Ollscoil Chathair
Bhaile Átha Cliath
Dublin City University

Response of Dublin City University to the Research and Innovation Strategy Consultation by the Department of Environment, Climate, and Communications (DECC)

August 2023

---

1. What gaps do you see in the Department's current research and innovation activities? How should we address those gaps in the Department Research and Innovation Strategy?

- Many of the solutions to climate breakdown and biodiversity loss have already been identified by the physical sciences. Significant blocks to transformative action on climate and biodiversity take place in various societal arenas, such as politics, policy, economics, the media, and in society in general. The social sciences and humanities have a vital role to play in strengthening Ireland's responses to these urgent challenges, but national funding continues to prioritise research and innovation activities in the natural sciences and engineering.
- An emerging finding from Ireland's Climate Change Assessment, particularly its volume 4, is the need for greater research capacity on the societal dimensions of our response to the climate and biodiversity crises, in order to underpin transformational approaches to climate action.
- Building on these observations, the Department should therefore fund more social science research, either directly or through agencies such as the SEAI and the EPA.
- The importance of *communication*, and research on effective communication for the climate emergency, needs to be given a higher priority and to be more nuanced.
- An important lesson from COVID-19 was that our society is multi-lingual, multi-cultural and people have different frames of reference based on the linguistic, cultural and political systems in which they were raised and educated. A good example was the different attitudes towards vaccination within Ireland's diverse linguistic and cultural communities. Therefore:
    - *To successfully communicate about climate change, the linguistic and culturally diverse nature of Ireland's society needs to be taken into account.*
    - *Communication will not be successful if it is top-down and one way; community-based and bottom up communication is crucial*
    - *Communication needs to be multi-modal as people process information in different ways and pay attention to different types of communication*

    - *Communication also needs to take into account general literacy and digital literacy skills, putting emphasis on citizen-oriented language and plain or simple language*
    - *The necessity to reinforce messages time and time again needs to be recognised*
- The Department has set out a vision of a" climate-neutral, sustainable, and digitally connected Ireland". The focus is on ambitious cross-governmental climate and environment action as well as a shift to sustainable resource use and an energy system transformation, as well as connectivity and cyber security. While all of these are essential for 21st-century Ireland, it is essential that they are brought together into an interconnected and integrated whole with a focus on avoiding silos given the cross-cutting nature of many of the issues. For example, cybersecurity is connected to internet safety, digital skills, digital literacy, and media literacy, among other areas. Research on these topics is often tied to work in the Department of Education (and associated bodies including the National Council for Curriculum and Assessment) and the Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media (and associated bodies including Coimisiún na Meán). Given these overlaps, there is considerable potential for fragmentation and silos.
- Mis/disinformation is a foundational challenge that cuts across the Department's areas. In the area of climate, for example, research and policy is subject to considerable misunderstanding as well as disinformation campaigns aimed at delaying climate action. To combat this, it is necessary to ensure that governments and public bodies develop clear communication strategies to both anticipate and respond to disinformation. Research can help define the disinformation threats in Ireland and the effectiveness of different responses such as de-bunking and pre-punking.
- There is also a need for more responsive and flexible research to reflect changing needs and priorities such as, for example, national and global events such as the Covid-19 pandemic, or the Oireachtas declaration of a global climate emergency. In order to conduct such research an interdisciplinary understanding of problems is essential as is a community outreach or citizen participation focus in order to ensure the Irish population is not misled about the remit or objectives of the unit. Thus, the research programme must be dynamic and capable of adapting to a changing and evolving policy and informational landscape, capable of directing funding to support new priorities while avoiding unnecessary disruption to the capacity and expertise in the aligned research organisations.
- There is a need to make more explicit the ways in which the strategic research and innovation ambitions of the Department of the Environment, Climate and Communications (DECC) can contribute to transformative practices i.e. translational practices that positively impact lives, societies and planetary well-being. To do this, the Strategy needs to consider how their ambitions to address climate challenges through R&I that involves engineering (technological) solutions, and/ or enforcing policy or legislative measures, can be further advanced through the implementation of Education for Sustainable Development (ESD). ESD plays a critical role in the types of transitions and transformations articulated within the strategic goals of this DECC strategy. It would therefore be beneficial for the Department of the Environment, Climate and Communications R&I strategy to refer to how its strategy and associated actions align with, support or contribute to ambitions within the Irish National Strategy on Education for Sustainable Development – ESD to 2030, for example in their consideration of how their technological solutions might enable smoother transitions to the '*circular economy: protecting & restoring our environment through sustainable resource use'* (Strategic Goal no. 3).
- Under the R&I Consultation Strategy Paper Current Research and Innovation Activities, it is stated that the Department provided research and innovation funding for third-level institutions through competitive calls for funding through the EPA, GSI, and SEAI. These calls appear to be focused on the Departments areas of Climate, Environment and Energy.

