/a
Facilitating a Green and Circular Economy 2021 Call Topic 5	Edible packaging, opportunities to prevent waste including microplastic arising from plastic and cardboard	€100,000	n/a

Call Topic Reference	Research Hub and Call Topic Titles	Max Budget (€) Per Project	Co-funded by
Facilitating a Green and Circular Economy 2021 Call Topic 6	Explore 'Best Practice' 'Natural Branding' technologies to reduce plastic branding on food	€100,000	n/a
Facilitating a Green and Circular Economy 2021 Call Topic 7	Identifying the scale of plastic in compost derived from household sources	€100,000	n/a
Facilitating a Green and Circular Economy 2021 Call Topic 8	Explore food waste associated with 'home working' since 2020.	€100,000	n/a
Facilitating a Green and Circular Economy 2021 Call Topic 9	Opportunities of Green Public Procurement (GPP)	€200,000	DAFM
Facilitating a Green and Circular Economy 2021 Call Topic 10	Awareness raising tools to address avoidable plastic waste arising from sanitary products and disposable nappies	€100,000	n/a
Facilitating a Green and Circular Economy 2021 Call Topic 11	Consumer awareness and behaviour change communications strategy to support sustainable consumption of clothing in Ireland	€150,000	n/a
Facilitating a Green and Circular Economy 2021 Call Topic 12	Artificial Intelligence to facilitate the circular economy in Ireland.	€150,000	n/a
Facilitating a Green and Circular Economy 2021 Call Topic 13	Sustainable and circular bio-based cities - BioCities	€500,000	DAFM
Facilitating a Green and Circular Economy 2021 Call Topic 14	Material flows of virgin and recycled plastic resources in the Irish economy	€150,000	n/a
Facilitating a Green and Circular Economy 2021 Call Topic 15	The impact of increases in online sales associated with Covid19 pandemic on national waste generation	€100,000	n/a
Facilitating a Green and Circular Economy 2021 Call Topic 16	Critical raw materials for Ireland	€100,000	n/a

Call Topic Reference	Research Hub and Call Topic Titles	Max Budget (€) Per Project	Co-funded by
Delivering a Healthy Environment			
Delivering a Healthy Environment 2021 Call Topic 1	Public exposure to non-ionising radiation (NIR) from major electricity infrastructure such as the Celtic Interconnector between Ireland and France	€100,000	n/a
Delivering a Healthy Environment 2021 Call Topic 2	Chemical indicators datasets for Ireland	€100,000	n/a
Delivering a Healthy Environment 2021 Call Topic 3	Assessing the current state of knowledge of the potential impacts on health and wellbeing from exposure to odour from industrial and waste facilities	€100,000	n/a
Delivering a Healthy Environment 2021 Call Topic 4	Review of emerging technologies / novel approaches for detection and quantification of the levels for Nitrogen Dioxide (NO ₂)	€100,000	n/a
Delivering a Healthy Environment 2021 Call Topic 5	An assessment of hazardous chemicals present in sediment and soil in Ireland	€350,000	DAFM
Delivering a Healthy Environment 2021 Call Topic 6	Research in support of the Industrial Emissions Directive (IED) Review Process	€350,000	n/a
Delivering a Healthy Environment 2021 Call Topic 7	An international best practice review of the localised and wider pollutant contribution of large railway hubs on air quality, in large urban centres	€350,000	DoT
Delivering a Healthy Environment 2021 Call Topic 8	What are the feasible and sustainable nature-based options that can be developed further to achieve zero discharge and minimise the adverse impacts on water quality from domestic wastewater discharges?	€350,000	n/a
Delivering a Healthy Environment 2021 Call Topic 9	Impact of Irish agricultural activities on air quality in Ireland particularly in relation to the contribution of secondary particulate matter (PM _{2.5}) and its association with ammonia levels	€350,000	DAFM
Delivering a Healthy Environment 2021 Call Topic 10	VTEC - Addressing the challenges it poses to our waters and health and wellbeing	€500,000	n/a

Call Topic Reference	Research Hub and Call Topic Titles	Max Budget (€) Per Project	Co-funded by
Delivering a Healthy Environment 2021 Call Topic 11	Assessment of Manganese in our aquatic environment and the impact on drinking water supplies	€350,000	n/a
Protecting and Restoring our Natural Environment			
Protecting and Restoring our Natural Environment 2021 Call Topic 1	Age dating of Irish groundwaters to inform more accurate prediction of the movement of nitrate in groundwater with the goal of improving water quality	€500,000	GSI
Protecting and Restoring our Natural Environment 2021 Call Topic 2	Landscapes, catchments and ecosystems: bringing together knowledge and practice from a range of spatial scales to inform policy	€200,000	DAFM
Protecting and Restoring our Natural Environment 2021 Call Topic 3	Development of a toolkit for <i>ex post</i> analysis of public spending on restoration for nature, of derelict or former industrial lands	€200,000	n/a
Protecting and Restoring our Natural Environment 2021 Call Topic 4	Enhancing public engagement in the SEA process and development of specific criteria that can be used for analysis of SEA implementation	€250,000	OPR
Protecting and Restoring our Natural Environment 2021 Call Topic 5	Water quality improvements arising from enhanced restoration	€500,000	n/a
Protecting and Restoring our Natural Environment 2021 Call Topic 6	The use of innovative as well as available technologies for data analysis and intelligence gathering in support of effective environmental enforcement	€100,000	n/a

Call Content

Addressing Climate Change Evidence Needs

Call Topic Title:	Analysis of terrestrial GHG emissions and removals and wider impacts of land management and peatland restoration on Ireland's Carbon and Nitrogen cycles		
Call Topic References:	<ul style="list-style-type: none"> • Addressing Climate Change Evidence Needs 2021 Call Topic 1: Carbon Dioxide • Addressing Climate Change Evidence Needs 2021 Call Topic 2: Methane • Addressing Climate Change Evidence Needs 2021 Call Topic 3: Nitrous Oxide 		
Project Type:	Research Fellowship		
Maximum Budget:	€300,000 per fellowship	Maximum Duration:	36 months for each fellowship
Co-funded by: Department of Agriculture, Food and the Marine			

Background

The state is investing over €100 million in a large-scale peatlands' restoration project⁵. Additionally, Bord na Mona and other state bodies have been awarded €9.9 million under the EU LIFE Programme Peatlands & People project (<https://peatlandsandpeople.ie/>). It is hoped that these investments help Ireland benefit from 26.8 million tonnes of land-based credits under the Effort Sharing Regulation for the period 2021-2030 commitment towards meeting our national 2030 targets. This allocation will only be available where independent scientific assessment and published peer reviewed evidence can demonstrate the success (in terms of emission reduction and enhanced removals/sequestration) for the rehabilitated/restored boglands.

Scope

Innovative research proposals are invited to:

- Review approaches to measurement, reporting and verification of terrestrial GHG emissions and removals from land with a focus on carbon rich soils such as peatlands in the context of systems in place in Ireland, Europe and globally as well as the guidance provided by the Intergovernmental Panel on Climate Change and emerging policies and actions to restore peatlands and wider enhancement of carbon sequestration and emission reduction, as per the EU LIFE IP Peatlands & People project.
- Evaluate the development and application of terrestrial system models and the integration of advanced observational data streams, including in-situ and remote data, in providing independent analysis of GHG emissions and removals which can complement and improve current analysis and improve on the methodologies used in national emission and removal estimates for peatlands

⁵ <https://www.gov.ie/en/publication/136a7-bord-na-mona-bog-rehabilitation-scheme/>

and reported in the National Inventory Report and support quality assurance/quality control (QA/QC) of emission and removal estimates as appropriate.

- Establish links between analysis of GHG emissions and removals in Ireland at a range of scales including through working with and contributing to relevant planned activities under the Global Carbon Project (GCP)⁶ as part of the JPI Climate initiative in this area. Use these links to compare related analysis of emissions and removals in similar European countries and internationally to ensure that work in Ireland is comparable with these analyses.
- Provide a critique of the measurement techniques and protocols and data assessment and modelling techniques that will support scientific quantification of GHG emissions and removals through enhanced restoration of 10,000ha of candidate cut-over and cut-away boglands and contiguous peaty grasslands included in the EU LIFE IP Peatlands & People project. Examine the applicability of these efforts in the context of the wider implementation of Actions 132, 133 and 134 under the Climate Action Plan.⁷
- Advance the development of an Ireland's carbon cycle and nitrogen cycle platforms which integrates and communicates high resolution and near real-time data on Ireland's GHG emissions and removals from land including seasonal variations and where feasible land management interventions. This activity should be cross-fellowship to include the main GHGs i.e. CO₂ CH₄ and N₂O.
- Work in parallel ensuring synergies and added value with NE-Topic-5: *Water quality improvements arising from the enhanced restoration.*

The fellowships will need to work closely with the EPA's Emission Statistics team who compiles the National Greenhouse Gas Inventory. It is expected that the three fellowships will have full access to data and flux instrumentation already in place / or to be put in place by Bord na Mona and National Parks and Wildlife Service.

The research is divided into three fellowships working on the three main greenhouse gases, (i) carbon dioxide, (ii) methane and (iii) nitrous oxide.

- An application for the fellowship on carbon dioxide should be made under: Addressing Climate Change Evidence Needs 2021 Call Topic 1 (Carbon Dioxide)
- An application for the fellowship on methane should be made under Addressing Climate Change Evidence Needs 2021 Call Topic 2 (Methane)
- An application for the fellowship on nitrous oxide should be made under: Addressing Climate Change Evidence Needs 2021 Call Topic 3 (Nitrous Oxide)

Fellowships are expected to spend 30% of their time on activities related to the Global Carbon Project.

⁶ <https://www.globalcarbonproject.org/>

⁷ Actions 132, 133 and 134 of the 2019 Climate Action Plan (<https://www.gov.ie/en/publication/ccb2e0-the-climate-action-plan-2019/>) refer to:

- Action 132 Deliver the full LULUCF flexibility available to Ireland in the context of the 2030 GHG targets.
- Action 133. Assess and implement mitigation options on post-production, peat extraction sites.
- Action 134: Implement measures for peatlands conservation.

Call Topic Title:	Framework for negative emissions and climate neutrality by 2050		
Call Topic Reference:	Addressing Climate Change Evidence Needs 2021 Call Topic 4		
Project Type:	Medium Scale Project		
Maximum Budget:	€350,000	Maximum Duration:	36 months
Co-funded by: Department of Agriculture, Food and the Marine			

Background

Ireland has increased its climate ambition under the Programme for Government⁸ to achieve climate neutrality by 2050⁹. Achievement of climate neutrality requires the provision of large-scale negative greenhouse gas (GHG) emissions or removals. To date this has focused on land management. However, recent research¹⁰ points to the limited capacity for land to deliver sufficient removals and to insure their permanence in the longer term. Other carbon-dioxide removal (CDR) solutions are known e.g. carbon capture and storage (CCS) but not used in Ireland or are emerging, such as carbon capture and use (CCU). There is a need to establish an analysis framework for consideration of these solutions in Ireland which complements decarbonisation analysis. This includes; technologies, behaviours, scale of contributions, barriers and delivery horizons. These should inform how to achieve climate neutrality by 2050 and maintain this. It would clarify the role and potential of negative emissions in Ireland over the coming decades and the costs and risks for providing these.

Scope

Innovative research proposals are invited to develop a framework for analysis of negative emissions options/solutions for Ireland that addresses land management, technology and behaviour change options. In particular this research will need to:

- Undertake scenario analysis of pathways for negative emissions in achieving climate neutrality in Ireland in line with EU and national climate ambition, paying attention to the need to focus on the development and uptake of solutions that would work in Ireland.
- Assess the potential for CCU and CCS technologies in Ireland, paying attention to the scale, level of maturity and resilience/environmental security of the technologies.
- Assess the level of investments needed in the context of emissions pathways and requirements to achieve climate neutrality. The framework should allow consideration of all existing and emerging solutions in the short, medium and longer terms.

Proposals under this project will need to build on existing research carried out on pathways to carbon neutrality for the Agriculture, Forestry and Other Land Uses (AFOLU) sector to pathways to climate neutrality for all sectors of the economy and build on pre-existing research regarding negative emissions technologies for Ireland. In addition, proposals must build on EU research on this topic, and investigate downscaling of existing research solutions/findings/outputs to the Irish context, where and as appropriate.

⁸ <https://www.gov.ie/en/publication/7e05d-programme-for-government-our-shared-future/>

⁹ <https://www.gov.ie/en/publication/7e05d-programme-for-government-our-shared-future/>

¹⁰ EPA Research Report No. 354 <http://www.epa.ie/publications/research/climate-change/research-354-ie-nets-investigating-the-potential-for-negative-emissions-technologies-nets-in-ireland.php>

Call Topic Title:	Critical infrastructure interdependencies – design for full scale study		
Call Topic Reference:	Addressing Climate Change Evidence Needs 2021 Call Topic 5		
Project Type:	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

It is essential to understand the risks climate change poses to critical infrastructure and, in particular what cascading effects may arise from failures and vulnerabilities in one type of infrastructure to another, in order to identify what needs to be addressed to achieve climate resilience, as identified in the 2018 National Adaptation Framework (NAF)¹¹. The significance of the challenge was aptly demonstrated by Hurricane/Storm Ophelia in 2017 when disruption of the electricity network in turn disrupted the supply of drinking water.

Scope

Innovative research proposals are invited to develop ‘a design to study critical infrastructure interdependencies with respect to the effects of climate change’. In particular, the research should explore:

- How to identify the risks climate change poses to critical infrastructure, paying particular attention to what cascading effects/interdependencies may arise from failures and vulnerabilities in one type of infrastructure (e.g. electricity) to another (e.g. water)?
- What information (e.g. GIS data, scenarios, incidents, failure costs) is required to complete such a study? This study should establish the data sharing needs, identify infrastructure owners, and establish experimental design for a full-scale study.
- What is required to understand cross sectoral impacts, cumulative impacts etc. and the integrated assessment and management of current and future vulnerabilities within the context of spatial planning practices and critical infrastructure? How these requirements are updated to consider new methodologies, scientific advances and climate change is also a key consideration.
- What is required to respond to Action 11 of NAF (*Ensure climate proofing considerations are fully integrated into arrangements and reforms arising from the new Ireland 2040 – National Planning Framework including guidelines, updated guidance on adaptation proofing of SEA and EIA and also in revisions of building standards*)?

¹¹ <https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/>

Call Topic Title:	Behaviour change among retail and servicing actors in the transport sector		
Call Topic Reference:	Addressing Climate Change Evidence Needs 2021 Call Topic 6		
Project Type:	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

The transport sector is a major source of Ireland’s greenhouse gas (GHG) emissions. However, there has been little decarbonisation, thus far¹². Retail and service actors have a significant role to play in decarbonisation of the transport sector (e.g. low emission vehicles, route planning), so the lack of progress warrants investigation and efforts to identify policies and measures to improve chances of success are required. One element that will require specific attention is the potential loss of income and employment from the decarbonisation of this sector. Accordingly, considering the need to bring about a just transition is a key element of this project.

Scope

Innovative research proposals are invited to investigate how to enable the retail and servicing actors in the transport sector to respond to the need to decarbonise. This should include:

- A behaviours and attitudes survey of relevant retail and service actors in the transport sector.
- Identification of barriers to change.
- Identification of the role for policy in this sector.
- Review of existing policies in Ireland.
- Review of policies in other jurisdictions.
- Recommendations for policy changes (as appropriate). In particular, identification of what policies would support transformation of the sector and ensure a just transition for those impacted.

