Department of Enterprise, Trade and Employment

DRAFT submission to the Department of the Environment, Climate and Communications

Research and Innovation Strategy Consultation Paper

August 2023

Introduction

DETE leads on the delivery of enterprise innovation policies and, through the enterprise agencies, the programmes and assistance to deliver on the Government's objectives for the enterprise sector and innovative businesses, delivering jobs and prosperity for Irish citizens. DETE is particularly focused on encouraging innovation start-ups and disruptive innovation; driving research commercialisation; working to ensure graduates are employment ready; that Ireland is a participant in frontier technology ecosystems; that innovation is pervasive in all sectors of enterprise; and that the right enabling environment is in place to support an innovation economy.

The business sector is the key driver of research and innovation in Ireland, accounting for almost three-quarters of our national investment in R&D[1]. The business sector works closely with the higher-education and public research system, including the health sector, to develop new knowledge, new technologies and the skills and talent to help address the key societal challenges and opportunities to improve our peoples' lives.

For the future, our success in strengthening enterprise driven research, development and innovation will directly impact on Ireland's ability to create and maintain a thriving and prosperous economy and grow employment. Research and innovation will be critical to achieve our national goals to create a cleaner, greener economy and society and to maximise the opportunities of digital transformation for the benefit of all our citizens.

Question 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?

Increased emphasis on innovation and applied research in key areas

DECC could impactfully emphasise innovation, over research, in the energy and climate policy space. Policy makers, agencies, and energy system operators, would benefit from greater practical knowledge and learning of implementation of proven international solutions in an Irish regulatory, infrastructure and climate context. Much of the challenge Ireland now faces is not a lack of technical solutions, but inertia or slow progress in 'sandboxing' / trialling / testing / regulating and scaling technologies in an Irish context.

Key examples would be:

- Carbon Capture, Use & Storage;
- Hydrogen production and use;
- High-temperature heat-pumps/ furnace equipment;
- Direct line / private wire infrastructure;

[1] Business Expenditure on R&D (BERD) accounted for 79.96% of overall expenditure on R&D (GERD) in 2021.

- Thermal storage at scale to provide electricity sector flexibility;
- Innovative / aggregated battery solutions; and
- Hybrid grid connections / co-located intermittent RE and demand.

Ireland has significant capabilities in communications systems, IoT connectivity, remote condition monitoring, robotics, VR/AR, etc. It will be essential that advances and applications across these digital technologies are further exploited for strategically important emerging sectors such as Offshore Wind.

Research infrastructures

Over recent years, significant investment, and collaboration with HEIs has created a diverse network of Research Centres, Technology Centres, Technology Gateways and other RPOs in areas of strategic importance for Ireland. These facilities and the networks they have promoted across the innovation ecosystem locally, nationally, and internationally have become important agents of enterprise transformation.

It may be worth considering a review of existing research infrastructures that are engaged with climate & environmental sustainability, and digital transformation to ascertain future investment needs to bolster capability in these areas. While digital related research and innovation infrastructures are strong, along with new initiatives on the landscape such as the European Digital Innovation Hubs, there may be gaps in particular on the climate/sustainability side, notwithstanding the strengthening ecosystems building around EI-supported centres such as CREDIT at DKIT and MaREI at UCC.

Space Communications and Cyber Security for Space

As the Government Department with responsibility for the delivery of Communications policy and programmes, it is imperative that the DECC engages in RD&I activities that relate to Space Communications and Cybersecurity for Space. A Joint communication by the European Council and Parliament on a European Union Space Strategy for Security and Defence highlights that cybersecurity standards and procedures in the space domain could be considered as part of the development of an EU Space Law. It also notes that the Commission will further explore the extent to which IRIS² can support the establishment of an EU critical communications system – therefore it is likely that RD&I opportunities will arise in the establishment of critical communications systems in space. A more proactive role in relation to evolving EU Space related developments would include actively shaping RD&I opportunities that will be developed by the Commission and enhance Ireland's participation in collaborative RD&I at a European level.