Competitive Research and Innovation Calls funding calls that are more specifically focused on Communications and Cybersecurity should be delivered.

- The department should promote research into sustainable Artificial Intelligence (AI). AI is a fundamental technology that will underly all aspects of the life of an Irish citizen from now on in domains such as healthcare, transport, construction, agriculture, entertainment, communication, etc. Current AI technologies are heavy energy users and large AI models require a significant investment in computing infrastructure. Recent advances in the AI domain facilitates low-resource AI model development leveraging clever techniques that optimise existing AI models, rather than creating new ones. With the presence of all major IT companies in Dublin, strategic partnerships and co-fund research can be sought. Edge computing with digital sensing can be used to measure and track sustainability progress and optimise resource usage in organisations. The department can encourage research into these domains through partnerships with funding agencies (e.g. EI / SFI) and directly funding novel/forward-thinking research projects.
- The government's latest climate action plan 2023 sets out the need for a new National Marine Research and Innovation Strategy. This strategy needs to be consulted with all academics across the island beyond just for example the marine institute. As well as open to all academics, NGOs should be consulted to input their positions and gaps they see in knowledge, data or processes, which academics may not be aware of. This new National Marine Research and Innovation Strategy must move beyond tourism and food of the 2017-2021 document and integrate heavily with biodiversity, marine protected areas, climate adaptation and offshore wind as well as energy generation, transit, security and export.
- The government's recently published Hydrogen Strategy has a 21 point action list, many of which can be answered by academics & industry and government departments working together. HyLIGHT, an SFI project led by DCU, was shown to be a useful project to help deliver open research questions in the energy transition and hydrogen space. The activities of this project and others should be extended and new projects funded to fill the open points in the government's Hydrogen Strategy and its deployment.
- While the Electricity Regulation Act 1999 prohibits nuclear fission in Ireland, it does not prohibit economic assessment of nuclear fission as a contributor to the green transition in Ireland. However, the act does have a freezing effect on such studies. Nuclear fission is as robust / reliable as power-plants relying on fossil fuels. Countries with nuclear power as part of their energy mix such as Finland, Sweden, and France consistently have the lowest CO2 emissions per kW/hr from their electricity networks. From a life cycle analysis perspective, nuclear fission has similar CO2 emissions as solar and wind, has a ~90% capacity factor (compared to ~20-30% for solar / wind), and does not require any (as yet non-existing) energy storage solutions to ensure reliable power supply. The footprint of such plants is small compared to wind / solar and so can preserve valuable land etc. The absence of any studies on the potential of nuclear power to contribute to Ireland's green transition is blinding the Irish public to a what is potentially a key tool.
- The department should consider addressing synthetic aviation fuels (particularly those which can be made by direct carbon capture). The aviation industry (particularly engine leasing) is a major part of the Irish economy and its likely that only synthetic fuels which will enable the aviation industry to make the green transition.
- The strategy also does not impress any real sense of urgency nor the scale of the challenge and the impact if we continue to fail to make the change necessary to live within the planetary boundaries. Perhaps a new definition of innovation could be considered e.g. - Innovation must work toward bringing the economies and societies back to within planetary boundaries'
- It is important to ensure that the interconnectedness of challenges, risks and impacts across the whole system is considered.

- Models must be transformed to meet the climate adjusted future that we face. New educational/research/business models are needed that are fit for a zero-carbon world that is more locally focused, less materially consumptive and protects and restores nature and our living environment.