¹² <http://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/irelands-national-inventory-submissions-2020.php>

Call Topic Title:	Climate resilient development pathways for Ireland		
Call Topic Reference:	Addressing Climate Change Evidence Needs 2021 Call Topic 7		
Project Type:	Medium Scale Project		
Maximum Budget:	€250,000	Maximum Duration:	24 months
Co-funded by: Department of Agriculture, Food and the Marine & Department of Transport			

Background

Ireland has not yet conducted research on downscaled sustainable Climate Resilient Development Pathways to 2050¹³. The Intergovernmental Panel on Climate Change (IPCC) now uses the concept of Climate Resilient Development Pathways to link adaptation, mitigation, and sustainable development¹⁴. Climate-resilient development pathways include strategies, choices, and actions that reduce climate change and its impacts. They also include actions to ensure that effective risk management and adaptation can be implemented and sustained (IPCC, 2014). Furthermore, the Working Group II report of the IPCC's 5th Assessment cycle (AR5) notes that: "More research about the relationship between mitigation, adaptation, and sustainable development is needed, as well as research on the relationship between incremental changes and more significant transformations for sustainable development". The importance of carrying out national research in this area is also reflected in the 2018 National Adaptation Framework (NAF)¹⁵.

Scope

Innovative research proposals are invited to:

- Using downscaled versions of the global Shared Socioeconomic Pathways¹⁶ for Ireland, identify options for climate resilient development pathways to 2050 for Ireland, as per IPCC WGII (Impacts, Adaptation and Vulnerability). Proposals should identify how they will link to Addressing Climate Change Evidence Needs 2021 Call Topic 12 (Development of Ireland specific Shared Socio-economic Pathways (SSPs) in the context of national and EU climate policy and analysis systems using international analysis data).
- Explore national perceptions of risk and resilience, identify Irish examples of bad risk management and maladaptation and provide recommendations for climate resilient development and societal transformation in Ireland.
- In addition to modelling and costing aspects, consider planning issues.

¹³ <https://www.ipcc.ch/report/ar5/wg2/climate-resilient-pathways-adaptation-mitigation-and-sustainable-development/>

¹⁴ <https://www.ipcc.ch/report/ar5/wg2/climate-resilient-pathways-adaptation-mitigation-and-sustainable-development/>

¹⁵ <https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/>

¹⁶ https://www.ipcc-data.org/guidelines/pages/glossary/glossary_s.html

Call Topic Title:	Transboundary and International climate impacts and synergies		
Call Topic Reference:	Addressing Climate Change Evidence Needs 2021 Call Topic 8		
Project Type:	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months
Co-funded by: Department of Transport			

Background

*Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change*¹⁷ discusses the cross-border dimensions of climate change impacts and acknowledges that local climate impacts have regional or global repercussions, and such transboundary climate risk can reach Europe. Given our shared geography and climatic influences, certain impacts of climate change, such as extreme weather events, and other challenges and opportunities of climate change are likely to be felt on an all island basis. More widely, the impacts of climate change have cascading spill over effects across borders and continents, therefore climate change also has implications for policies such as international cooperation, migration, trade and security. This is reflected in the research priorities included in the 2018 National Adaptation Framework (NAF)¹⁸.

The NAF also includes the objective to avail of opportunities to collaborate with other jurisdictions to tackle common challenges on adaptation and resilience and to consider transboundary impacts and synergies when they arise. The importance of collaboration across jurisdictions in response to climate change is reflected in the Department of the Taoiseach's Shared Island Dialogues¹⁹, in Project Ireland 2040²⁰ and by the British Irish Council²¹. The Northern Ireland Climate Change Adaptation Programme 2019-2024²² also notes the opportunities for collaborating on an all island basis in a number of areas such as invasive species.

Research is now needed to consider cross border adaptation issues on an all island basis but also to identify areas where Ireland will face challenges from climate change internationally.

Scope

Innovative research proposals are invited to:

- Explore what are the key cross-border, transboundary and international impacts of climate change for Ireland.
- Explore what transboundary synergies can be developed to build the resilience of mutually significant sectors that face similar challenges and opportunities and what information or policy gaps need to be.

¹⁷ https://ec.europa.eu/clima/sites/clima/files/adaptation/what/docs/eu_strategy_2021.pdf

¹⁸ <https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/>

¹⁹ <https://www.gov.ie/en/publication/3eb3c-shared-island-dialogues/>

²⁰ <https://www.gov.ie/en/campaigns/09022006-project-ireland-2040/>

²¹ <https://www.britishirishcouncil.org/areas-work/environment/climate-adaptation>

²² <https://www.daera-ni.gov.uk/sites/default/files/publications/daera/Northern%20Ireland%20Climate%20Change%20Adaptation%20Programme%202019-2024%20Final-Laid.PDF>

This research should include an analysis of impacts of common climate risks (e.g. coasts, water resources, invasive species, air quality, impacts on energy and transport infrastructure) on an all island basis and common solutions; and explore the implications of climate change for Ireland given interconnected global societies (e.g. migration, conflict, displacement), ecosystems and economies.

Call Topic Title:	Top-down assessment of GHG emissions and removals from agriculture and land using advanced observation systems (Integrated Carbon Observation System, ICOS)		
Call Topic Reference:	Addressing Climate Change Evidence Needs 2021 Call Topic 9		
Project Type:	Research Fellowship		
Maximum Budget:	€300,000	Maximum Duration:	36 months
Co-funded by: Department of Agriculture, Food and the Marine			

Background

Ireland, as a party to the UN Framework Convention on Climate Change (UNFCCC)²³, has committed to develop climate change research and systematic observations including observations of greenhouse gases (GHGs) and other factors which influence, or impact on, the climate system. GHG observation systems have been developed in Ireland and across Europe through a series of research activities that were designed to understand and quantify GHG emissions and removals as well as to assess progress in implementation of climate policy. Analysis based on observational data are of particular interest for studies of emissions and removals in terrestrial systems (e.g. forest, grassland and peatland) and for analysis of heterogeneous distributed emissions e.g. from livestock.

Harmonised data from these GHG monitoring and analysis networks are used to provide detailed analysis of GHG emissions and removals at a range of temporal and spatial scales (local, national and continental). The analysis is used for verification, and for quality assurance/quality control (QA/QC) purposes, in National Inventory Reports for Ireland. They are also used to identify gaps and anomalies and to identify emissions and removals hotspots.

Research is required in Ireland to further develop spatial and temporal analysis of emissions and removals at a range of scales that can complement, and support analysis provided in the national emissions inventory, inform actions including peatland restoration and which links to similar systems in Europe and more widely as appropriate.

Scope

Innovative research proposals are invited to:

- Provide integrated analysis of observational data including, in-situ and remote, localised inventory development and data requirements and synergies with actions on air quality, and water management.
- Develop analysis tools to support national emission inventory collation and QA/QC with respect to terrestrial emissions and removal for all nationally relevant ecosystem types at a range of scales.
- Enhance systems models for key national sectors and analysis at a range of temporal and spatial scales.
- Compare related analysis of emissions and removals in similar European countries and internationally to ensure that work in Ireland is comparable with these analyses.

²³ <https://unfccc.int/>

- Support as appropriate QA/QC activities related to the national GHG inventory as outlined in the IPCC Refinement of the 2006 Good Practice Guidelines (IPCC, 2019)²⁴.
- Advance the development of Ireland's carbon cycle and nitrogen cycle frameworks which integrates and communicates high resolution and near real-time data on Ireland GHG emissions and removals from land including seasonal variations and where feasible land management interventions. This should align closely with the three fellowships Addressing Climate Change Evidence Needs 2021 Call Topics 1, 2 and 3 and include the main GHGs i.e. CO₂ CH₄ and N₂O. It should also align with Protecting and Restoring our Natural Environment 2021 Call Topic 5.

The fellowship will need to work closely with the EPA's Emission Statistics team who compiles the National Inventory and the EU Integrated Carbon Observation System Research Infrastructure²⁵. It is also expected that this fellowship will establish links with and contribute to relevant planned activities under the Global Carbon Project²⁶ as part of the JPI Climate initiative in this area.

²⁴ <https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/>

²⁵ <https://www.icos-cp.eu/>

²⁶ <https://www.globalcarbonproject.org/>

Call Topic Title:	Industrial transition and national development in the context of achievement of the 2050 climate neutrality goal		
Call Topic Reference:	Addressing Climate Change Evidence Needs 2021 Call Topic 10		
Project Type:	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

There has not been much focus on national industries prospects in decarbonisation studies in Ireland. Some nationally important industries, e.g. cement, are large emitters of CO₂ and how they will fully decarbonise is uncertain. Additionally, it is essential that policies incentivise investors to support low carbon technologies in industry.

Research is needed to assess how Ireland-based industries are responding to climate action and how this should evolve in response to increased climate ambition nationally and at EU level. Analysis of EPA inventory and projections shows further action is required to set the industrial sector on a pathway consistent with decarbonisation.

Scope

Innovative research proposals are invited to:

- Explore the potential for further decarbonisation and wider sustainable development policy in current nationally regulated industries, the direction and ambition of current policies in the context of the Paris Agreement, and the tools available to achieve decarbonisation in the sector including regulation, carbon pricing and policy signals to investors.
- Examine the interaction of different pieces of legislation such as Industrial Emissions Licensing and the EU Emissions Trading Scheme in driving decarbonisation of industry.

The project should provide:

- An overview of decarbonisation pathways for regulated industry in Ireland.
- An initial assessment of regulated industries' responses to regulation and carbon pricing along with an assessment of their strategic plans and CSR (Corporate Social Responsibility) activities.
- An assessment of the potential for regulation and other policies and measures to deliver increased mitigation in the sector consistent with EU ambition to 2030 and 2050.
- A characterisation of what the regulated economy looks like at the moment in respect of how it drives decarbonisation of industry.
- Recommendations on how industrial sectors can be encouraged to accelerate their decarbonisation consistent with increased EU ambition and the Paris Agreement.

Call Topic Title:	Development of Ireland specific shared socio-economic pathways (SSPs) in the context of national and EU climate policy and analysis systems using international analysis data		
Call Topic Reference:	Addressing Climate Change Evidence Needs 2021 Call Topic 11		
Project Type:	Large Scale Project		
Maximum Budget:	€400,000	Maximum Duration:	48 months
Co-funded by: Department of Agriculture, Food and the Marine			

Background

Climate policy is informed by analysis of emissions pathways that are consistent with international climate policy goals. This involves the use of large-scale Integrated Assessment Models (IAM)s, international databases such as EDGAR²⁷ and earth systems models as used by Copernicus²⁸. Shared Socio-economic Pathways (SSPs)²⁹ have emerged as key tools to explore sectoral and cross sectoral policy options.

This research should explore how Ireland is represented in large scale models and how European and global SSPs may be applied to circumstances in Ireland with the aim of developing Ireland specific SSPs that can inform sectoral and cross sector analysis of mitigation pathways that achieve climate neutrality. In doing so, the project would assess the quality of data for Ireland in international databases in order to ensure that these are compatible with national databases.

Scope

Innovative research proposals are invited to:

- Analyse European and global SSPs and their approaches to the socio-economic situation in Ireland.
- Develop Ireland-specific shared socio-economic pathways, based on the latest integrated assessment models, to support analysis of sectoral and cross sectoral mitigation scenarios (including land and agriculture sectors).
- Explore pathway trade-offs as well as overall national developmental scenarios and associated sectoral pathways and how they may achieve or contribute to meeting longer climate mitigation goals, and their implication for shorter term actions.
- Carry out an assessment of historic data sets (before the establishment of the National Greenhouse Gas Inventory) for Ireland, including assessment of their robustness and compatibility with official data (as provided by the National greenhouse gas inventory) and how these are used in large scale analysis and models e.g. IAMs and engage with data managers on options to include revised or updated data.
- Develop datasets and analysis tools, in line with European and global systems.

²⁷ <https://www.eea.europa.eu/themes/air/links/data-sources/emission-database-for-global-atmospheric>

²⁸ <https://www.copernicus.eu/en>

²⁹ https://www.ipcc-data.org/guidelines/pages/glossary/glossary_s.html

The project must be aligned to the development of national climate and air policies generally. The project should also:

- Support and foster dialogues on climate action scenarios to 2050 and beyond.
- Support sectoral and cross sectoral engagement with the SSP approaches.
- Establish links with EU systems and global networks e.g. Copernicus, EDGAR and EC JRC (Joint Research Centre).
- Make better use of national observational data e.g. from ICOS-Ireland network.
- Develop linkages with work on climate resilience including actions at local scales.
- Support the development of Ireland-specific climate resilient development pathways carried out under Addressing Climate Change Evidence Needs 2021 Call Topic 7.

Call Topic Title:	Development of Nitrous Oxide emissions verification system for Ireland		
Call Topic Reference:	Addressing Climate Change Evidence Needs 2021 Call Topic 12		
Project Type:	Large Scale Project		
Maximum Budget:	€600,000	Maximum Duration:	48 months
Co-funded by: Department of Agriculture, Food and the Marine			

Background

Nitrous oxide (N₂O) is a key greenhouse gas which in Ireland is largely produced through fertilizer use and livestock management in agriculture. Its production cycle is complex and influenced by soils and meteorology. Consequently, there are large uncertainties in emissions estimates for N₂O which come from diffuse sources and are influenced by applications and meteorology. Management and reduction of these emissions is challenging. Options include land management systems, livestock management, and fertiliser use. N₂O is recognised as the third most important GHG with an atmospheric lifetime of over 100 years and is an important component of Ireland's GHG emissions profile. Addressing N₂O emissions poses a considerable immediate challenge due to its links with soil management and food production as well as for Ireland's ambition to be climate neutral by 2050.

The United Nations Framework Convention on Climate Change and the Intergovernmental Panel on Climate Change (IPCC) guidelines³⁰ recommend the development of inverse modelling as a means of emissions verification. The methodology has been applied in Ireland for methane and carbon dioxide emissions (through previous EPA funded research³¹), but not yet for N₂O. The methodology can be used in QA/QC analysis of emissions inventories and inform actions to address emissions.

Advancing analysis of Ireland's nitrogen cycle and identification of management options is a priority issue and research is needed to advance development of a platform which integrates and communicates high resolution and near real-time data on Ireland's GHG emissions and removals from land including seasonal variations and where feasible land management interventions. Given the large degree of uncertainty that exist in estimate of emissions of this gas, further developments and work to enhance quantification of these is required.

Research should be aligned to climate mitigation policy and achievement of emissions targets as well as linked work in the UK which is based on measurements carried out in Ireland.

Scope

Innovative research proposals are invited to:

- Develop observation systems for N₂O that complements existing atmospheric observation systems and links with similar analysis in the UK and Europe and enhances the use of national observational data e.g. from ICOS-Ireland network.
- Develop analysis tools to support national emission inventory verification with respect to terrestrial emissions and removals of N₂O.
- Develop enhanced systems models for Ireland including mapping of temporally and spatially disaggregated analysis.

³⁰ <https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/>

³¹ <http://www.epa.ie/publications/research/climate-change/research-331-implicit-improving-inversion-model-capability-in-ireland.php>

- Advance analysis of Ireland’s nitrogen cycle, including analysis of the contributions of land management and impacts of weather and climate.