Question 2

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

Interdepartmental and inter-agency engagement and horizon scanning

Cross-Departmental engagement will also provide a useful platform to ensure that information on future trends is shared – for example, engagement with the National Space Strategy Co-ordination Group where information is shared across Departments regarding developments on EU/National/International space activities cuts across the areas of Communications, Climate, Cybersecurity etc.

DETE's agencies have a considerable depth of knowledge about enterprise-based developments in the area of climate and digitalisation, across a range of sectors.

Impact 2030 champions a joined-up approach across the policy system on future horizon-scanning so that we have the best intelligence possible on global trends in technology and innovation. DECC will have an important role in progressing this objective along with other Departments (including DETE), Agencies and other bodies.

Liaison with RPOs and industry

RPOs and Industry are often at the leading edge of future trends in the R&I space in their sectors, therefore it might be useful for DECC to consider how RPOs and Industry might, if not already, be represented in their stakeholder groups for their relevant sectoral areas. For example, the SFI Research Centres such as MAREI, ICRAG and CONNECT, are undertaking cutting edge research in sectors relevant to DECC. Industry insights can also be gained from the Technology Centres and Technology Gateways funded by Enterprise Ireland, who will have expertise on the needs for industry in terms of innovation – this could include CEADAR national AI Centre, MCCI Tech Centre, WiSAR and TSSG in terms of Communications, and Credit in Dundalk IT on the issue of Climate and sustainability.

EU level engagement

It is critically important that Ireland works with partners elsewhere in Europe, and we are well placed to support that through horizon Europe. In addition, engagement through relevant EU groups and networks such as the European Research Area will enable DECC to be informed about future trends at the EU/International level.

Question 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?

Space Communications and Cyber Security
As mentioned above, better engagement on Space related activities and support for R&I activities for this sector would be welcomed. This will have relevance not only for the communications side of the Department, but Space R&I activities can have a very beneficial impact in terms of the climate change agenda. As part of Ireland's membership of the European Space Agency (ESA) we have access to significant Earth observation data. This data can assist policymakers and industry in addressing the challenges and impacts of climate change and therefore a strong focus on the use and application of this data for R&I activities would be very beneficial.

Communications/Cybersecurity
New communication protocols around 5G+ and 6G, with emphasis on high level data processing, seamless connectivity, and developing the next generation factory of the future (involving highly automated connected buildings, with automated distribution warehousing, 24/7 lights off in advanced manufacturing plants, etc).

Grid flexibility
Research and innovation around grid flexibility and how to ensure that Large Energy Users (LEUs) are not curtailed in times of peak demand and low renewable energy is very important. How can we balance the growing energy demands from LEUs including data centres with the need to reduce our

energy usage. Are there particular gains that can be found from improvements in energy efficiency e.g., servers/data centres? Can we 'sandbox' trial particular types of market instruments or technologies?

The development of next generation IT network equipment that would help reduce power consumption and optimise network management in areas that include factory of the future (Industry 5.0), energy intensive manufacturing, and data centres. New chip designs and AI-based approaches would be of particular relevance here.

Machine learning for predictive modelling and active control offers a very powerful tool to manage grid load, by a) predicting grid loading from meteorological data (e.g., wind strengths), and b) automating grid response through load reallocation (shedding) via, for example, batteries.

Designing LEU operations to optimally exploit excess renewable energy generation (e.g., via thermal storage, chillers, etc).

Carbon Capture and Storage (CCS) and Carbon Capture, Utilisation and Storage (CCUS)
CCS and also CCUS – what would need to be done to make this technology operational across a relatively small number of sites in Ireland, what are the timelines/potential costs involved, is there is sufficient scope for industrial clusters in Ireland to benefit from this, and also what potential there is in salt caverns/unused gas fields such as Kinsale for storage of carbon? In addition to CCS, it would be useful for research to consider the U part (Utilisation) and how we can use the carbon that has been captured.