2. What actions can the department take to identify future trends in the areas under our remit?

- Horizon scanning/ foresight studies to identify emerging trends and future disruptions including: analysing global and local trends, technological advancements, societal changes and economic shifts to identify future trends and challenges. Findings can inform strategic planning and policy development in research and innovation.
- Establish a dedicated research unit staffed by qualified (multi-disciplinary) researchers within the Department to monitor and analyse emerging trends in climate, environment, sustainability, and digital technologies. It should be capable of overseeing a diverse research agenda and multiple centres and institutions and identifying potential future challenges and opportunities. The unit would facilitate knowledge-exchange, interdisciplinary research projects, and collaborative problem-solving.
- Leverage data analytics and big data to analyse patterns and trends related to environmental and climate changes, providing valuable insights for future planning. The research unit should be overseen by a Strategic Advisory Board to oversee the research function. A useful model would be the Strategic Advisory Board (SAB) for science funded by the Rural and Environment Science and Analytical Services Division (RESAS) of the Scottish Government.
- Ensure there is coordination between different departments and bodies in terms of commissioning or accessing research. An effective strategy will require a significant capacity for the coordination of knowledge sharing and enabling of collaboration.
- Establish collaborative research networks to facilitate knowledge exchange between researchers, industry experts and policymakers.
- Collaboration with industry/ start-ups through partnerships, innovation hubs and accelerator programmes to identify emerging research areas.
- International collaboration and benchmarking to gain exposure to cutting edge research and identify emerging trends that are shaping innovation globally.
- Encourage and support interdisciplinary research to facilitate the identification of future trends. Funding programmes that more explicitly promote and support interdisciplinary collaboration and provide incentives for researchers to explore new areas and emerging trends.
- It is important to fund the “basic research to impact” continuum. The future ideas and trends will come from fundamental research. These ideas will lead to future technologies or solutions for climate mitigation/adaptation, environmental protection etc.
- It is critical to adopt a truly interdisciplinary approach to research. Where AI is perceived as being important as a capacity, moreover it should be seen as an enabling technology to develop solutions for example: Monitoring capability using satellite, in-situ, meteorological etc can all be integrated using machine learning. There is therefore a need to value truly integrated research. Similarly, engineering and computing domains can play a key role in biological sciences – understanding the impacts of climate change on ecosystems, or in physical sciences in developing marine energy systems using computational fluid dynamics.
- Further engage with IT research centres in the domain of AI / NLP / Data Science and software engineering and seek the input of interdisciplinary experts from these centres on advisory panels. Join advisory boards on research projects / centres and contribute directly to the scientific activates of these projects and centres.

3. Are there specific thematic areas relevant to the Department's remit which you would like to see more research and innovation activity in? How can this be achieved?

- An urgent need for greater prioritisation of research in the humanities and social sciences has been identified under Question 1. We would highlight the following areas as particularly worthy of prioritisation:
    - Communication and discourses: Identification of key stakeholders and communities of interest and characterise and analysis of the debates and discourses taking place in each of these groups. Once it has been identified how these groups conceive of and approach the challenges of climate change and biodiversity loss, these insights can be employed to create targeted engagement strategies.
    - It is evident that a significant communications campaign - aimed at informing the public of the changes necessary for a just transition to a zero carbon society, and recruiting public support for such measures - will have to be undertaken by the Department. There is an extensive body of research in the field of climate and environmental communications which finds that a range of messages, framings, platforms, and channels must be mobilised to reach and engage fragmented audiences. The Department should consider a major programme of establishing research aimed at identifying how different sectors, groups, and communities, such as farmers, coastal communities, the corporate sector, the transport sector, construct climate change in their separate discourses.
    - Politics and governance: There has been limited analysis to date of climate institutions and governance arrangements in Ireland. In light of the significant evolution of the governance landscape in recent years as a result of the Climate Action and Low Carbon Development (Amendment) Act 2021 and related processes, further research is needed to study the implications of these changes and provide a basis for further strengthening of the framework, with a focus on three areas in particular. First, research is needed on how the layering of new climate governance arrangements on existing institutions plays out in the distinctive context of Irish politics and policymaking. Second, future research ought to focus on the governance of particular sectoral climate action challenges. Third, further research on climate governance at local and regional level, and in a multilevel governance context, would help to strengthen climate action responses and avoid fragmentation.
- Biological sciences, biodiversity, ecological sciences need to be studied to provide a greater understanding of impacts of anthropogenic activities including climate change.
- Multidisciplinary research – where we see truly collaborative and integrated research to develop ideas to solutions is needed. Not collaboration for collaboration's sake , but rather real interdisciplinarity in research.
- Domain experts are better positioned to make research recommendations on relevant thematic areas including climate change mitigation and adaptation; renewable energy technologies; circular economy and sustainable resource management; and digital transformation for environmental monitoring. However, it is noted that democratic legitimacy, citizen empowerment, and trustworthy information are cross-cutting concerns for each of these areas:
    - Democratic legitimacy concerns the extent to which the public supports expert-led policymaking. As democratic governments increasingly rely on experts for complex subjects such as energy, there is a danger of becoming distant from citizens. As such, there is a need to research how to reduce the gulf between citizens and experts.