The project will need to work closely with the EPA’s Emission Statistics team, who compiles the National greenhouse gas inventory. It is also expected that this project will establish links with EU and global networks, e.g. the Integrated Carbon Observation System Research Infrastructure³², the Global Carbon Project³³ who have recently published their first nitrogen analysis, and Copernicus services³⁴.

³² <https://www.icos-cp.eu/>

³³ <https://www.globalcarbonproject.org/>

³⁴ <https://www.copernicus.eu/en>

Call Topic Title:	Factors in just resilience and wellbeing		
Call Topic Reference:	Addressing Climate Change Evidence Needs 2021 Call Topic 13		
Project Type:	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months
Co-funded by: Department of Transport			

Background

Climate change impacts are linked to wellbeing, particularly the future wellbeing of vulnerable socio-economic groups. Climate adaptation and just resilience can also contribute to wellbeing. The Intergovernmental Panel on Climate Change (2014) acknowledge that climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development. Continued high greenhouse gas (GHG) emissions would lead to mostly negative impacts for biodiversity, ecosystem services and economic development and would amplify risks for livelihoods, food and human security. How just resilience is to be achieved in Ireland is an understudied area of growing importance that is reflected in both *Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change*³⁵ and the 2018 National Adaptation Framework (NAF)³⁶.

Scope

Innovative research proposals are invited to explore how climate change impacts and their magnitude differ within the population and across economic sectors.

This research is expected to:

- Recommend a definition of just resilience in an Irish context.
- Identify regions and socio-economic groups most at risk to climate impacts.
- Consider sectors most at risk of being climate affected and what measures may be required for those working in those sectors to achieve just resilience.
- Review the potential for nature-based solutions as a source of resilience and wellbeing.

³⁵ https://ec.europa.eu/clima/sites/clima/files/adaptation/what/docs/eu_strategy_2021.pdf

³⁶ <https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/>

Facilitating a Green and Circular Economy

Topic Title:	Identify the regulatory levers needed to develop new markets for renewable carbon		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 1		
Project Type	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

In order to address climate change, there is a need to curb consumption of fossil resources. In the energy sector, this is possible through 'decarbonisation'. However, this decarbonisation is not feasible for materials produced using organic chemistry, which is defined by the use of carbon and in practice based predominantly on the use of fossil carbon. So, for the important chemical and plastic industries, there is a need to find alternative carbon sources in order to shift towards a more sustainable and climate-friendly production and consumption process. These alternative carbon sources are referred to as 'renewable carbon'³⁷. The atmosphere and the marine and terrestrial environments host significant renewable carbon potential. The equivalent to decarbonisation in the energy sector is a transition to renewable carbon in the chemical and plastics industries.

While the EU has a key role, national and sectoral developments are required for particular materials. Policy focus can be directed at identifying and removing regulatory barriers for example in relation to renewable carbon product innovation, supply chain and use.

Scope

Innovative research proposals are invited to:

- Conduct a documentary review of 'best practice' 'renewable' carbon options which can be:
 - (re)grown (biosphere – marine and terrestrial);
 - (re)captured (technosphere and atmosphere); or
 - (re)cycled (technosphere).
- Identify barriers, levers and pathways for 'renewable carbon' circular business opportunities.

³⁷ <https://onlinelibrary.wiley.com/doi/abs/10.1002/ghg.1992#:~:text=utilisation%20and%20recycling-Definition,but%20not%20from%20the%20geosphere>

Topic Title:	'By-product' material as a nationally useful secondary raw material via the by-product regulatory mechanism		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 2		
Project Type	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months
Co-funded by: Department of Agriculture, Food and the Marine			

Background

Material which results from a production process including biological, the primary aim of which is not the production of that material, may be considered to be a 'by-product'³⁸ and not waste, if certain conditions are met, including that there is no further processing carried out other than normal industrial practice. By-product material may be used in circumstances that result in its direct contact with environmental media such as soil or water.

For example, in 2018, the EPA received by-product notifications for 6,251,396 tonnes of C&D material. Notifications for 2,605,878 tonnes were withdrawn. The EPA determined that 907,000 tonnes of the soil and stones notified were by-product, as notified. The estimated quantity of C&D material for which no determination has been made to date amounted to 2,738,518 tonnes. By-product notifications do not necessarily mean that the activities proceeded; however, if they did, material classed as a by-product would not have entered the waste management network or be included in the 2018 waste statistics data³⁹.

Improving waste management in Ireland, particularly repair for reuse and recycling is key to the EU Action Plan for a Circular Economy⁴⁰ and the third pillar of the Raw Materials Initiative⁴¹ "resource efficiency and supply of "secondary raw materials" through recycling, as well as other related EU strategies. It is also important for the National policy statement on the bioeconomy⁴² that seeks to '*ensure greater sectoral coherence within the bioeconomy through the development of risk assessment and management protocols regarding the use of by-products which encourages the piloting of opportunities*'.

Scope

Innovative research proposals are invited to:

- Conduct research to provide evidence on how specific by-product material including biological notified to the Agency can be used as a nationally useful secondary raw material via the by-product regulatory mechanism with a specific focus on the further use being lawful in that:
 - The material fulfils all relevant product, environmental and human health protection requirements for the specific use; and

³⁸ Examples of such material include: crushed concrete, demolition rubble, road planings, soil and stone, industrial sludges, wood, glass and biological resources.

³⁹ <http://www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/>

⁴⁰ https://ec.europa.eu/ireland/news/New-Circular-Economy-Action-plan-shows-the-way-to-a-climate-neutral-competitive-economy_en

⁴¹ <https://www.ima-europe.eu/content/raw-materials-initiative#:~:text=The%20RMI%20is%20based%20on,resource%20efficiency%20and%20promoting%20recycling>

⁴² <https://assets.gov.ie/2244/241018115730-41d795e366bf4000a6bc0b69a136bda4.pdf>

- Will not lead to overall adverse environmental or human health impacts, which will be dependent on the nature and characteristics of the material and specific use scenarios

(of particular interest is the identification of potential parameters of concern that relate to particular material types that may result in overall adverse environmental or human health impacts).

- Develop risk assessment and management protocols regarding the use of by-products which encourages the piloting of opportunities.

Topic Title:	Recovered waste as a nationally useful secondary raw material via the end-of-waste regulatory mechanism		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 3		
Project Type	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months
Co-funded by: Department of Agriculture, Food and the Marine			

Background

The concept of End-of-Waste (EOW) was established in the European Waste Framework Directive⁴³ (WFD) and is adopted in domestic law through Article 28 of the European Union (Waste Directive) Regulations 2011⁴⁴ and 2020⁴⁵. End of Waste material, which is classified as waste can transition to a material/product which is not classified as waste, if it undergoes a recycling or other recovery operation and meets End-of-Waste criteria⁴⁶. Rates of circular (secondary) material use have remained consistently low in Ireland since 2010 at below 2%, compared with a European Union (EU) average of 11% in 2017⁴⁷. Improving waste management in Ireland, particularly repair for reuse and recycling is key to the EU Action Plan for a Circular Economy⁴⁸ and the third pillar of the Raw Materials Initiative⁴⁹ “resource efficiency and supply of “secondary raw materials” through recycling, as well as other related EU strategies. It is also important for the National policy statement on the bioeconomy⁵⁰ that seeks to ‘*assess the current legislative definition of waste and recommend whether a re-designation is necessary for residual waste flows to be successfully managed for use in the bioeconomy.*

The use of waste-derived materials reduces the need to exploit primary resources in addition to the diversions of waste from landfill or incineration. This can reduce local environmental impacts, such as amenity impacts arising from quarrying and refining or agriculture impacts arising from the use of chemical fertilizer, and global environmental impacts, including greenhouse gas emissions. Industry can benefit commercially and help to remove quality waste materials from the scope of waste legislation.

Scope

Innovative research proposals are invited to:

⁴³ <https://eur-lex.europa.eu/eli/dir/2008/98/2018-07-05>

⁴⁴ <https://op.europa.eu/en/publication-detail/-/publication/ac3b3dd3-e2f9-4560-a9fb-8f3b1c8c38f5/language-en>

⁴⁵ <http://www.irishstatutebook.ie/eli/2020/si/323/made/en/pdf>

⁴⁶ Examples of such waste include: crushed concrete, demolition rubble, waste wood, bituminous mixtures, tyres

⁴⁷ <http://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-environment-2020---chapter-15--performance-policy-and-implementation.php>

⁴⁸ https://ec.europa.eu/ireland/news/New-Circular-Economy-Action-plan-shows-the-way-to-a-climate-neutral-competitive-economy_en

⁴⁹ <https://www.ima-europe.eu/content/raw-materials-initiative#:~:text=The%20RMI%20is%20based%20on,resource%20efficiency%20and%20promoting%20recycling>

⁵⁰ <https://assets.gov.ie/2244/241018115730-41d795e366bf4000a6bc0b69a136bda4.pdf>

- Critically evaluate the current state of knowledge/ literature in this field. Identify ‘best practice’ with comparative EU countries and apply within an Irish context.
- Assess the current legislative definition of waste (including End of Waste criteria) and present recommended policy solutions that support circular economy ambitions, including circular bioeconomy⁵¹.
- Provide evidence on how certain recovered waste (e.g. crushed concrete and demolition materials and or biological materials) can be used as a nationally useful secondary raw material via the end-of-waste regulatory mechanism with a specific focus on how the use of this secondary raw material:
 - will fulfil the technical requirements for the specific purposes and meet applicable legislation and standards; and,
 - will not lead to overall adverse environmental or human health impacts, which will be dependent on the nature and characteristics of the material and specific use scenarios.

Of particular interest is the identification of potential parameters of concern that relate to particular waste material types and any limits that may be necessary such that the use will not lead to overall adverse environmental or human health impacts.

⁵¹ <https://www.gov.ie/en/press-release/3d585e-national-policy-statement-on-the-bioeconomy/>

Topic Title:	Circular business models for Ireland		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 4		
Project Type	Medium Scale Project		
Maximum Budget:	€350,000	Maximum Duration:	36 months

Background

Environmental and sustainability challenges are inextricably linked to economic activities and lifestyles. The traditional linear economic model in Ireland of take – make – dispose has resulted in socio-economic and environmental challenges. Small and medium enterprises (SMEs) account for 99.7% of active enterprises, 68.0% of persons engaged, 50.3% of turnover and 46.2% of gross value added (GVA) in Ireland⁵². The key challenge is the need to transition from Business as Usual economic growth models towards more sustainable economic models (circular business models) that inform robust impactful and implementable policy. Circular business models are needed to facilitate the objectives of the National Waste Action Plan for a Circular Economy⁵³, the EU Circular Economy Strategy⁵⁴, which are aligned to and represent key foundations of the EU New Green Deal⁵⁵ and the EU Bioeconomy Strategy⁵⁶.

Circular business models represent fundamentally different ways of producing and consuming goods and services. They have the potential to drive the transition towards a more resource efficient and circular economy and, in doing so, significantly reduce the environmental pressure resulting from economic activity⁵⁷.

Scope

Innovative research proposals are invited to:

- Conduct a review of the different circular business models gaining traction internationally such as circular supply models, resource recovery models, product life extension models, sharing models and product service system models.
- Critically review and evaluate resource and climate gains from the different models.
- Identify recommendations for the most appropriate business models for Ireland across the different sectors as some models may be better suited to a particular sector.
- Provide robust evidence to inform systemic transformation that aligns with key policy and strategy commitments, whilst at the same time acknowledges and understands Ireland’s unique socio-economic and environmental characteristics.
- Work in collaboration with industry or a public body to establish a circular business demonstration project for Ireland based on one of the most appropriate models informed by the

⁵² <https://www.cso.ie/en/releasesandpublications/ep/p-bii/businessinirelandabridged2012/smallandmediumenterprises/>

⁵³ <https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/>

⁵⁴ <https://ec.europa.eu/environment/circular-economy/>

⁵⁵ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁵⁶ https://ec.europa.eu/info/research-and-innovation/research-area/bioeconomy/bioeconomy-strategy_en

⁵⁷ <https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf>

research findings. The demonstration project will be replicable; and the demonstration model identified must be running for one year.

Interim deliverables to include: Interim Report on the review of current knowledge available about circular business models to be submitted at Month 12.

Topic Title:	Edible packaging, opportunities to prevent waste including microplastic arising from plastic and cardboard		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 5		
Project Type	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

Consumption of plastics is expected to double in the next 20 years⁵⁸. Ireland has waste reduction targets that align with the National Waste Action Plan for a Circular Economy⁵⁹, the EU Circular Economy Strategy⁶⁰ and the EU New Green Deal⁶¹. The Programme for Government (2020)⁶² outlines how Ireland will work with the EU to encourage the further reduction and prevention of plastic packaging. Each EU member state is obliged to meet targets, set out in the EU Packaging and Packaging Waste Directive⁶³, for the recycling and recovery of waste packaging made from glass, plastic, paper and board, metals and wood. The European Commission aims to take further targeted measures on plastics in order to address the sustainability challenges posed by this ubiquitous material. Ireland exceeded current Packaging Directive target of 22.5%, however, the revised Packaging Directive sets significantly more ambitious plastic packaging recycling targets of 50% for 2025 and 55% for 2030 which will be challenging for Ireland to meet⁶⁴.

Creative and innovative alternatives to plastic packaging are becoming more available and viable. There is a growth in creative local and more circular enterprise using edible packaging. Edible food packaging eliminates the typical waste cycle and doesn't require any recycling. Since most edible packaging can be consumed or composted, it offers a potential alternative to traditional food packaging and potentially represents one element in meeting future food packaging waste reduction targets founded on more circular principles. A reduction in the need to use plastic packaging can deliver multiple socio-economic and environmental benefits, addressing Climate Change by reducing the need for fossil fuels and a reduction in plastic labels needing to be disposed reduces the impact on soil, water and air if incinerated that can have an impact on the natural environment and human health and well-being.

Scope

Innovative research proposals are invited to:

- Conduct a documentary review of International 'best practice' in the use of edible packaging options as a means to reduce plastic packaging and thus facilitate more green and circular economy opportunities in Ireland.
- Critically evaluate edible packaging practices currently in use in Ireland.

⁵⁸ https://www.ellenmacarthurfoundation.org/assets/downloads/news/New-Plastics-Economy_Background-to-Key-Statistics_19022016v2.pdf

⁵⁹ <https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/>

⁶⁰ <https://ec.europa.eu/environment/circular-economy/>

⁶¹ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁶² <https://www.gov.ie/en/publication/7e05d-programme-for-government-our-shared-future/>

⁶³ <https://op.europa.eu/en/publication-detail/-/publication/f8128bcf-ee21-4b9c-b506-e0eaf56868e6>

⁶⁴ <http://www.epa.ie/publications/monitoring--assessment/waste/national-waste-statistics/national-waste-statistics-summary-report-for-2018.php>

- Explore the barriers and enablers to an increase in the use of edible packaging options.
- Identify 'edible packaging' opportunities for use in Ireland.