Hydrogen/Green Hydrogen
Hydrogen – where can it be most impactful in decarbonising our energy use and unlocking 'hard- to-abate' activities. Are there short-term and medium-term research and innovation funding at EU and national level that we can leverage to build the skills and expertise we will require. Is there any complementary national support that is needed, and can we introduce pilot projects on hydrogen that are accessible for Irish projects.

Research into what is required to repurpose methane/natural gas infrastructure in industry so that it is suited to using hydrogen gas at a later date: what are the likely costs, changes required – both technologically and regulatory; and if/how it could be used as a fuel in the cement sector to decarbonise the heat requirements in kilns.

With the potential to become a net exporter of Green Hydrogen/Synthetic Fuels in the future, Ireland will need a significant R&D capability to maximise the return for Ireland Inc.

Waste to Energy and District Heating
Given the success in reducing emissions from cement plants by using solid recoverable fuel (SRF), there may be useful research around incentivising and encouraging more production of SRF in Ireland. Are there also waste to heat opportunities that can be trialled? District Heating – how can we increase its uptake e.g., in other parts of Dublin that may be close to data centres following the success in South Dublin Co Council and AWS.

Circular economy, ESPR, Right to Repair, Green Consumer Claims, Packaging Waste directives etc. – There is a lot happening in this space and many directives/regulations coming into force driven by the EU, some research around how we can best simplify these messages, communicate the core messages to business and the public on these and how to improve upon what we are doing in this space could be useful. (A lot of this work cuts equally across DETE and DECC)

Heat pump technologies

Supporting research that tries to increase the operable temperature range for industrial heat pumps so that electrification becomes a more viable option for (some) medium grade heat users in industry. To date, heat pump technologies have generally been developed to operate in medium heat manufacturing environments of up to 100C. Significant research should be undertaken to develop heat pump technology to cater for heat temperatures in the 100C - 300C range.

Other areas

- The feasibility of high temperature heat storage as a commercial decarbonisation, demand flexibility and/or storage option in Ireland.

- Currently, there are limitations to the capacity of batteries for industrial applications. More research on building larger capacities would be worthwhile.

- IDA: Additional research into data centres energy usage including: alternative/modified techniques, productive uses for waste heat and new technological solutions for storing and processing data optimally.

- Policy research on the non-cost factors affecting the uptake of low carbon solutions by industry and public sector.

- An expansion of RD&I investment in floating offshore wind is necessary to meet the needs of the industry and Ireland's energy needs, building on the important capabilities within MaREI.

Question 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?

AI and High-Performance Computing (HPC) can be utilised too. Quantum and 6G are also likely to be at the forefront of future technological developments and investment in R&I in these areas will support and create a positive environment for quantum and 6G start-ups.

Applications for AI and quantum computing include:

- fully harnessing the potential of the vast quantity of Earth Observation data referenced above.
- optimising power consumption and network loads at next generation data centres (with particular focus on generative AI and quantum capabilities); and
- security of communications on future networks such as dedicated quantum networks or hybrid quantum/classical networks.

AI is very much a key feature for many of the projects that have been funded under the Disruptive Technologies Innovation Fund and the role of AI in the digital transformation agenda is clear.

It is important that any new R&I activities in the AI space should be complementary to any R&I initiatives including those being undertaken by DETE or its agencies.

The role of the European Digital Innovation Hubs in relation to artificial intelligence and digital research also needs to be recognised and included in strategies.

In general, it would be useful if the research and innovation strategy made provisions for gathering evidence on the relationship between digitalisation at the firm level and its contribution to climate action.

Question 5

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

It is essential that the business community is made aware of the role and ongoing research and innovation activities of the Department of Environment, Climate and Communications, so as to encourage more enterprises to engage with the Department's agenda.