    - Citizen empowerment concerns the capacity of citizens to develop the knowledge and skills required of the 21st Century media world including access to reliable information and communication infrastructures.
    - Trustworthy information is a two-fold concern about (i) the threats posed by media manipulation and disinformation and (ii) public access to and trust in reliable information sources.
- In addition to a focus on communication and language in general, the role of the arts needs to be given stronger consideration. Again, drawing on the crisis of the pandemic, music, art, film etc. played a really important part in dealing with the crisis. Additionally, disciplines like history have important lessons for use about previous climate crises that we should surely not ignore.
- Media like film, music, art, are very powerful ways in which to communicate messages and to lobby for behaviour change. The government should not underestimate the role of arts and humanities in dealing with the climate crisis. While a focus on science and technology is understandable, a focus on this alone will ensure failure.
- Sustainable AI is an increasingly important research topic within ICT. Given Ireland's heavy reliance on the ICT industry, more research into sustainable AI is essential to retain Ireland's position as a leader in the AI domain. Given the alignment with the *Digital Decade* (as part of the *Digital Age* priority area) the thematic area of cyber security does not adequately align with the vision of a "human-centric digital society to empower citizens and businesses". While cybersecurity has to underpin this vision it, in some ways, focuses solely on avoidance of harm rather than empowerment. As such there needs to be a broadening of the scope of this thematic area to address alignment with this broader vision and a focus needs to be placed on putting the research infrastructure to support this broader vision in place.
- The government's recently published Hydrogen Strategy has a 21 point action list. One main output of the hydrogen strategy was that there is a need for more research and innovation activity in the hydrogen sector, at production, storage and demand.
- A number of the points in the action list of the hydrogen strategy focused on demonstration projects or pilot projects and even energy parks being necessary to gain experience on the integration of that technology into our existing energy system and mature the hydrogen market.
- These hydrogen demonstration projects will only work if collaboration between academics & industry and government departments happen from the beginning.
- Achieving these tasks will ensure a successful green hydrogen economy is nurtured and has the ability to grow and make an impact on Ireland's decarbonisation strategy. Research and innovation activity is needed to enable this.

4. Have you views on the impact of disruptive technologies such as AI, Quantum and 6G as part of the digital transformation agenda and the implications of these technologies for the Department?

- It is important to keep in mind that AI is limited in terms of ability and recreates bias and stereotypes that are already encoded in the training data used for generating AI models. Some groups in society are under- or incorrectly represented in the data used to train AI systems. Uncritical over-reliance on such technologies will only exacerbate existing inequalities which will create further problems for tackling the climate crisis.
- The dedicated research suggested above could play a key role in horizon-scanning future developments and their potential implications. Digital technologies are always evolving and are likely to play a disruptive role into the future. In terms of digital transformation, it is vital that citizens are not left behind or left vulnerable to manipulative and vested interests. The Department needs to proactively develop policies to govern the ethical use of AI and related technologies. In terms of citizen empowerment, there is a tendency to perceive empowerment

narrowly in terms of 'how-to' skills rather than broadly in terms of digital knowledge, skills, and confidence. In addition, there is a tendency to focus on formal education rather than the lifecourse. Research on disruptive technologies should include a focus on how to ensure citizens are informed, secure, and empowered in the digital sphere.