Topic Title:	Explore 'Best Practice' 'Natural Branding' technologies to reduce plastic branding on food		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 6		
Project Type	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

The Programme for Government (2020)⁶⁵ outlines how Ireland will work with the EU to encourage the further reduction and prevention of plastic waste. Each EU member state is obliged to meet targets, set out in the European Waste Framework Directive⁶⁶ (WFD). Plastic branding from food that is composted can cause major environmental threats due to their inability to breakdown or their low rate of breakdown which thereby, may lead to environmental pollution, blockage of waterways and death of marine and freshwater flora and fauna⁶⁷.

Natural Branding is a technique that uses a laser to remove pigment from the skin of produce, without affecting its shelf life, thereby creating a natural label that eliminates plastic stickers. The Natural Branding technology reduces CO₂ emissions in the labelling sector by eliminating plastic packaging and sticker labels. The laser technology is said to create less than 1% of the carbon emissions needed to produce a sticker of similar size⁶⁸.

Research is needed, in the medium-term and longer-term to better understand the significance of this plastic waste stream in order to develop methods facilitated by new technologies to manage and mitigate against risk and to meet commitments under inter alia the Waste Framework Directive, The Water Framework Directive and the European Plastics Strategy⁶⁹.

Scope

Innovative research proposals are invited to:

- Conduct a documentary review of International 'best practice' in the use of 'Natural Branding' techniques as a means to reduce plastic packaging and thus facilitate more green and circular economy opportunities in Ireland.
- Identify current technology available for use in 'Natural Branding' that could be replicated in Ireland.

⁶⁵ <https://www.gov.ie/en/publication/7e05d-programme-for-government-our-shared-future/>

⁶⁶ <https://eur-lex.europa.eu/eli/dir/2008/98/2018-07-05>

⁶⁷ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7920964/>

⁶⁸ <https://plasticsmartcities.org/products/natural-branding-1#:~:text=The%20Natural%20Branding%20technology%20reduces,a%20sticker%20of%20similar%20size.>

⁶⁹ https://ec.europa.eu/environment/topics/plastics/single-use-plastics_en

Topic Title:	Identifying the scale of plastic in compost derived from household sources		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 7		
Project Type	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

The Programme for Government (2020)⁷⁰ outlines how Ireland will work with the EU to encourage the further reduction and prevention of plastic waste. Each EU member state is obliged to meet targets, set out in the European Waste Framework Directive⁷¹ (WFD). EU policy and strategy promotes the recycling of nutrients from organic wastes into products that fertilise and improve soil health using fewer mineral fertilisers. This has renewed interest in the use of compost and digestate as fertilisers. To ensure compost meets the required standards further research is needed to address a knowledge gap to identify the scale of plastic in compost that could potentially compromise the quality of the compost (e.g. paper towel, tea bags, and fruit stickers). Plastics in compost can cause major environmental threats due to their inability to breakdown or their low rate of breakdown which thereby, may lead to environmental pollution, blockage of water ways and death of marine and fresh water flora and fauna⁷². Furthermore, plastics can negatively affect the soil ecosystem by releasing toxic substances and inhibiting soil dwelling organisms⁷³. Research is needed to identify the amount of plastic associated with this waste stream to inform solutions to reduce plastic in compost.

Scope

Innovative research proposals are invited to:

- Conduct a comprehensive review to highlight the degree of plastic embedded in food items that are placed in compost bins, seen as entirely of a biodegradable food basis but may in fact contain “invisible” plastic. Such plastic could compromise the integrity of the compost by:
 - causing microplastic to enter the soil;
 - compromising soil and water through plastic/microplastic contamination;
 - allowing plastics/microplastics to enter the food chain;
 - otherwise causing harm to the natural environment and human health.
- Identify solutions to reduce plastic in compost.

⁷⁰ <https://www.gov.ie/en/publication/7e05d-programme-for-government-our-shared-future/>

⁷¹ <https://eur-lex.europa.eu/eli/dir/2008/98/2018-07-05>

⁷² <https://www.sciencedirect.com/science/article/abs/pii/S0048969717320843?via%3Dihub>

⁷³ <https://royalsocietypublishing.org/doi/10.1098/rstb.2008.0284>

Topic Title:	Explore the impacts of 'home working' on food waste		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 8		
Project Type	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

Ireland generates approximately 1 million tonnes of food waste per year (not including wasted food from agriculture); which represents a carbon footprint as high as 3.6 Mt CO₂eq. Around 455,000 tonnes of this food waste comes from households and the food services sector⁷⁴. Household and commercial food waste is of concern because of the high level of embedded resources and the different waste collection mechanisms⁷⁵. Ireland, along with almost 200 other countries, has committed to achieving the United Nations Sustainable Development Goals (SDGs)⁷⁶, including SDG 12.3: *“By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses”*⁷⁷.

With an expected shift to increased homeworking and possible associated moves by urban dwellers to rural centres, there is likely to be an impact on food waste generation patterns; expected increase in homes, but also consequences for food service providers in workplaces and those in the locality of large office population centres.

Research is required to provide information for waste management capacity and infrastructure planning and to provide an evidence base to inform possible solutions for food service providers in balancing meeting customer needs in a manner that prevents increased food waste. In addition, are there local circular business enterprise opportunities that may arise associated with increased home working patterns to facilitate Ireland’s commitments under the National Waste Action Plan for a Circular Economy⁷⁸.

Scope

Innovative research proposals are invited to:

- Conduct a review of food purchasing and consumption practices associated with home working since 2020.
- Identify recommendations to inform food waste prevention and management measures associated with home working.
- Conduct a review of implications for non-home work related food waste generation, e.g. office canteens in the context of food waste and planning for food needs in times of uncertainty linked to levels of home working.

⁷⁴ <http://www.epa.ie/publications/monitoring--assessment/waste/national-waste-statistics/national-waste-statistics-summary-report-for-2018.php>

⁷⁵ <http://www.epa.ie/our-services/monitoring--assessment/circular-economy/food-waste/>

⁷⁶ <https://sdgs.un.org/goals>

⁷⁷ <http://www.epa.ie/our-services/monitoring--assessment/circular-economy/food-waste/>

⁷⁸ <https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/>

Topic Title:	Opportunities of Green Public Procurement (GPP)		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 9		
Project Type	Medium Scale Project		
Maximum Budget:	€200,000	Maximum Duration:	36 months
Co-funded by: Department of Agriculture, Food and the Marine			

Background

The Irish Government spends about €9 billion on goods and services annually. Average annual public sector purchasing is approximately 11% of Ireland's GDP which is a large part of economic activity and demand. This provides Ireland's public sector with significant influence to stimulate the provision of more resource-efficient, less polluting goods, services and works within the marketplace^{79, 80}.

Green Public Procurement (GPP) is identified as one instrument in reducing environmental impact and is included within the stated ambitions of Ireland's Programme for Government 2020⁸¹ and Ireland's Waste Action Plan for a Circular Economy 2020⁸² and the national policy statement on the bioeconomy⁸³. The Climate Action Plan 2019⁸⁴ promotes the need to accelerate GPP by supporting research on quantifying costs/benefits of GPP in an Irish context as a step to be taken. The EU New Green Deal⁸⁵ also promotes GPP suggesting that public authorities, including the EU institutions, should lead by example and ensure that their procurement is green. GPP is acknowledged nationally and at EU level as a key policy lever in improving sustainability. The integration of green public procurement principles into the economy will further enhance Ireland's reputation as an innovative, eco-efficient and forward-looking place to do business which is informed by more circular business practices.

Scope

Innovative research proposals are invited to:

- Examine potential opportunities for implementing Irish GPP policy to reduce environmental/carbon footprint, displace use of high embedded energy material and limit the impact of resource use and increase sustainability.
- Conduct costs and benefits of Green Public Procurement in an Irish context.
- Critically evaluate implementation gaps in GPP policy and practice and how to overcome these including integration with the national bioeconomy policy statement.
- Quantify the scale of GPP spend within national spending by public authorities.
- Develop a list of potential products and services that could be purchased under green public procurement.

⁷⁹ <https://www.gov.ie/en/publication/efa12-green-public-procurement-gpp/>

⁸⁰ [https://www.europarl.europa.eu/RegData/etudes/STUD/2017/602065/IPOL_STU\(2017\)602065_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2017/602065/IPOL_STU(2017)602065_EN.pdf)

⁸¹ <https://www.gov.ie/en/publication/7e05d-programme-for-government-our-shared-future/>

⁸² <https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/>

⁸³ <https://assets.gov.ie/2244/241018115730-41d795e366bf4000a6bc0b69a136bda4.pdf>

⁸⁴ <https://www.gov.ie/en/publication/ccb2e0-the-climate-action-plan-2019/>

⁸⁵ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

- Identify opportunities for making GPP more circular - i.e. guidance on how to promote reduced consumption and the use of life cycle assessment by public authorities as a means to systemically influence their procurement decisions.

Interim deliverables to include: Interim Report on preliminary findings on GPP opportunities at Month 18.

Topic Title:	Awareness raising tools to address avoidable plastic waste arising from sanitary products and disposable nappies		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 10		
Project Type	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

Ireland has waste reduction targets that align with the National Waste Action Plan for a Circular Economy⁸⁶, the EU Circular Economy Strategy⁸⁷ and the EU New Green Deal⁸⁸. The Programme for Government (2020)⁸⁹ outlines how Ireland will work with the EU to encourage the further reduction and prevention of plastic as a waste stream. Each EU member state is obliged to meet targets, set out in the EU Packaging and Packaging Waste Directive⁹⁰, for the recycling and recovery of waste packaging made from glass, plastic, paper and board, metals and wood. The European Commission aims to take further targeted measures to address the sustainability challenges posed by this ubiquitous material. The revised Packaging Directive⁹¹ sets significantly more ambitious plastic packaging recycling targets of 50% for 2025 and 55% for 2030 which will be challenging for Ireland to meet⁹².

The need to reduce plastic waste in sanitary products, cleansing wipes and disposable nappies is identified as a research need in EPA Research report No. 363 (“No Home For Plastic”)⁹³. Sanitary protection and disposable nappies are a large source of avoidable plastic waste. Research is needed to develop solutions to prevent, and mitigate against risk associated with this waste stream, most especially as there are viable and more sustainable alternative products available. Reducing this waste stream will help to meet commitments under inter alia the Waste Framework Directive, The Water Framework Directive and the European Plastics Strategy.

Scope

Innovative research proposals are invited to:

- Conduct a review of ‘best practice’ ‘plastic free’ sanitary products, cleansing wipes and nappies.
- Develop educational/awareness guidance to facilitate behaviour change from the use of current plastic based sanitary products, wipes and nappies to more sustainable options.

⁸⁶ <https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/>

⁸⁷ https://ec.europa.eu/environment/topics/circular-economy/first-circular-economy-action-plan_en

⁸⁸ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁸⁹ <https://www.gov.ie/en/publication/7e05d-programme-for-government-our-shared-future/>

⁹⁰ <https://op.europa.eu/en/publication-detail/-/publication/f8128bcf-ee21-4b9c-b506-e0eaf56868e6>

⁹¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01994L0062-20150526>

⁹² <http://www.epa.ie/publications/monitoring--assessment/waste/national-waste-statistics/national-waste-statistics-summary-report-for-2018.php>

⁹³ <http://www.epa.ie/publications/research/socio-economics/research-363-no-home-for-plastic.php>

Topic Title:	Consumer awareness and behaviour change communications strategy to support sustainable consumption of clothing in Ireland		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 11		
Project Type	Medium Scale Project		
Maximum Budget:	€150,000	Maximum Duration:	18 months

Background

The current consumption of new textiles and generation of post-consumer textiles in Ireland highlights a linear textile economic model that is unsustainable. Over half of the new textiles consumed in Ireland are clothing, with an average consumption of 16.6kg per person in 2018 and 27.4 kg per person in 2019. A comparison to a reported EU average consumption of 9.9 kg of new clothing per person in 2018 shows that Ireland's per capita consumption of new clothing is significantly higher⁹⁴. A National Waste Action Plan for a Circular Economy⁹⁵ will support an education and awareness campaign around textiles as a theme of SDG 12 Sustainable Production and Consumption.

The EU Circular Economy Action Plan⁹⁶ contains 35 actions to be taken throughout the entire lifecycle of products to make sustainable products the norm, and it focuses on the key product value chains electronics and information and communications technology (ICT), batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water and nutrients. Although waste legislative targets to-date have focused on recovery (including energy recovery) and recycling, the next focus will be on increasing recycling and increasing the preparation of products for reuse with a view to increasing prevention in the future. A plan will be transposed into national law in 2020/2021 and introduce: challenging recycling targets, new separate collection obligations and in some cases collection targets.

Scope

Innovative research proposals are invited to:

- Conduct research to provide evidence about consumer awareness with regard to textiles;
- Develop a communications strategy/guidance/interventions that will:
 - profile the textile consumption behaviours of different age cohorts;
 - promote less, and more sustainable, consumption of clothing;
 - provide useful information about the care and longevity of clothing;
 - enable more reuse of clothing such as swapping, donation, purchasing second-hand;
 - increase in repair, repurposing and recycling of clothing;
 - provide information regarding the appropriate disposal of textile waste.

⁹⁴ <https://www.eea.europa.eu/publications/textiles-in-europes-circular-economy>

⁹⁵ <https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/>

⁹⁶ https://ec.europa.eu/ireland/news/New-Circular-Economy-Action-plan-shows-the-way-to-a-climate-neutral-competitive-economy_en

Topic Title:	Artificial Intelligence to facilitate the Circular Economy in Ireland		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 12		
Project Type	Medium Scale Project		
Maximum Budget:	€150,000	Maximum Duration:	36 months

Background

The EU New Green Deal⁹⁷ acknowledges the important role of digital technologies as drivers of change and enablers in solving environmental problems. Technological advances have enabled the growth in the use of Artificial Intelligence (AI) in a more cost-effective manner. AI can provide smart, integrated solutions and pathways to facilitate ‘Green’ and ‘Digital’ transitions to innovative circular business model opportunities. Such transitions facilitate achievement of climate neutrality while fostering economic growth that is environmentally and socially responsible. Digitalisation is a key element of Ireland’s Programme for Government 2020⁹⁸. AI is recognised as one of the central enablers of digital transformation in several industries and core to the two major transitions in the next decade: to a low-carbon future and to greater digitalisation, automation, and robotics.

Ireland has commitments to meet ongoing targets under EU waste legislation including the Waste Framework Directive⁹⁹, the Landfill Directive¹⁰⁰ and the Producer Responsibility Directives (EU Packaging and Packaging Waste Directive¹⁰¹, End-of-Life Vehicles¹⁰², Waste Electrical and Electronic Equipment, Batteries and Accumulators¹⁰³).

Research is required to examine and critically evaluate the use of AI to enable Ireland to derive valuable waste prevention insights and circular economy management opportunities from national materials and goods flows.

Scope

Innovative research proposals are invited to:

- Conduct a comprehensive documentary review of international ‘best practice’ in the use of AI in facilitating circular economy ambitions.
- Develop guidance on ‘best practice’ to address e.g. key waste related challenges in a more cost-effective manner using more recent technological advancements.
- Critically evaluate the current status/use of AI in Ireland to inform opportunities/potential application for AI use in an Irish context to meet circular economy and bioeconomy commitments.
- Assess circular economy stakeholders’ attitudes to the increased use, and potential, of AI technologies.