In particular, it is important that possibilities for collaboration are highlighted and encouraged. Research opportunities need to be promoted as visibly as possible, including through the Knowledge Transfer Ireland platform managed by Enterprise Ireland.

Question 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?

Driving collaborative research

The DECC R&I Strategy could support better integration between industrial research areas and climate / energy policy areas; including private sector, regulators, system operators and policy makers, sharing and jointly tackling technical challenges for our energy system and decarbonisation solutions.

Support for Curculéire (Industry-led Circular economy research centre) is an example of where this can work well – and this commercial research model could be replicated in energy and ClimateTech innovation.

Demonstration Projects - Space:

The Disruptive Technologies Innovation Fund (DTIF) provides funding for the "Creating an Architecture for Manipulating Earth Observation data" (CAMEO) Project. This project led by UCD with Industry seeks to harness the potential of Earth Observation data. The CAMEO consortia are seeking Demonstrator cases from Government Departments and therefore could serve as a useful point of engagement with DECC. These Demonstrator cases could be used to deliver on key policy objectives. Earth Observation data has been used to support policy in areas such as:

- Pollution monitoring research and education/training
- Coastal Erosion and Longshore Drift Prediction
- Nationwide ozone and aerosol profiles
- Urban growth monitoring
- Forest Change Monitoring
- Urban Solar Estimation
- Disaster Response & Relief
- International Security

Innovation Procurement/Pre-Commercial Procurement

As Ireland requires more innovation in the area of climate and digital, we must consider how best to support more start-ups in Ireland to engage on solutions and secure deals. Innovation procurement and pre-commercial procurement are tools that can be utilised for the purpose of finding new solutions to problems, turning challenges into opportunities, and creating strong references for innovative start-ups in competing for future contracts. DETE would welcome the prospect of working with DECC in exploring potential initiatives in this area.

Question 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.

Embedding Knowledge Transfer and Commercialisation as a strategic objective of the DECC R&D Strategy

Fruitful collaboration between the enterprise sector and the public research system is essential if the full value of investment in the public research system is to be realised.

Ireland has long recognised the value of industry/academic collaborations and has developed a comprehensive knowledge transfer system. Through such collaborations, enterprise gains access to cutting-edge research and scientific talent that can help stimulate new business opportunities, goods and services, while HEIs gain access to real-time challenges, finance for research and new partners. Importantly advances in different sectors such as digital communications, environmental sciences, artificial intelligence, health, ag-tech and more have the capacity to deliver significant societal and economic benefit, including improved quality of life outcomes for citizens and enhanced business performance in critical areas such as energy efficiency, digital solutions etc.

Ensuring that the enterprise potential from public RD&I investment in *Communications, Cyber Security, Energy, Environment and Climate Action* is fully realised therefore needs to be embedded as a key objective of the DECC RD&I Strategy.

The suite of direct supports available to the enterprise agencies, such as Innovation Vouchers and Innovation Partnerships, remain vitally important as drivers of industry-academic collaboration. In addition, the work of Knowledge Transfer Ireland (KTI) is a crucial component in facilitating the connections between industry and academia, and in driving the commercialisation of HEI research activity.

In the coming years, KTI will play an increasingly important role, through the development of new programmes, in bolstering the research commercialisation capacity of the new Technological Universities (TUs) whilst also maintaining the capacity and capabilities within the current University Innovation Offices. More recent initiatives will be particularly focused on driving spin-out company formation and enhancing technology transfer capacity within the newly established universities. In addition, KTI will continue to enhance and promote the IP Protocol across the public research system and enterprise sector.

EI's Commercialisation Fund is a globally unique instrument which provides funding to bridge the 'valley of death' between research and successfully realised innovation. Enterprise Ireland

strategically leverages this commercialisation funding and the Technology Transfer/Innovation Office network, to turn third-level research into commercially viable products, services, and companies.