- Concerns around ethics, privacy and impacts on employment need to be carefully addressed through regulatory frameworks and responsible AI governance.
- While we have noted above the danger of uncritical adoption of AI without due attention to ethical implications, it is important to note that this fundamental technology will have transformative potential and as such the Department can leverage AI to improve public services, enhance policy making through data-driven insights, optimise resource allocation, and address societal challenges.
- While the media commentary on AI is often negative, the transformative potential of AI can be hugely positive for Ireland and the Irish citizen. As Ireland moves to a low-carbon economy, AI will be central to optimising the energy creation, energy usage, transport flow, productivity and health of Irish citizens. In Harnessing Digital – The Digital Ireland Framework, it is stated that all dimensions of the framework should be "underpinned by a coherent governance structure, and a modern, cohesive, well-resourced regulatory framework". To harness the potential of disruptive technologies such as AI, research in this area must be cognisant of the evolving regulatory landscape around these technologies and must ensure that research efforts in this area are aligned with these requirements. This is a key element of ensuring that the Department Statement of Strategy Strategic Goal 4: Deliver world class connectivity in communications is achieved. While Goal 5 focus is to: Ensure best in class governance & regulation, this goal is not accounted for in the Department's current Research and Innovation Activities. This is a key aspect Harnessing Digital – The Digital Irelands Framework of Digitisation of Public Services e.g. digitisation of health services.
- Where these "disruptive technologies" can be integrated, that is where the greatest impact will be. Very often we see development of AI for example with a tag-on application. What is needed is using **AI as an enabler** to help address research questions.
- The Department should invest in disruptive technologies including the development of AI research centres and next generation communication networks. It will also need to ensure a good supply of future talent in this area.
- AI will be hugely impactful on all areas of research going forward. It will be critical to ensure that opportunities to encourage truly interdisciplinary research is supported and facilitated, particularly offering opportunities for AHSS researchers to gain the experience to truly engage with and impact the implementation of AI in society.

5. How can the Department better communicate its research and innovation needs?

- There is potential for a research project with regard to improving the Science/Policy interface for Climate, Energy and Biodiversity research in Ireland. In particular, such a project could explore how to embed meaningful two-way communication between the Government and HEIs to support the Climate, Environmental, and Energy policymaking process from a communications and research funding policy lens.
- Additionally, through hosting or carrying out workshops with the research community, or conferences where researchers can pitch ideas – like those for Horizon Europe.
- Clear and accessible communication (user-friendly website with up-to-date information, contact points for enquiries, utilising social media for updates and interaction).
- Regular consultations and feedback channels (workshops, forums, feedback mechanisms on policies and initiatives).
- Provide clear information about guidelines for funding, deadlines, application processes etc.

- Strong partnerships with academia, industry and other stakeholders to understand their needs and better align research and innovation activities to them.
- Reach out to the leaders of research centres for discussion on how the department and centres can work together to make a positive impact.
- Stakeholder meeting & events, such as the Energy Summit workshop that was on the 6th of July 2023 was an invaluable opportunity for the Taoiseach, Tánaiste, Minister Ryan and Minister Coveney to engage directly with those who play such an important role in Ireland's energy sector and who will be instrumental to the successful decarbonisation of our energy systems and of seizing the opportunities that this presents. These activities should be more common.
- Release specific funding calls to ask precise questions that researchers apply to help answer, similar to EPA & SEAI funding calls.

6. How can the Department work more effectively to source evidence from the national research and innovation community to support its work in policy development, policy implementation, and the uptake of new technologies?

- Ensure true interdisciplinary collaborative research; do not rely solely on STEM for the evidence.
- Leverage data analytics and big data to identify emerging research topics, academic publications, government/ industry reports etc. and extensive consultation with stakeholders through workshops, focus groups etc.
- Agencies like the EPA for example are a great science to policy interface and their effort to track research outputs is a model that should be replicated in order to identify potential innovation.
- The Department's Current Research and Innovation Activities – Activity 1. Performing & Commissioning Research and Innovation to Inform Policy and Practice appears to be focused on engagement with researchers but in the context of the uptake of new technologies does not appear to focus on the innovation aspect i.e., "putting research into practice" which is generally led by industry in this context.
- Attend academic workshops and dissemination activities, these generally occur at the end of a project completion and can be a short synopsis of research completed and outputs achieved. They are open to all to attend.
- Release specific funding calls to ask precise questions that researchers apply to help answer, similar to EPA & SEAI funding calls.
- Join advisory boards on research projects.

7. How can the Department engage more effectively with all stakeholders in the national research and innovation system? If you are responding on behalf of an organisation, please state how the Department could more effectively engage with your organisation.