⁹⁷ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁹⁸ <https://www.gov.ie/en/publication/7e05d-programme-for-government-our-shared-future/>

⁹⁹ <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32008L0098>

¹⁰⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3AI21208>

¹⁰¹ <https://op.europa.eu/en/publication-detail/-/publication/f8128bcf-ee21-4b9c-b506-e0eaf56868e6>

¹⁰² https://ec.europa.eu/environment/topics/waste-and-recycling/end-life-vehicles_en

¹⁰³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02012L0019-20180704>

- Develop a portfolio of case studies to showcase and provide information about AI examples currently in use internationally and in Ireland.

Topic Title:	Sustainable and circular bio-based cities – BioCities		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 13		
Project Type	Large Scale Project		
Maximum Budget:	€500,000	Maximum Duration:	48 months
Co-funded by: Department of Food, Agriculture and the Marine			

Background

Cities produce a high level of solid waste each year. Around half of this waste is organic. Urban biowaste is often perceived as a challenge for urban agendas due to its potential pressure on the environment and human health, as well as its ‘nuisance’ factor. The EU Bioeconomy Strategy¹⁰⁴ which is aligned with the EU Circular Economy Action Plan¹⁰⁵ and the EU New Green Deal¹⁰⁶ has identified concrete actions to develop local Bioeconomy Strategic Deployment Actions which will showcase the vast potential of the bioeconomy for rural, coastal, and urban areas development.

Recovery of key usable components from urban bio-waste streams and valorisation to high value-added compounds/products represents an innovative solution that supports development and deployment of a circular local bioeconomy¹⁰⁷. Irish cities to date have not coordinated the development of plans/strategies to support the development of circular bio-based economy projects for the production of innovative bio-based products.

Research is required to examine urban biowaste and wastewater as circular feedstock including developing solutions to enable conversion of mixed urban bio-waste into sustainable feedstock for the circular bio-based industry.

Scope

Innovative research proposals are invited to:

- Identify all impediments and limitations to the conversion of urban ‘biological’ waste streams (including urban wastewater, industrial and commercial sourced organic wastes, separately collected organic waste, mixed solid municipal waste streams or a combination) into sustainable feedstocks such as chemical precursors, polymers, materials and/or fertilisers at yields that are appropriately scalable to pre-commercial levels. Such ‘impediments’ to include evaluation of challenges for secondary product standards and certification for biowaste derived resources.
- Apply a technologically based cascade-type approach for valorisation of the target feedstock into a range of several products and materials with energy or biogas valorisation only considered at an appropriate point in the cascade.
- Develop a prototype project development assistance tool and plan aimed to foster investments and to implement projects to valorise urban biowaste and wastewater through the production of innovative bio-based products within the framework of targeted circular bio-based economy strategies in urban area. This prototype would aid the replication of circular bio-based economy

¹⁰⁴ <https://op.europa.eu/en/publication-detail/-/publication/edace3e3-e189-11e8-b690-01aa75ed71a1/language-en/format-PDF/source-149755478>

¹⁰⁵ <https://ec.europa.eu/environment/circular-economy/>

¹⁰⁶ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

¹⁰⁷ <https://www.ellenmacarthurfoundation.org/publications/urban-biocycles>

strategies in urban areas in Ireland and aim to facilitate any Irish cities participating in Cities with the EU Horizon 2020 supported pilot group in drafting Urban Circular Bioeconomy Strategies¹⁰⁸.

- Assess the economic, social and environmental impacts of the developed products/materials or processes using life-cycle assessment methodologies based on accepted and validated approaches, to include public acceptance.

Interim deliverables to include: Interim Report on preliminary findings that highlight impediments and limitations to the conversion of urban 'biological' waste streams at Month 12.

¹⁰⁸ <https://cordis.europa.eu/project/id/101000836>

Topic Title:	Material flows of virgin and recycled plastic resources in the Irish economy		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 14		
Project Type	Medium Scale project		
Maximum Budget:	€150,000	Maximum Duration:	36 months

Background

Plastic is a priority area for the circular economy at EU and national level as outlined in current waste policy, A Waste Action Plan for a Circular Economy¹⁰⁹. The Programme for Government (2020)¹¹⁰ outlines how Ireland will work with the EU to encourage the further reduction and prevention of plastic packaging waste and the government is considering a levy on virgin plastic, to incentivise the use of recycled plastic.

There is a need to quantify the movement of virgin and secondary, recycled plastic material resources into, within and out of Ireland that will provide robust evidence to inform better policy making and identify investment and enterprise opportunities that are characterised by more circular economy principles as outlined in the EU Circular Economy Action Plan¹¹¹ which is aligned with the European Green Deal¹¹². The EU Circular Economy Action Plan is a central plank of EU policy towards the transition to a low/zero carbon economy and is a political and economic priority for Ireland and the EU.

Material Flow Analysis (MFA) is an analytical method to quantify flows and stocks of materials or substances in a well-defined system, which in this context refers to virgin and recycled plastics. MFA represents a powerful tool to support waste management decisions.

Scope

Innovative research proposals are invited to:

- Conduct a documentary review of the nature, extent and flow of virgin plastic and recycled plastic into, out of and within Ireland.
- Quantify the value of materials in circulation.
- Critically examine regulatory, policy, fiscal barriers to circular economy activity in material flows. (to include opportunities and barriers to delivering a circular economy in Ireland for plastics that the project identifies).
- Identify opportunities to incentivise plastic recycling and the use of recycled plastic in the manufacturing sector.
- Develop visual tools, e.g. Sankey Infographic¹¹³ to display major transfers or flows within the system.

¹⁰⁹ <https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/>

¹¹⁰ <https://www.gov.ie/en/publication/7e05d-programme-for-government-our-shared-future/>

¹¹¹ <https://ec.europa.eu/environment/circular-economy/>

¹¹² https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

¹¹³

https://www.google.com/search?q=sankey+infographic&rlz=1C1GCEU_en&oq=Sankey&aqs=chrome.0.69i59j0i433j69i57j0l4j46i175i199j0l2.7668j0j15&sourceid=chrome&ie=UTF-8

- Organise a ‘material flows’ webinar for key stakeholders including policy makers and the manufacturing sector.

Interim deliverables to be submitted at Month 12:

- Interim Report A on the review of virgin plastics and secondary/recycled plastics flows.
- Interim Report B providing details with early findings on opportunities and barriers to delivering a circular economy in Ireland for plastics that the project identifies.

Topic Title:	The impact of increases in online sales associated with Covid-19 pandemic on national waste generation		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 15		
Project Type	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

Shopping patterns have changed since the Covid-19 Global pandemic with a growth in ecommerce and online sales¹¹⁴. Ireland is now generating 11,740 tonnes of packaging waste from online shopping per year, an increase of 17% from 2018¹¹⁵. Statistics from 2018 prior to the Covid-19 pandemic highlighted that there has been a considerable shift in consumer buying to the online marketplace in Ireland in recent years. Euromonitor international figures indicate that Irish consumers are one of the fifth biggest internet shoppers internationally¹¹⁶.

The packaging required for online products increases the need for more resources, which in the case of plastic packaging is fossil fuel based and an increase in packaging results in an increase in packaging that needs to be dealt with post purchase. Each EU member state is obliged to meet targets, set out in the EU Packaging and Packaging Waste Directive¹¹⁷, for the recycling and recovery of waste packaging made from glass, plastic, paper and board, metals and wood. Ireland met all targets for recycling and recovery of packaging waste in 2018. Ireland's recycling rate is 64% and the recovery rate is 91%. However, much higher EU recycling targets will apply from 2025 and 2030, which will be challenging for Ireland¹¹⁸. Ireland also has waste reduction targets that align with the National Waste Action Plan for a Circular Economy¹¹⁹, the EU Circular Economy Strategy¹²⁰ and the EU New Green Deal¹²¹.

Scope

Innovative research proposals are invited to

- Conduct a documentary review of statistics available for 'Online' sales in Ireland since the Covid-19 pandemic.
- Conduct a documentary review of packaging waste generated since March 2020 linked to Covid-19 restrictions. This review would provide information:
 - To extrapolate the carbon footprint e.g. raw material use associated with the packaging material associated with online purchases, i.e. the resources needed for the packaging.

¹¹⁴ https://unctad.org/system/files/official-document/dtlstictinf2020d1_en.pdf

¹¹⁵ <https://repak.ie/news-room/online-shopping-2019/#:~:text=29th%20November%202019%3A%20Ireland%20is,increase%20of%2017%25%20from%202018.&text=This%20figure%20is%20predicted%20to,the%20country%20from%20online%20purchases>

¹¹⁶ <https://www.euromonitor.com/ireland/country-factfile>

¹¹⁷ <https://op.europa.eu/en/publication-detail/-/publication/f8128bcf-ee21-4b9c-b506-e0eaf56868e6>

¹¹⁸ <https://eur-lex.europa.eu/eli/dir/1994/62/2015-05-26>

¹¹⁹ <https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/>

¹²⁰ <https://ec.europa.eu/environment/circular-economy/>

¹²¹ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

- On how the packaging waste was disposed of and the implications of the disposal option of the packaging e.g. plastic/cardboard/polystyrene.

Topic Title:	Critical raw materials for Ireland		
Call Topic Reference:	Facilitating a Green and Circular Economy 2021 Call Topic 16		
Project Type	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

One of the priority actions of the European Commission's Staff Working Document on Critical Raw Materials (CRM) in 2018 was to establish a list of CRMs at the EU level¹²². An objective of the EU's 8th Environment Action Programme¹²³ is "to turn the Union into a resource-efficient, green and competitive low-carbon economy". In this regard, it is important to identify those raw materials critical to the Irish economy and ensure that Ireland can move towards sustainable competitiveness through directing its efforts to protecting key natural resources, reducing waste, increasing recycling and consider substitution alternatives where possible. Furthermore, the EU Action Plan for the Circular Economy¹²⁴ that seeks to stimulate Europe's transition towards a circular economy acknowledges the importance of CRM to boost global competitiveness, foster sustainable economic growth and generate new jobs.

The main research question is to use the existing methodologies developed by the European Commission¹²⁵ to create a list of critical raw materials (CRM) for Ireland and to provide evidence to identify the non-energy extractive industry raw materials (NEEI-RM) that are critical to Irish industry. This study should focus on the needs of industry in Ireland based on (i) the last 5-10 years and (ii) estimated future needs and potential supply chains¹²⁶, if possible. The research should identify CRM for industrial uses in Ireland on the basis of sectors, e.g. electronic and electrical equipment, pharmaceuticals and chemicals, medical devices, manufacturing and refer to any existing databases.

Scope

Innovative research proposals are invited to:

- Provide a methodology Report: explaining the procedures used to develop the CRM list based where possible based on national datasets to the extent available.
- Prepare a CRM list for Ireland based on the methodology report.
- Conduct a review of 'Best Practice' with comparative EU countries and apply within an Irish context explaining the procedures used to develop the CRM list.
- Work with the Geological Survey Ireland to provide guidance to relevant stakeholders and recommendations for a national database.

Please note: It is expected that project will liaise with GSI in (i) the development of guidance to relevant stakeholders and (ii) making recommendations regarding the development of a national database.

¹²² <https://ec.europa.eu/transparency/regdoc/rep/10102/2018/EN/SWD-2018-36-F1-EN-MAIN-PART-1.PDF>

¹²³ <https://ec.europa.eu/environment/pdf/8EAP/2020/10/8EAP-draft.pdf>

¹²⁴ <https://ec.europa.eu/environment/circular-economy/>

¹²⁵ https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en

¹²⁶ For European examples of a similar study see:

https://rmis.jrc.ec.europa.eu/uploads/CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2020.pdf

Delivering a Healthy Environment

Topic Title:	Public exposure to NIR from major electricity infrastructure such as the Celtic Interconnector between Ireland and France		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 1		
Project Type:	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

The National Planning Framework 2040 (Objective 47) aims to secure Ireland’s electricity security through interconnections with other states. Interconnection infrastructure, such as the Celtic Interconnector, are relatively new to Ireland but are common throughout Europe. The Celtic interconnector is due to become operational in 2024/2025. Infrastructure used to transmit and distribute electricity emit a form of non-ionising radiation (NIR) known as extremely-low frequency (ELF) electric and magnetic fields (EMF). It is common for members of the public, especially those living near planned infrastructure, to be concerned about potential health effects from exposure to ELF-EMF. In 2019, the EPA was assigned responsibilities for public exposure to NIR under the Radiological Protection Act 1991 (Non-Ionising Radiation) Order 2019 (SI No. 190 of 2019). This includes ELF - EMF. Guidelines to limit the level of public exposure to ELF-EMF have been issued by the International Commission on Non-Ionizing Radiation Protection (ICNIRP, 2010)¹²⁷ and the European Commission (EU, 1999)¹²⁸. The World Health Organization (WHO) endorses the use of ICNIRP’s exposure limit recommendations. Typical exposure levels of the public to ELF-EMF tend to be below ICNIRP’s guidelines but this does not always allay people’s concerns.

Scope

This research project aims to gather information on the best available techniques and approaches to assess public exposure to ELF-EMF and potential health risks associated with major electricity infrastructure and techniques for dealing with related health queries from similar projects, internationally. The research will allow for the provision of the best evidence-based advice to the EPA and should assist in building capacity in EMF by promoting the development of expertise and research capacity to address knowledge gaps in relation to public exposure to NIR from ELF-EMF. Innovative research proposals are invited to:

- Undertake a literature review of available data on ELF-EMF public exposure from major electricity installations, including the collection or estimation of quantitative data through measurements or modelling.
- Provide recommendations for Ireland on specific measures that take account of those in place or envisaged for similar projects in other European countries.
- Critically evaluate the current requirements of ELF - EMF measurement / monitoring in Ireland.
- Conduct a comprehensive review of both Irish and EU best practice to consultation and engagement to address potential concerns/objections raised for similar projects.

¹²⁷ <https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf>

¹²⁸ <https://op.europa.eu/en/publication-detail/-/publication/9509b04f-1df0-4221-bfa2-c7af77975556/language-en>

Topic Title:	Chemical indicators datasets for Ireland		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 2		
Project Type:	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

Chemicals are an integral part of modern society and if developed and managed effectively can support a transition to a sustainable and circular society. At present there are significant environmental and health issues associated with both legacy and existing chemicals. Currently there is no national consolidated policy or strategy on chemicals, however the introduction of the EU Chemicals Strategy for Sustainability¹²⁹ (published in October 2020) highlights the potential benefits from development of a national strategic direction on managing the health and environmental risks associated with chemicals. The EPA State of the Environment Report 2020¹³⁰ and the EU Chemicals Strategy for Sustainability, highlight the need for a more integrated and cross-cutting approach to addressing the risks posed by chemicals. The recently approved EPA Strategy on Chemicals 2020¹³¹ explicitly proposes the development of national indicators on chemicals in support of a more coherent approach to chemicals risk management.

Scope

Innovative research proposals are invited to assist stakeholders in the development of a national indicator dataset on chemicals to inform any national strategic direction on chemicals for Ireland. In particular this research will need to:

- Undertake a full review of what datasets are available in Ireland/Europe to support the characterisation of the chemical burden on the environment and human health in Ireland.
- Develop a chemicals indicator dataset using existing information that allows measurement of progress and delivery of outcomes in achieving national objectives on chemicals and the risks which they pose to the environment and to human health.
- Identify the most significant data gaps in terms of being able to characterise the risks posed by chemicals in the environment in an Irish context, highlighting areas where additional reporting/recording of data is needed.
- Provide recommendations for a long-term chemicals' indicators datasets for Ireland.