The new Innovators Initiative: Pioneering Smart Futures, is a mechanism to encourage entrepreneurship and stronger innovation capacity. Innovators' Initiative programmes will be hosted in Irish publicly funded Research Performing Organisations (RPOs) or within consortia of Irish RPOs. These training programmes will create cohorts of highly skilled innovators who can observe and identify unmet market needs within specific sectors of growth in Ireland.

Question 8

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

Through the inter-Departmental structures in place in the context of Impact 2030, including the Impact 2030 Implementation Forum, DECC could explore in more detail the capacity available to it through the research and innovation infrastructures/RPOs across the system as a whole.

Question 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?

The European Research Area

The EU published the European Research Area policy agenda in 2021 with the aim of creating a single, borderless market for research, innovation, and technology across the EU, seeking to develop and put in place key R&I policy tools which connect R&I and industrial innovation strategies. The ERA aims to speed up the transfer of research results into EU industrial ecosystems through the development of common industrial technology roadmaps with Member States, industry, and relevant stakeholders to include R&I investment agendas from fundamental research to deployment.

Action 12 under the current ERA work programme aims to develop and put in place key R&I policy tools which connect R&I and industrial innovation strategies. Both the green and digital transitions call for increased R&I investments, notably by industry, and timely scale-up and deployment of results by industry, including SMEs and start-ups, as well as strategic and joint engagement by policymakers, industry, and R&I stakeholders.

DECC and DETE along with the relevant agencies are examining how Ireland can usefully contribute and also benefit from the outputs of ERA Action 12.

Satellite Communications

Many European States are promoting R&I activities relating to Satellite Communications. For example, the UK has recently announced £50m in funding for satellite communications.

UK Space Agency announces £50 million for satellite communications - GOV.UK (www.gov.uk)

Green Industrial Plan

Although the research and innovation strategy consultation paper refers to the European green deal, it would also be important to take note of the green industrial plan published Feb 23. it aims to:

- Build the industrial capacity for the clean technologies that make up the Green Deal
- Respond to energy market disruption with affordable, secure and sustainable energy for Europe
- Recover from the pandemic better prepared for the green and digital transitions

These goals align with the horizontal digital/green polices being implemented across the government departments and also seek to boost sustainable competitiveness which is also an objective of DETE.

The plan highlights how a shared policy will help the EU deliver on its net zero ambitions if there is one approach rather than 27 national approaches.

As part of the Green Deal Industrial Plan, the Commission proposes to put forward a Net-Zero Industry Act to underpin industrial manufacturing of key technologies in the EU. This act could be used as the basis for addressing the challenges/opportunities in achieving net-zero.

Question 10

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

Excess energy

It is generally accepted that Ireland has huge potential in the whole area of renewable energy, especially in offshore wind. The Programme for Government references potential of at least 30GW of floating wind power with several experts estimating the potential at 50 GW plus. At such levels, Ireland would have excess electricity and accordingly would need to find a market for the excess (current peak demand is 5.5 GW).

There are varying views on what could be done with the excess. Some experts believe that excess electricity should be exported as green electricity via interconnectors, while more speak of the need for large electricity storage. Others believe that excess electricity should be converted into green hydrogen/ammonia and then exported. More experts see opportunities to establish new high energy intensive manufacturing industries in the country, industries which heretofore were traditionally based in countries with strong indigenous energy sources.

Some experts believe that the country should use the excess electricity to power data centres, and this would underpin the country's future tech sector; the point here is that it would be more economic for Ireland to 'export data rather than electricity'.

There is a need for research and analysis to ascertain likely and best possible options for excess electricity to inform policy in this area for Ireland.

Research skills development

There is an ongoing need to grow our research talent pool, working with partners, such as DFHERIS and SOLAS, to foster research and innovation skills and producing well qualified graduates that can engage productively in the broader digital, climate and sustainability ecosystem.

Digital Europe

It would be useful to explore how Ireland can better leverage European level programmes, such as Digital Europe, perhaps through the cross-departmental implementation structures of Impact 2030.