- Ongoing engagement with the research community would be a welcome initiative. [redacted] visit to the DCU Center for Climate and Society in July 2022 was very welcome. In previous years (pre-pandemic), [redacted] (EPA) undertook visits to HEIs early in the calendar year to inform the development of each year's EPA Research Call. Such visits could be repeated, or an annual research priorities workshop could be held with invitations extended to the research community.
- It would also be very useful to receive feedback on such meetings, and to develop them into an ongoing two-way dialogue.
- Given the scope of the Department's remit, it needs to be able to communicate and exchange information with a wide-range of researchers who are working across multiple sectors (academic, government, NGO, industry) and across multiple disciplines in the sciences, social

sciences, humanities, and business. This is challenging because the needs and practices of these research communities vary considerably. There is no one-size-fits-all approach in this scenario. It is suggested that the Department adopt a broad communication and engagement strategy that makes use of multiple channels. The Department may consider establishing a dedicated platform or website to communicate the Department's research and innovation priorities, funding opportunities, and ongoing projects. This may be supplemented by more tailored sector/discipline specific events for knowledge sharing and regular stakeholder consultations. A research and innovation advisory committee comprising representatives from diverse stakeholders would be beneficial to guide these efforts.

- Establish regular dialogue with university representatives (e.g., dedicated meetings, roundtables, forums).
- Direct channels with senior leaders to allow for strategic discussions, alignment of priorities and better coordination between the department and university.
- Participate in university events.
- Develop joint funding programmes to encourage collaborative research projects between the department and the university sector.
- Support capacity building through the provision of workshops, training, mentoring, guidance on grant applications, research management, commercialisation etc.
- The most important stakeholders are our children who will have to deal with these challenges going forward. Their views and actions need to be prioritised.
- Regarding engagement in research funding, current calls appear to be focused on the Departments areas of Climate, Environment and Energy. Competitive Research and Innovation Calls funding calls within the Department that are more specifically focused on Communications and Cybersecurity should be delivered. For funding outside the department, i.e., participation in transnational research and innovation projects funded by, e.g., Horizon Europe, Interreg and LIFE the examples provided in the Strategy Consultation Paper are also focused on Sustainability goals which seems to imply that more focus should be placed on engagement with third-level institutions to engage with these calls in the areas of Communications and Cybersecurity.
- Join DCU advisory boards on DCU research projects e.g. Adapt Centre, Insight Centre, Lero. Additionally, directly engage with centre leaders. Invite researchers from research centres to join panels and contribute to department strategy.

8. Should the Department seek to grow its capacity to carry out in-house research? If yes, how can this be achieved?

- There is potential for the Department to play an important role in creating a two-way, reciprocal process of capacity building. For example, departmental officials could be seconded to work with university-based researchers on specific research projects. Likewise, university researchers could work in the department, in collaboration with the department's in-house research team. This sharing of expertise, methodological approaches, and research cultures could be of benefit to both parties.
- For instance, SFI has previously piloted the use of Public Service Fellowships which provide opportunities to embed academic researchers in Government Departments and the Oireachtas for a period to work on specific collaborative research projects. These activities should be extended. SFI also manages the National Challenge Fund, which will see mission-oriented challenges to address Ireland's green transition being used to incentivise researchers to deliver tangible impacts for society. These activities should be extended.
- In line with question three above, it is suggested that the Department establish a dedicated research unit. This would require hiring qualified researchers from multiple disciplines. This expertise is necessary to understand, commission, and manage research. However, for more

detailed or specialised research it may be more beneficial to collaborate with researchers from other sectors. It would also need to provide training and professional development opportunities, offer courses focused on project management, research methodologies, data analysis and research ethics.

- As an alternative, the Department could establish partnership and joint research projects that would allow the Department to access specialised knowledge, expand its research capabilities and enhance the quality and relevance of its research.

Ireland also needs:

- **demonstrator sites for research** where the research pipeline can be facilitated from fundamental science to demonstration. For example: modular wastewater treatment infrastructure where new technologies can be tested for chemicals removal, solids removal; sludge characterisation and application
- **renewables test facilities** at 1/16 scale for example;
- **funding for scaling up** (numbers of units) of research outputs to demonstrator – for example development of multiple units for test in different scenarios.
- This demonstrator/test requires **engineering capability** therefore support for **engineering research programmes** is needed to retain engineers in research.
- Support for **hackathons** to look at solving problems through research.

9. Are there examples internationally of Government strategies on research and innovation in climate, communications / digital, circular economy, cyber security, energy or environment that we should examine? If so, can you provide details?