This research project will support the implementation of the EU Chemicals Strategy in Ireland through the identification of baseline datasets and indicators. These datasets/indicators have the potential to provide a benchmark for implementation of the EU Chemicals Strategy in Ireland and to provide a mechanism for identifying key national issues measuring progress in reducing the risk associated with chemicals. The delivery of this proposed research is therefore an important step in identifying national actions to support reduced chemical burden on the environment and on human health. The

¹²⁹ https://ec.europa.eu/environment/strategy/chemicals-strategy_en

¹³⁰ <http://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-environment-2020---an-assessment---report.php>

¹³¹ Internal EPA document

research should also ensure linkage with other research topics in particular the topics Delivering a Healthy Environment 2021 Call Topic 5 and Delivering a Healthy Environment 2021 Call Topic 11.

This project should consider available information from the European Chemicals Agency, European Information Platform for Chemical Monitoring¹³² and the EEA European Environmental Health Atlas which is currently under development. The research should also look into relevant synergies/learnings from the ongoing EU research project HBM4EU¹³³.

¹³² <https://ipchem.jrc.ec.europa.eu/>

¹³³ <https://www.hbm4eu.eu/the-substances/pesticides/>

Topic Title:	Assessing the current state of knowledge of the potential impacts on health and wellbeing from exposure to odour from industrial and waste facilities		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 3		
Project Type:	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

Odours from EPA licenced facilities remain the single biggest subject of complaints received regarding EPA licenced sites. In 2019, the EPA received 300 complaints regarding odour, but in 2020 this figure increased to 683, which represents a 127% increase. Odour complaints are often accompanied by concerns from the public about the potential health impact of the odours. EPA licences tackle odour from an air quality and nuisance stance; however, they do not address or monitor the impact of odours from a health perspective. Odour nuisance may negatively affect human health and wellbeing, particularly if people are exposed for extended periods. The extent of this impact on people's health and wellbeing is currently not fully understood. Understanding the risks and impacts to our health from odour pollution exposure and identifying appropriate mitigation and behavioural responses is a knowledge gap that needs to be addressed urgently.

Scope

Innovative research proposals are invited to:

- Undertake a comprehensive review of current scientific literature in this area and provide an evidence base to appropriately inform the public on the health impact of odours coming from the types of facilities licenced by the EPA, in particular the food & drink, waste transfer sector, landfill, and agricultural sectors. This is to be submitted by Month 4.
- Identify international best practice from Europe, and also worldwide in dealing with this issue and apply within an Irish context.
- Provide a range of odour emission rates based on national and international data; including the individual components of emissions to atmosphere that cause odour from the different sectors.
- Conduct a review of the current state of knowledge in this field, to identify key knowledge gaps for potential future research.
- Provide recommendations and science-based advice on appropriate channels and format for communicating the information to the broader public.

Topic Title:	Review of emerging technologies / novel approaches for detection and quantification of the levels for Nitrogen Dioxide (NO ₂)		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 4		
Project Type:	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

While overall air quality in Ireland is good, as highlighted in the EPA State of the Environment Report 2020¹³⁴ there are still exceedances of nitrogen dioxide (NO₂) in some of our major urban centres and Ireland is not always meeting the World Health Organisation (WHO) guideline values for some air pollutants. Whilst Ireland has no obligation to meet WHO guidelines, the Clean Air for Europe CAFE Directive¹³⁵ is being reviewed and may possibly align with the WHO limit values. The EPA monitors air quality and implements the CAFE Directive, the Convention on Long Range Transboundary Air Pollution and the National Emissions Ceiling Directive (NECD)¹³⁶. The EPA Air Quality in Ireland 2019¹³⁷ report highlights that there was an exceedance of the EU annual average legal limit for NO₂ at one urban traffic station due to pollution from transport. There are indications that Ireland will exceed the EU limit values for NO₂ at further monitoring stations in the future and this needs to be addressed at various levels. In Ireland and in much of the EU, NO₂ is monitored by using a certified 'Indirect Monitoring' technique. The EU is currently reviewing the use of 'Direct Monitoring' techniques that measure only NO₂.

Research in emerging air quality monitoring technologies and novel approaches that are EU compliant could help further tackle Ireland's issues in relation to increases in air pollutants (existing and emerging) from transport that is resulting in exceedances in NO₂. Research would allow Ireland to explore mechanisms for achieving the highest international air quality standards. This research is considered an opportunity to improve monitoring and assessment, inform regulatory decision making, assist in the development of technologies and identify solutions to reduce unnecessary exposure to poor air quality, for Ireland.

Scope

Innovative research proposals are invited to:

- Provide recommendations for emerging and existing NO₂ direct measurements methods that are equivalent with the CEN Standard (EN14211:2012), i.e. method certification, equivalence and calibration.
- Conduct a comprehensive review of the prevalence of use of Direct Reference Method in other EU monitoring and compliance networks, comparable to Irish environmental conditions.
- Critically evaluate how these methods can be directly comparable with air quality limits and identify the advantages/disadvantage in an EU context such as:
 - data discrepancies between reference methods including measurement of uncertainty
 - effects of metrological conditions and other interfering components

¹³⁴ <http://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-environment-2020---an-assessment---report.php>

¹³⁵ <https://eur-lex.europa.eu/eli/dir/2008/50/oj>

¹³⁶ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.344.01.0001.01.ENG&toc=OJ:L:2016:344:TOC

¹³⁷ <http://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2019.php>

- compatibility with current IT software systems
- Provide technical practicalities and financial implications of the monitoring method, including compatibility with the systems used by the EPA¹³⁸.
- Explore 'Best Practice' opportunities in Europe and apply to an Irish context, with respect to technologies to reduce air pollution compliant with EU obligations.

¹³⁸ The EPA uses Envista ARM software to retrieve the data from the sites and to process data from the EPA Air Quality Ambient monitoring network.

Topic Title:	An assessment of hazardous chemicals present in sediment and soil in Ireland		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 5		
Project Type:	Medium Scale Project		
Maximum Budget:	€350,000	Maximum Duration:	36 months
Co-funded by: Department of Agriculture, Food and the Marine			

Background

The impact of chemicals (both legacy and emerging) in the environment on our health and wellbeing is currently not fully understood, especially with respect to mixtures of chemicals and the human exposure pathways for these substances. The EPA State of the Environment Report 2020¹³⁹ and the EU Chemicals Strategy for Sustainability¹⁴⁰ both summon the need for a much more integrated policy approach to address the complex risks posed by chemicals. While the EPA operates a well-established and comprehensive Water Framework Directive (WFD)¹⁴¹ programme for surface and transitional water monitoring including biota, there is a gap regarding sediment analysis. Sediment has been identified as a target matrix for some Priority (Hazardous) Substances and Watch List substances. In addition, some of these Persistent, Mobile and Toxic (PMT) hydrophobic compounds tend to partition to sediment including sewage sludge and may have an adverse impact on the reuse of sewage sludge from an agricultural perspective (e.g. PFAS, pyrethroids, UV filters/sun-screen agents, heavy metals, flame retardants, PCBs, antimicrobial resistant (AMR), anti-parasitic residues (AP) etc.). Such substances have the potential to be re-mobilised in the environment after flood and storm events which are increasing due to climate change.

The proposed research project should provide a status update on chemicals in Irish sediments and soils, with a focus on potential hot-spots (e.g. Waste Water Treatment Plants (WWTP) outfalls, harbour areas, agricultural areas where sewage sludge is applied) to assist in the evaluation of the effects of material that accumulates or is disposed of in the environment. The analysis of biosolids derived from secondary or tertiary WWTPs could also be included in the scope. Proposals should also ensure linkage with other research topics in this call such as Delivering a Healthy Environment 2021 Call Topic 2 and Delivering a Healthy Environment 2021 Call Topic 11.

Scope

Innovative research proposals are invited to:

- Identify areas of concern and areas where additional effort is needed, such as increased intensity of sediment, biota, or water monitoring or direct soil measurements, by undertaking an initial screening of hazardous chemicals in sediments and soils.
- Provide a comprehensive Irish survey of hazardous chemicals and substances in sediment and/or soil including sufficient data for reliable long-term trend analyses of those priority substances that tend to accumulate in sediment. This should be finalised by Month 24.

¹³⁹ <http://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-environment-2020---an-assessment---report.php>

¹⁴⁰ https://ec.europa.eu/environment/strategy/chemicals-strategy_en

¹⁴¹ <http://www.epa.ie/our-services/monitoring--assessment/freshwater--marine/water-monitoring-and-assessment-/>

- Assist in establishing the development of a prioritisation list of potential hot-spots in sediment and/or soil for future assessment and to inform for example National Action Plans and monitoring programmes.
- Undertake a full review of best practice in other European countries such as the 'Information Platform for Chemical Monitoring'¹⁴² the ongoing EU research project HBM4EU.¹⁴³ This review should be submitted by Month 12.

The research must build on findings and outputs from previous research on biosolids, sediments, other EPA monitoring programmes and utilise where relevant the National Soil Database¹⁴⁴.

¹⁴² <https://ipchem.jrc.ec.europa.eu/>

¹⁴³ <https://www.hbm4eu.eu/the-substances/pesticides/>

¹⁴⁴ <https://data.gov.ie/dataset/national-soils-database>

Topic Title:	Research in support of the Industrial Emissions Directive (IED) Review Process		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 6		
Project Type:	Medium Scale Project		
Maximum Budget:	€350,000	Maximum Duration:	24 months

Background

The Industrial Emissions Directive (IED)¹⁴⁵ is the main EU instrument regulating pollutant emissions from industrial installations in order to achieve a high level of protection of the environment. The European Commission is committed to reviewing the IED under the European Green Deal¹⁴⁶. The IED review aims to support the European Green Deal goals on zero pollution, climate neutrality, biodiversity and a cleaner, more circular economy. In parallel, the Industrial Strategy for Europe highlights the need for new processes and technologies, innovation and investment to facilitate industry's shift to a climate neutral, clean and circular economy. The revised IED Directive is due in 2022/2023. It is likely that new sectors will be required to be licensed under the IED; some of whose environmental impacts are not well understood at present. Ireland needs to be ready to react in a timely manner to such changes with sound evidence-based knowledge.

Scope

This proposed research is required in the context of the ongoing process to assess options for amendments of the Industrial Emissions Directive (IED). The study goal is to understand what the current structure of a number of sectors is (e.g. Intensive Cattle rearing, Mining/Quarrying, Aquaculture and Battery Production), including evaluating emissions to the environment from these sectors from an Irish Context. In addition, there is potential changes to the existing IED licensing thresholds for a number of sectors (Large Combustion Plants (LCP), Pigs, Poultry). The proposed research should aim to provide a status update on key licencing aspects, changes to thresholds and emerging sectors being proposed in the reviewed IED and the impacts this will have for Ireland.

Innovative research proposals are invited to:

- Establish the current state of knowledge/ literature in this field, to identify key knowledge gaps for potential new unlicensed sectors in Ireland. This should be submitted by Month 12.
- Provide a full review of the key licencing aspects, changes to thresholds and emerging sectors being proposed in the reviewed IED and the impacts this will have for Ireland. This should be submitted by Month 18.
- Conduct a comprehensive review of best practice with comparative EU countries and apply within an Irish context. This should be submitted by Month 24.
- Undertake a critically evaluation of the impact of these changes and how to apply new requirements to these sectors, by ground truthing on selected Irish sample sectoral sites /case studies to pilot.
- Provide advice on the appropriate channel and format for communicating the information to the new sectors identified and the broader public.
- Prepare a suite of fact sheets for various sectors.

¹⁴⁵ <https://ec.europa.eu/environment/industry/stationary/ied/legislation.htm>

¹⁴⁶ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

Topic Title:	An international best practice review of the localised and wider pollutant contribution of large railway hubs on air quality, in large urban centres		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 7		
Project Type:	Medium Scale Project		
Maximum Budget:	€350,000	Maximum Duration:	36 months
Co-funded by: Department of Transport			

Background

The European Environment Agency (EEA) estimates show that more than 400,000 premature deaths are attributable to poor air quality in Europe annually¹⁴⁷. In Ireland, the number of premature deaths attributable to air pollution is estimated at 1,300 people. The WHO has described air pollution as the 'single biggest environmental health risk'. The EPA Air Quality in Ireland 2019 report¹⁴⁸ also highlights exceedance trends in our air quality that need to be addressed at various levels. Much of Ireland's increasing levels of high density residential urban centres, are located near major transport centres, such as rail. The impact on the localised air quality in such areas, and in turn on the health and wellbeing of those living in these areas is not yet known. Emissions from diesel trains and the concentration of traffic at railway hubs have the potential to cause elevated levels of air pollutants locally, but there are data gaps in research to the situation at Irish railway hubs. It is important to fill this research gap because due to the impact of air pollution on human health and to support current and future plans to address pollutant concentrations in urban areas.

Scope

This innovative research project will gather information on the best international practice in assessing the impact of rail emissions at large railway hubs and the impact on the localised air quality in high density residential/urban centres. It will allow the provision of the best evidence-based advice to the public and other stakeholders. The proposed research project should also ensure alignment with the Urban Transport-Related Air Pollution (UTRAP) Working Group process.

Innovative research proposals are invited to:

- Undertake a comprehensive review of best EU practice and apply to Irish data on how to mitigate against/reduce high contributions of harmful emissions¹⁴⁹.
- Apply this assessment of best international practice to Ireland by ground truthing on selected Irish sample sectoral sites/case studies to pilot. This should be submitted Month 18.
- Provide an assessment of the impact on the localised air quality in high density residential/ urban centres from rail hubs.
- Provide recommendations on how to reduce the potential impacts of rail on localised air quality.

¹⁴⁷ <https://www.eea.europa.eu/publications/air-quality-in-europe-2020-report>

¹⁴⁸ <http://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2019.php>

¹⁴⁹ Such practice needs to be comparable with an Irish context and ensure compliance with EU air quality standards.

Topic Title:	What are the feasible and sustainable nature-based options that can be developed further to achieve zero discharge and minimise the adverse impacts on water quality from domestic wastewater discharges?		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 8		
Project Type:	Medium Scale Project		
Maximum Budget:	€350,000	Maximum Duration:	36 months

Background

The 2021 Code of Practice for Domestic Waste Water Treatment Systems (Population Equivalent ≤ 10)¹⁵⁰ provides guidance on the site characterization, design, operation and maintenance of domestic waste water treatment systems. Domestic wastewater discharges are impacting groundwater and surface water quality, particularly in areas of low soil permeability, and are impacting on the delivery of River Basin Management Plan (RBMP) objectives. The application of zero discharge nature-based solutions (NBS) as part of sustainable domestic wastewater treatment have the potential to form an integral solution nationally and make a considerable impact on water quality and the delivery RBMP objectives. Further investigation into NBS that can minimise environmental impact and deliver RBMP objectives, that would facilitate sustainable rural communities, is needed. Mitigation of environmental degradation caused by domestic wastewater discharges will help deliver national obligations under the Water Framework Directive (WFD).

This research is required to advance the management practices for domestic wastewater discharges in areas with low soil permeability where there are higher risks of resulting deterioration in groundwater and surface water quality. The output from this research project should provide empirical evidence of the applicability or not of zero discharge nature-based solutions in the management of domestic wastewater discharges into the environment within Ireland's climatic conditions.