- Please see the New Zealand Government's website on Emergency Response: https://getready.govt.nz. While not exactly the same context, elements of good communications policy can be seen here, including multilingualism, multimedia, multiple stakeholder representation, clear and simple language etc. If we can embrace and replicate this for climate response it will have a stronger impact.
- The work with media organisations has identified a need to increase capacity and environmental literacy within the media sector. Levels and quality of climate change coverage in the provincial press and local radio are in particular need of remediation. The Department could examine supporting an initiative similar to Yale Climate Connections (https://yaleclimateconnections.org/) whereby a free, independent, multimedia environmental news service is provided by a university-based team of student reporters and senior, professional editors.
- See the Scottish government's 2022 to 2027 Environment, Natural Resources and Agriculture Strategic Research Programme (SRP) which involves collaboration, coordination and networking across multiple disciplines, led by an in-house research unit, overseen by a Research Portfolio Board which oversees the whole portfolio of research funded by the programme including the Centres of Expertise. Its members will represent the users of research in the Scottish Government and external stakeholders, as well as research providers. The Portfolio Board is supported by three subgroups covering scientific, operational and institutional issues including a Strategic Advisory Board as well as a Scientific Advisory Board, which works in partnership with a number of academic and other research institutes in both the social and environmental sciences. A principal strategic focus of the Scottish example is to avoid silos and barriers between the different funding mechanisms used.
- Some examples below for AI/ digital from the US and Singapore:
    - https://www.whitehouse.gov/wp-content/uploads/2023/05/National-Artificial-Intelligence-Research-and-Development-Strategic-Plan-2023-Update.pdf

    - https://www.nsf.gov/digitalstrategy/
    - https://www.imda.gov.sg/about-imda/research-and-statistics/sgdigital/digital-economy-framework-for-action
- The EU Green Deal and ZPAP is one that has many targets that are relevant.
- Existing EU Commission coordinated Hydrogen Research and Innovation activities that Ireland can align with:
    - **Agenda Process for the European Research and Innovation Initiative on Green Hydrogen**
    - **The Joint Research Centre** (JRC) - the EU Commission's science and knowledge service
    - **Hydrogen Europe** – Hydrogen Europe have detailed a Strategic Research & Innovation Agenda (Hydrogen *Ireland* Association is a full member)
    - **Clean Aviation** – In the clean Aviation Agenda, Hydrogen presents several key advantages when considering aviation applications
    - **The European Clean Hydrogen Alliance** –part of the EU Commissions New Industrial Strategy for Europe
    - **UN-ECE** – The United Nations Economic Commission for Europe
    - **Task Force on Hydrogen** - initiated by the UNECE Group of Experts on Gas, the Group of Experts on Renewable Energy and the Group of Experts on Cleaner Electricity Systems.
    - **Clean Hydrogen Partnership -** the EU Framework Programme for Research and Innovation Clean Hydrogen Partnership has a matching budget of €300 million, the main objective is to contribute to EU Green Deal and Hydrogen Strategy through optimised funding of R&I activities.

10. Are there any other matters you wish to raise in relation to the development of the research and innovation strategy?

- The definitions of research and innovation, while specific to this strategy are not allowing for innovations as transfer of domain knowledge e.g. membrane technologies for food applications could have applications in the water domain. Innovation must be seen as adapting technology or knowledge also to address a research question or challenge.
- One recommendation is to ensure research evidence is available for citizens in accessible and actionable ways. It is suggested that the Department and any research funded by the Department follow best practices in science communication and aim to enhance the public communication of science. This is a necessary step to help reduce the gap between experts and citizens and to mitigate against potential mis/disinformation that may undermine the Department's objectives.
- Key areas that must be addressed:
    - It is important that we lead in areas of climate mitigation – peatland and wetland activities – paludiculture for example; addressing mixed ecosystems rather than just forestry based solutions. This area needs research.
    - Agriculture – the impact of intensification is significant on the environment and therefore research must address a re-thinking of this industry.
    - Renewables; (marine, hydrogen, solar) and integration into the grid.
    - Water and wastewater treatment – there is potential to create technologies that are modular and suited to 100,000 PE;
    - Safe materials – legislation in relation to nano must be considered where up to now, we have not adequately considered the hazard and risk associated with nanotechnology.