Scope

Innovative research proposals are invited to:

- Establish the current state of knowledge/literature in this field. This should be submitted by Month 12.
- Provide science-based evidence into whether nature-based solutions can provide sustainable solutions to domestic wastewater discharges.
- Assess the ability of nature-based solutions to provide zero discharge solutions (such as zero discharge willow beds) year-round under Irish conditions.
- Undertake a critical evaluation of the cost effectiveness of such nature-based solutions. This should be submitted by Month 24.
- Provide recommendations on long-term management requirements of such nature-based solutions.

Interim deliverables to include:

- State of knowledge/literature review by Month 12

¹⁵⁰ <http://www.epa.ie/publications/compliance--enforcement/waste-water/2021-code-of-practice-for-domestic-waste-water-treatment-systems.php>

- Interim Report detailing the critical evaluation of the cost effectiveness of such nature-based solutions by Month 24.

This research must align with the requirements of the EPA 2021 Code of Practice for Domestic Waste Water Treatment Systems and must build upon previous and existing research in this area, such as assessments of disposal options for treated wastewater from single houses in low permeability subsoils¹⁵¹.

¹⁵¹ <http://www.epa.ie/publications/research/water/research-161---assessment-of-disposal-options-for-treated-waste-water-from-single-houses-in-low-permeability-subsoils.php>

Topic Title:	Impact of Irish agricultural activities on air quality in Ireland particularly in relation to the contribution of secondary particulate matter (PM _{2.5}) and its association with ammonia levels		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 9		
Project Type:	Medium Scale Project		
Maximum Budget:	€350,000	Maximum Duration:	36 months
Co-funded by: Department of Agriculture, Food and the Marine			

Background

In Ireland, the number of premature deaths attributable to air pollution is estimated at 1,300 people¹⁵². Particulate matter (PM) – PM_{2.5} concentrations are of particular concern in Ireland, levels of PM_{2.5} are above the WHO air quality guideline values. Bringing the PM levels down below the WHO guideline values will be a challenge, requiring co-operation across a number of sectors. The potential impact, if any, of the recent increase in agricultural activities in Ireland on air quality, in relation to the levels of ammonia and the role it plays as a significant precursor for secondary PM, but in particular their transformation into PM, and transportation of this, is unknown.

The knowledge gap that exists for the potential impact air quality impacts of agricultural activities (which is an increasing sector), with regard to ammonia and PM, and in turn our health and wellbeing needs to be addressed as a matter of urgency.

There are limited data for secondary PM_{2.5} within an Irish context, where there are significant ammonia emissions from the agricultural sector. Research in this area will provide a greater understanding of the Irish context of agricultural activity and air quality (both urban and rural). Detailed research in this area should also inform policy development, source apportionment, assist modelling and address knowledge gaps in a national context.

Scope

Innovative research proposals are invited to:

- Undertake a comprehensive assessment of the overall impact of agriculture on urban and rural air quality.
- Conduct analysis and measurements of ammonia and PM (including chemical speciation);
- Assess the contribution of agriculture to secondary PM_{2.5} formation to include:
 - transportation pathways
 - a breakdown of impacts of different agricultural activities and sectors
 - spatially resolved estimates of ammonia and secondary and primary PM from each sector
- Provide a suite of recommendations based on international best practice, in the context of reviewing Irish data for proposed actions¹⁵³ to reduce the impacts of agriculture on urban and rural (localised) air quality.

Interim deliverables to include: Interim Report on progress submitted by Month 18.

¹⁵² <http://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2019.php>

¹⁵³ Examples such as the measures included in “Ag Climatise – National Climate & Air Roadmap for the Agriculture Sector” are implemented.

Topic Title:	VTEC - Addressing the challenges it poses to our waters and health & wellbeing.		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 10		
Project Type:	Large Scale Project		
Maximum Budget:	€500,000	Maximum Duration:	48 months

Background

It is well known that the levels of Verocytotoxigenic Escherichia coli (VTEC) in Ireland are one of the highest reported in Europe EPA Report 2020 ‘Focus on Private Water Supplies’¹⁵⁴. With an estimated 30% of the household wells in Ireland being contaminated by E. coli (VTEC is a pathogenic, form of E. coli) its transmission is considered zoonotic arising from animal or human waste and the HSE also reporting increased cases of related VTEC cases. The challenge of VTEC is a major issue which will require a multidisciplinary and holistic approach, to address the challenges it poses to our waters and health & wellbeing.

This large-scale project should apply a ‘One Health’ approach, at catchment level and addressing it from a multidisciplinary and transdisciplinary perspective. The sources are known, therefore this research is needed, in the medium-term and longer-term to better understand the significant impact of substances such as VTEC and how it is transported in our environment, as well as developing methods on how to manage, mitigate and regulate them in terms of their impacts on the aquatic ecosystems, environment and our health.

Scope

Innovative research proposals are invited to:

- Improving our knowledge of the fate and transport pathways of VTEC, in the environment, from point and diffuse pollution sources.
- Provide recommendations on how to detect, monitor and regulate for VTEC effectively in our aquatic ecosystems and our drinking water supplies.
- Provide a suite of methods on how to ‘break’ the pathway from source to receptor.
- Develop a set of risk assessment tools to comply with the new Drinking Water Directive.
- Assist in strengthening current measures and introduce novel mitigation measures that can be applied at catchment level.

Interim deliverables to include: Annual Interim Reports to be submitted by Month 12, Month 24 and Month 36, highlighting progress status of all aspects of the research detailing what progress is being made and what the data is demonstrating.

This research must build on national and international research and apply within an Irish context. Such research should be utilised by this research to provide a or guide in the identifying further potential test sites and tools to validate the risk assessment requirements needed for Ireland to ensure compliance with the new Drinking Water Directive¹⁵⁵.

¹⁵⁴ <http://www.epa.ie/publications/compliance--enforcement/drinking-water/annual-drinking-water-reports/focus-on-private-water-supplies-2019.php>

¹⁵⁵ https://ec.europa.eu/environment/water/water-drink/legislation_en.html

Topic Title:	Assessment of Manganese in our Aquatic Environment & the Impact on Drinking Water Supplies.		
Call Topic Reference:	Delivering a Healthy Environment 2021 Call Topic 11		
Project Type:	Medium Scale Project		
Maximum Budget:	€350,000	Maximum Duration:	36 months

Background

Elevated levels of manganese in drinking water sources (Lakes) in Cavan and Monaghan have presented treatment difficulties to both Irish Water and the National Federation of Group Water Schemes (NFGWS). During 2020 water restriction notices were put in place on two supplies when levels of up to 1000 ug/L in the raw water sources meant treatment systems for manganese removal were overwhelmed. Water restriction notices are onerous as elevated levels of Manganese cannot be addressed by boiling the water, and alternative drinking water supplies must be put in place until drinking water plants have returned to satisfactory operation. Irish Water have undertaken preliminary investigations with monitoring of the raw water sources, but numerous questions remain and would benefit from additional assessment and research into increasing our understanding and fill this existing knowledge gap.

Chemicals such as Manganese in our environment presents a significant risk to both natural ecosystems and human health. An understanding of the fate and transport of this substance in our environment is critical, not only from a drinking water perspective, it will also support aligning with new EU Drinking Water Directive coming into force in 2023, the Water Framework Directive (WFD), the EU Chemicals Strategy for Sustainability and the EPA Strategy on Chemicals 2020¹⁵⁶.

Scope

This research should assist in developing solutions to address this major issue in our drinking water supplies and environment. Innovative research proposals are invited to:

- Identify catchment activities, including licensed activities (intensive agriculture) that may present as sources and/or pathways of Manganese in the environment.
- Assess and characterise the water chemistry in the raw water sources, in particular the various states of Manganese in the raw water and whether nutrients, dissolved oxygen, temperature and climate factors, algal blooms, intensive licenced activities and assess if these components are playing a role in the elevated levels seen in these raw water sources.
- Conduct a comprehensive review of international best practice and research.
- Undertake a review of existing data (such as Irish Water and NFGWS and any other relevant available data etc.)¹⁵⁷;
- Provide an analysis of sampling results over an extended period to examine seasonal climate effects.
- Provide recommendations for a sampling and monitoring plan across seasons and climates to assess and monitor raw water conditions, within an Irish context.

¹⁵⁶ Internal EPA document

¹⁵⁷ Irish Water and the National Federation of Group Water Schemes have confirmed their support for this research, including sharing of their data and allow access to sites.

Interim deliverables to include: Annual Interim Reports to be submitted by Month 12, Month 24 and Month 36, highlighting progress status of all aspects of the research detailing what progress is being made and what the data is demonstrating.

The research should also consider available information from the European Information Platform for Chemical Monitoring¹⁵⁸ and the EEA European Environmental Health Atlas which is also currently under development.

The research should also look into relevant synergies/learnings from the ongoing EU research project HBM4EU¹⁵⁹. It should also ensure linkage with other research topics in this call such as Delivering a Healthy Environment 2021 Call Topic 2 and Delivering a Healthy Environment 2021 Call Topic 5.

¹⁵⁸ IPCHEM <https://ipchem.jrc.ec.europa.eu/>

¹⁵⁹ <https://www.hbm4eu.eu/>

Protecting and Restoring our Natural Environment

Topic Title:	Age dating of Irish groundwaters to inform more accurate prediction of the movement of nitrate in groundwater with the goal of improving water quality		
Call Topic Reference:	Protecting and Restoring our Natural Environment 2021 Call Topic 1		
Project Type:	Large Scale Project		
Maximum Budget:	€500,000	Maximum Duration:	48 months
Co-funded by: Geological Survey Ireland			

Background

Concentrations of nitrate in groundwater are increasing. The EPA 2019 Indicators Report (EPA 2020)¹⁶⁰ indicated that over a fifth (22%) of groundwater sites had concentrations greater than 25 mg/l NO₃ (considered as a high nitrate concentration). This is an increase of 5.2% of sites since 2018. In addition, almost half (49%) of groundwater sites over the period 2013 to 2019 had increasing nitrate concentrations. There is limited data available on the age of Irish groundwaters and the interpretation of groundwater behaviour would be enhanced by having groundwater age information available. This is particularly relevant to the movement of nitrate in the water environment. Knowing the age of groundwater would, enable an improved understanding of the 'lag time' it takes for nitrate to move from the ground surface to groundwater, and also to associated surface waters. The present level of understanding means that there are uncertainties in predicting nitrate levels in groundwater and associated surface waters. Being able to accurately predict the movement of nitrate in groundwater would enable, for example, the effects of changes in agricultural practices on nitrate water quality to be predicted and evaluated. Thus, better management practices could be implemented with the goal of improving water quality. It has been argued that due to long lag times in Irish groundwater, rapid changes in nitrate levels in groundwater would not be expected from changes in agricultural practices. However, the assumption of long lag times is disputed, and in some vulnerable areas lag times may be quite short i.e. months to a year or two. Short lag times imply a greater vulnerability of groundwater to practices which use excessive nitrate, and thus different measures would be needed in such areas to reduce migration of nutrients to groundwater. Isotopic analysis and age dating are not widely developed in Ireland, and this knowledge gap needs to be addressed.

Scope

The outputs from the project will primarily be applied in the characterization of groundwater pressures for after the third cycle of the WFD, post 2027 (and reporting on such) under WFD and specifically under the EU Environmental Objectives (Groundwater) (Amendment) Regulations 2016.

A better understanding will enable more targeted WFD programmes of measures (POMs) to be implemented with the goal of improving water quality. The outputs would also be used to refine the status assessments for water after the third cycle post 2027 under WFD. It should also inform concentrations of nitrate above the safe Irish Drinking Water Standard of 50 mg/l as nitrate is a key metric and will also inform the Nitrates Directive with regard to nitrogen applications.

¹⁶⁰ <http://www.epa.ie/publications/monitoring--assessment/freshwater--marine/water-quality-in-2019.php>

Innovative research proposals are invited to:

- Include sampling of deeper-lying groundwater systems.
- Develop a dataset of groundwater ages for representative hydrogeological settings, and changes with vertical profiles across Ireland. Such hydrogeological settings should include a range of soil drainage types, subsoil permeabilities and subsoil thicknesses, aquifer types and pathway types.
- Undertake a comprehensive review on age dating methodologies of nitrate in groundwaters.
- Provide an estimation of the lag times in different hydrogeological settings across Ireland.
- Quantify the pathways to establish how groundwater flow is distributed across different pathways, which is important to establish a full picture of groundwater flow so that impacts of, for example, nitrate on receptors can be established.

It is a requirement that the data and outputs being collated by the research is compatible with the existing EPA Groundwater database and in a format, which can be easily included into the existing database.

Topic Title:	Landscapes, catchments and ecosystems: bringing together knowledge and practice from a range of spatial scales to inform policy		
Call Topic Reference:	Protecting and Restoring our Natural Environment 2021 Call Topic 2		
Project Type:	Medium Scale Project		
Maximum Budget:	€200,000	Maximum Duration:	24 months
Co-funded by: Department of Agriculture, Food and the Marine			

Background

The EPA State of the Environment Report 2020¹⁶¹ calls for improved policy coordination “a single overarching policy position - a vision to protect Ireland’s environment into the future”. Research in this area should assist in developing and adopting a toolkit for integrating EPA and other key environmental datasets (historic, present and possibly future projections) into a coherent national landscape characterisation process and in turn facilitate enhancing, restoring and improving our habitats. Historical landscape characterisation processes and outputs could also be used to help develop the evidence base on the past baseline health of ecosystems and assist in avoiding ‘shifting baseline’ syndrome. For environmental schemes (e.g. local agri-environment initiatives through the reformed Common Agricultural Policy (CAP) programme now incorporating the Rural Development Programme) and/or conservation planning it is important to define what sort of measures are eligible for support or are achievable through improved management, and how these mechanisms could be harnessed to manage pressures for change in ways that maintain historic landscape character, which may also achieve desirable goals for wider landscape and nature conservation with associated environmental dividends. By complementing Gross Domestic Product (GDP) with statistics from the System of Integrated Environmental and Economic Accounting (UN-SEEA) and ongoing research in Natural Capital Accounting, policymakers will be able to make better economic decisions about natural resources and ecosystems. This research should highlight the real benefits in articulating how we assure environmental protection through landscape considerations (beyond visual amenity) and will be multidisciplinary, ideally to include environmental planners, landscape expertise and ecologists.

Scope

Innovative research proposals are invited to:

- Review and analyse existing national landscape characterisation processes and assessments.
- Build on existing methodologies and/or develop a toolkit to assist landscape characterisation for landscape protection, management and planning. The latest the state of the art of Irish environmental data and knowledge should be used to examine synergies and gaps at different spatial planning scales (national, regional, county, landscape, catchment etc) and how to integrate the latter at landscape scale.
- Using the best available data, GIS based database, decision-making tools undertake a pilot application of the tool kit and methodology.
- Provide recommendations on how to incorporate the natural environment into such processes.
- Identify and develop means for coherent and long-term knowledge transfer between the different disciplines involved in this work, including a resource assessment for training needs.

¹⁶¹ <http://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-environment-2020---an-assessment---report.php>

The research should build on national¹⁶² and international research/work and apply within an Irish context. The research should include consideration of the ongoing National Land Cover mapping work currently been undertaken by EPA and Ordnance Survey Ireland (OSi).

¹⁶² For example Marine Institute's Seascapes <https://emff.marine.ie/blue-growth/definition-and-classification-ireland> Local Authority Landscape assessments and [Landscape and seascape character assessments - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/landscape-and-seascape-character-assessments)

Topic Title:	Development of a toolkit for <i>ex ante</i> and <i>ex post</i> analysis of public spending on restoration for nature, of derelict or former industrial lands, including placemaking projects in our communities		
Call Topic Reference:	Protecting and Restoring our Natural Environment 2021 Call Topic 3		
Project Type:	Medium Scale Project		
Maximum Budget:	€200,000	Maximum Duration:	24 months

Background

The EPA State of the Environment Report 2020¹⁶³ states that nationally, Ireland needs to intensify its efforts to protect nature. Many communities and businesses have taken opportunities to create more people and biodiversity friendly spaces in our cities, towns, villages and countryside, through restoration or rehabilitation projects¹⁶⁴. There are now greater opportunities to reimagine and retrofit these often impaired and/or derelict spaces and Local ‘placemaking’ projects also have potential to bring about benefits for communities and the environment. Public funding is frequently discharged in supporting such interventions. The National Planning Framework ‘Ireland 2040 Our Plan’¹⁶⁵ also looks to prioritise development and regeneration of brownfield over greenfield conversion, where possible.

Research in this area will look at initiatives ‘before and after’ investment, through lenses of impacts on environmental quality, nature, human health/wellbeing and social capital benefits (including equity), and through this analysis will develop a framework to undertake a fully integrated *ex post* assessment beyond economic and biodiversity boundaries, for such investments. The methodology will leverage the developing natural capital accounting applications and how these might be applied to people and biodiversity friendly restoration/rehabilitation projects undertaken on derelict/impaired spaces. Such *ex ante* and *ex post* analysis of these evaluation methodologies should also ensure that it will be of benefit and used by policymakers. Selected Irish sample sites for testing this *ex post* analysis framework will be drawn from publicly funded projects on impaired lands in urban, coastal and rural settings.

Scope

Innovative research proposals are invited to:

- Undertake a cost benefit analysis of the investment in both placemaking and biodiversity projects.
- Examine best practice and initiatives, including technical/capital supports utilised with comparative countries and apply (assessing transferability) within an Irish context.
- Conduct a comprehensive review of current evaluation methodologies and develop evaluation methodologies to assess the beneficial environmental quality, nature, social and health impacts from these protective and restorative projects.
- Examine the governance hierarchy in place, to understand where best this research can inform ground truthing at appropriate scale.
- Ground truthing on selected Irish sample case studies to pilot evaluation methodologies and to evaluate the impact of these projects by undertaking *ex anti* and *ex post* assessment of the

¹⁶³ <http://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-environment-2020---an-assessment---report.php>

¹⁶⁴ Peatland rehabilitation of the former Bord Na Mona peatlands, should not be included in proposals.

¹⁶⁵ <https://npf.ie/>

methodology in terms of environmental/nature/social placemaking in urban areas that involve brownfield derelict land opportunities and in selected specific biodiversity placemaking projects.

Topic Title:	Enhancing public awareness and engagement in SEA and the development of specific criteria to inform both policy development and implementation/monitoring in order to maximise the effectiveness of the SEA process		
Call Topic Reference:	Protecting and Restoring our Natural Environment 2021 Call Topic 4		
Project Type:	Medium Scale Project		
Maximum Budget:	€250,000	Maximum Duration:	24 months
Co-funded by: The Office of the Planning Regulator			

Background

The EPA State of the Environment Report 2020¹⁶⁶ calls for an “Environmental Policy Position for Ireland’s environment” reinforced through an integrated national policy position on protecting Ireland’s environment. Effective Strategic Environmental Assessment (SEA) is only as good as the ‘buy in’ from communities and plan makers and statutory authorities must ensure high quality SEA is undertaken and related environmental objectives can be delivered. How can effective and meaningful SEA that is aligned with the main drivers identified in the SEA Action Plan 2021-2025 be delivered? While consultation carried out at the plan/SEA level complies with the relevant legislation, there are opportunities to enhance its effectiveness and the level of public participation and engagement. By improving understanding of SEA, maximising the level of participation and engagement in the process, there is an opportunity to allay concerns that often manifest in objections and legal challenges at later stages in plan implementation and at project/EIA level (e.g. road projects, flood relief schemes, wind energy projects etc.). How can this be improved?

Scope

This research will advance the effectiveness of SEA in protecting the environment and promoting sustainable development by applying Key Performance Indicators (KPIs) at three key stages – the process including SEA consultation and participation, SEA outputs and SEA outcomes. Having an established and robust set of national KPIs will lead to better high-quality plans, that in turn will ensure more effective implementation of plans and programmes against a common set of SEA criteria. These criteria will be developed by the research and can be used for ex-post analysis of SEA practice and ensure more meaningful monitoring and review processes of both the SEA process and the associated plan/programme. The project will be solution-focused and develop a series of practical recommendations. Innovative research proposals are invited to:

- Identify successful novel approaches/best practice (both national and international) to SEA and other consultation and engagement and explore how to apply these within an Irish context.
- Provide recommendations for different levels of consultation aligned with different sector plans and plans in the planning hierarchy, that could inform the development of guidance on public participation. A report should be delivered at Month 12.
- Critically evaluate the current preliminary SEA KPIs.
- Pilot KPI development and application across the planning hierarchy at local, regional, national level and selected key sectoral plans. Particular emphasis should be placed on the use of KPIs in consideration of cumulative effects, which often presents as an obstacle at later stages of implementation. A short report outlining this piloting should be delivered at Month 18.

¹⁶⁶ <http://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-environment-2020---an-assessment---report.php>

- Develop a robust framework of specific SEA criteria that can be used for an ex-post analysis of SEA practice and inform the monitoring and reviews of plans and programmes.

Interim deliverables to include:

- Interim Report on recommendations for different levels of consultation aligned with different sector plans and plans in the planning hierarchy, by Month 12
- Interim Report detailing the piloting of KPI development and application across the planning hierarchy at local, regional, national level and selected key sectoral plans by Month-18.

Topic Title:	Water quality improvements arising from the enhanced restoration		
Call Topic Reference:	Protecting and Restoring our Natural Environment 2021 Call Topic 5		
Project Type:	Large Scale Project		
Maximum Budget:	€500,000	Maximum Duration:	48 months

Background

The state is investing over €100 million in a large-scale peatlands' restoration project. Additionally, Bord na Mona and other state bodies have been awarded €9.9million under the EU LIFE Programme Peatlands & People project (<https://peatlandsandpeople.ie/>). It will be the largest wetland restoration project ever undertaken in the EU and naturally has significant potential to address climate and biodiversity ambitions nationally. It is expected that there will be significant water quality benefits with ammonia, dissolved organic carbon and sediment losses from peatlands greatly reduced. Approximately 28,000 ha of former cutover and cutaway peatlands are included in the restoration and rehabilitation schemes with a further 5,000ha that are currently undergoing restoration/rehabilitation.

The research will run in parallel with the works on the Peatlands Climate Action Scheme (PCAS) for enhanced rehabilitation on 33,000 ha of bogs owned by Bord na Mona and licenced under nine bog groups by the EPA¹⁶⁷. Under this scheme the licensee has committed to increased frequency of monitoring to monthly and an additional suite of parameters from those in the licence to include dissolved organic carbon. This project will provide independent assessment of the PCAS work and supplement (not replace) the ongoing work and the data available being monitored and collated.

Scope

Innovative research proposals are invited to:

- Review the 33,000ha (28 kha + 5kha) of peatlands being included in the enhanced restoration/rehabilitation programme and select a minimum of five candidate areas/catchments that are representative of the range of considered challenges across the candidate lands¹⁶⁸ (cutover, cutaway, drained, sensitivity, and type of restoration/rehabilitation proposed, etc)¹⁶⁹.
- Deliver recommendations for any changes in management and execution of the enhanced restoration programme (5 to 10-year lifecycle and beyond if required) as this may deliver better outcomes for study catchments or situation types.
- Assess existing monitoring infrastructure and arrangements in the five candidate study areas, recommend amendments to infrastructure as may better inform evaluation of the long-term impact of the enhanced restoration/rehabilitation of the former worked peatland areas.
- Profile the water quality and flows pre- and post-completion of the enhanced restoration/rehabilitation works in the candidate sites.
- Assess, measure and evaluate the water quality, focussing on ammonia, sediment, dissolved organic carbon and alteration to flows, including channel bed and substrate in terms of potential

¹⁶⁸ This could include adjacent lands activity that may be undermining the restoration efforts.

¹⁶⁹ Note these candidate sites should only be selected from the 10,000ha included in the LIFE project but are required to be representative of the 33,000ha.

recovery of heavily sedimented reaches and recovery and riparian condition from the peatlands being restored/rehabilitated¹⁷⁰.

- Provide an evaluation of the benefits, co-benefits, and any disbenefits, associated with water quality improvements and alterations to catchment flows (including scaled-up potential for the entire landbank). Benefits should include those for water quality/quantity, social and wider environmental, climate, biodiversity with the research availing of supporting research where available, e.g. natural capital accounting.

Interim deliverables to include: Interim Reports providing a short update on all aspects of the research (highlighting what progress is being made and what the data is demonstrating) at Month 18 and Month 36.

The research should work in parallel, ensuring synergies and added value with the three Climate Fellowships that are supporting the Climate Change research elements - Analysis of terrestrial GHG emissions and removals and wider impacts of land management and peatland restoration on Ireland's Carbon and Nitrogen Cycles.

- Addressing Climate Change Evidence Needs 2021 Call Topic 1 Fellowship 1. Carbon Dioxide
- Addressing Climate Change Evidence Needs 2021 Call Topic 2 and Nitrogen Cycles. Fellowship 2. Methane
- Addressing Climate Change Evidence Needs 2021 Call Topic 3 Fellowship 3. Nitrous Oxide

Research in this area must build on extensive and existing peatland research (both national and international)¹⁷¹. Proposal should ensure no duplication with ongoing Peatlands Climate Action Scheme (PCAS)¹⁷² work but complement this. It is expected the research project should have full access to data and instrumentation already in place / or to be put in place by Bord na Mona¹⁷³ and National Parks and Wildlife Service. Proposals should ensure the use of such water quality baseline data already in place and in combination with their own data and will support Water Framework catchment management ambitions.

¹⁷⁰ This should include downstream monitoring locations and significant pressure sites under WFD, as identified as by EPA Catchments and LAWPRO.

¹⁷¹ EPA Research Database <https://eparesearch.epa.ie/smartsimple>

¹⁷² <https://www.bnmpcas.ie/restoration/>

¹⁷³ Under the PCAS the licensee has committed to increased frequency of monitoring to monthly and an additional suite of parameters from those in the licence to include dissolved organic carbon.

Topic Title:	The use of innovative as well as available technologies for data analysis and intelligence gathering in support of effective environmental enforcement		
Call Topic Reference:	Protecting and Restoring our Natural Environment 2021 Call Topic 6		
Project Type:	Desk Study		
Maximum Budget:	€100,000	Maximum Duration:	12 months

Background

Waste crime is a significant cost to the state, from staff resources to remediation costs. Waste legislation needs to be effective and enforceable and the range, level and application of penalties for breaches of waste management legislation sufficient to deter unwanted behaviours (EPA, 2020¹⁷⁴) Enforcement of unauthorised waste disposal is a priority action for regulators.

Research is needed to identify new and emerging technologies and approaches that can support the detection of regulatory non-compliance at licensed facilities across the industrial, food processing and Agri sectors; as well as the detection of environmental crime such as illegal dumping, waste transfers activities and peat excavation. Effective enforcement will not only assist the EPA and other statutory bodies in achieving the implementation of policies and objectives of national environmental legislation for protecting our air, water, land, and ecosystems, but will assist Ireland is responding to the EU Zero Pollution Action Plan¹⁷⁵.

Scope

The outputs from this research will inform the development of effective environmental enforcement approaches and strategies to secure behaviour change and promote the protection of the environment.

Innovative research proposals are invited to:

- Explore and identify new and emerging technologies and approaches that can support the detection of regulatory non-compliance at licensed facilities across various sectors; as well as the detection of environmental crime such as illegal dumping, waste transfers activities and peat excavation.
- Undertake a comprehensive review of the state-of-the-art approaches both to data enforcement analysis in combination with remote sensing technologies such as satellite imagery and drone surveillance to establish best practice in intelligence gathering in other jurisdictions.
- Critically evaluate available technologies and software packages that could be utilised to enhance or improve the efficiency of enforcement activities, within an Irish context.
- Provide a suite of recommendations that could be used by enforcement regulators, to inform the development of effective environmental enforcement, across various sectors and activities.

¹⁷⁴ <http://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-environment-2020---an-assessment---report.php>

¹⁷⁵ https://ec.europa.eu/environment/strategy/zero-pollution-action-plan_en

Expected Outputs

Please consult the **2021 Guidelines and Terms & Conditions** for the full list of expected outputs and interim/final reporting requirements.

Outputs from ALL projects must build on recently completed and existing research and other relevant information.

Where project outputs include data and/or technical solutions (websites, developed software, database solutions etc.) then the format of same must be agreed with the EPA to ensure that they can be installed on EPA infrastructure and maintained by EPA staff after the completion of the project. The EPA can supply a current list of approved data formats and technology on request and the exact format of all outputs must be agreed with the EPA before development of same commences. All data outputs must have a comprehensive set of metadata and all technical solutions must be fully documented according to EPA requirements.

It is essential that, in their proposal, applicants clearly demonstrate the policy-relevance of the outputs of their proposed research; the applicability of their findings; and how these outputs address a knowledge -gap and can be efficiently transferred/applied to the implementation of policies and the protection of the environment. Applicants **must** clearly demonstrate how their proposed research will provide the evidence to support environmental policy in Ireland, in terms of identifying pressures, informing policy and developing solutions.

Timeframe

Wednesday 19 th May 2021	Call opening
Wednesday 7 th July 2021 at 17:00 GMT	Deadline for queries relating to the technical contents of this call
Wednesday 14 th July 2021 at 17:00 GMT	Submission deadline
Wednesday 21 st July 2021 at 17:00 GMT	Approval deadline
July/September 2021	Evaluation process
October/November 2021	Negotiation ¹⁷⁶
November/December 2021	Grant award of successful projects
By 31 st March 2022	Start of successful projects

¹⁷⁶ The EPA may consider calling the shortlisted applicants for interview at this stage.

Further Information

Information on current research projects being supported by the programme is available in the Research section of the EPA website: <http://www.epa.ie/our-services/research/>.

The following additional documents are available from the EPA website:
<http://www.epa.ie/publications/research/current-call-documents/>

- 2021 Guidelines and Terms & Conditions.
- EPA Research Programme 2021 – 2030 –Communicating Research.

Other relevant EPA Research Programme Strategies and Policies are also available from the EPA website: <http://www.epa.ie/our-services/research/epa-research-2030/strategies-and-policies/>.

For updates on the EPA Research Call 2021:

1. Subscribe to [EPA Research Newsletters](#)
2. Follow us on Twitter [@EPAResearchNews](#)
3. Visit the [EPA Funding web pages](#)
4. Check the [Research Call Frequently Asked Questions web page](#)

Any queries that are not covered in the call documentation or on the FAQs web page must be submitted to research@epa.ie.