Rialtas na hÉireann
Government of Ireland

National Smart Specialisation Strategy

Consultation Paper

Prepared by the Department of Enterprise, Trade and Employment
June 2021

Contents

Introduction

Smart Specialisation Strategies (or S3) are enterprise innovation strategies that aim to prioritise public research and innovation investments for the economic transformation of regions, building on regional competitive advantages and facilitating market opportunities. The development of a new Smart Specialisation Strategy for Ireland presents an opportunity to assess, with stakeholders, our regional competitive advantages, future market opportunities, solutions to societal challenges, and the effectiveness of the current suite of innovation supports. We will also review and consider the recommendations of existing strategies and develop strong connections with future strategies. It is intended that S3 in Ireland will serve as an important strategic bridge, connecting national level innovation policy with regional enterprise priorities and regional actors, ensuring ongoing coherence between regional and national enterprise policy making. It will link several major policy areas: Regional Enterprise Plans (REPs) and Regional Spatial and Economic Strategies (RSES) will inform the S3, which will in turn inform the regional enterprise aspect of the next national innovation strategy for Ireland, consultations for which are occurring in parallel with the S3.

WHAT IS SMART SPECIALISATION?

Smart Specialisation is an innovation policy concept developed by the European Commission that aims to boost regional innovation, contributing to growth and prosperity by helping and enabling regions to focus on their strengths. This will promote broader benefits, including innovation driven growth in regions and promotion of sustainable growth models. A key enabling condition to qualify for European Regional Development Fund (ERDF) Operational Programme for 2021-27 is the development of a national or regional smart specialisation strategy.

The development of an S3 involves an entrepreneurial discovery process, ensuring inclusive and active involvement of all stakeholders. This is a process whereby government, business, academia and civil society identify a region's strengths and comparative assets, prioritise research and innovation investment in competitive areas and define a shared vision for regional innovation.

REQUIREMENTS FOR A SMART SPECIALISATION STRATEGY

The fulfilment criteria for S3s during the 2021-2027 cycle are set out in the Cohesion Policy legislative package and are summarised below:

1. Up-to-date analysis of bottlenecks for innovation diffusion, including digitalisation
2. Existence of competent regional/national institution or body, responsible for the management of the smart specialisation strategy
3. Monitoring and evaluation tools to measure performance towards the objectives of the strategy
4. Effective functioning of Entrepreneurial Discovery Process (EDP)
5. Actions necessary to improve national or regional research and innovation systems
6. Actions to manage industrial transition
7. Measures for international collaboration

IRELAND'S APPROACH TO THE S3 PROCESS

This paper is part of a two-stage consultation process for the S3. At a regional level, Smart Specialisation has been integrated as a thematic area into the Regional Enterprise Plans (REPs) and is a part of the statutory Regional Spatial and Economic Strategies (RSESs). The consultations taking place in the nine REP areas will give local and regional insights into innovation priorities. This online consultation will engage key innovation stakeholders who may not be represented at the REPs fora and will help to provide broader insights.

There are also numerous recent studies and policy documents to consider in the context of this strategy, and the S3 will draw together the relevant findings of these policies and well as the insights gained during the two-stage consultation process. The final output will be a policy document with specific actions and clearly articulated goals and objectives that will inform Ireland's investments in research, development, and innovation nationally and regionally.

This process will be overseen throughout by a steering group of key government stakeholders, providing governance of S3 during strategy creation. Their role will include ensuring that all the criteria for S3 are met, identifying S3 monitoring structures, and identifying the regional and national interests within S3, thus bridging any gap between national and regional policies.

THE AIM OF THIS CONSULTATION

Through this online consultation DETE hopes to collect the views of stakeholders with an interest in the development of the national and regional enterprise innovation landscape, especially businesses or business support organisations, national/regional/local public authorities and research and innovation organisations.

The consultation paper sets out suggested regional strengths and emerging areas of future opportunity and asks stakeholders for feedback on the areas proposed. In line with the fulfilment criteria for a S3, as set by the European Commission, the paper also addresses the following cross-cutting issues in national enterprise innovation (the industrial transition aspect of the S3 requirements being split into digital transformation and green transformation):

1. Digitalisation and digital transformation
2. Green transformation for enterprise
3. Innovation diffusion
4. International collaboration on RD&I
5. Actions to improve the national or regional enterprise research and innovation system

In addition to input on these areas, we also welcome more general views on enterprise innovation, regional enterprise development and suggestions for future actions/initiatives to help implement the smart specialisation strategy.

European Framework for Smart Specialisation

COHESION POLICY

Cohesion policy is the EU's strategy to promote and support the development of its Member States and regions. The policy aims to strengthen economic and social cohesion by reducing disparities in development between regions. It focuses on key areas which will help the EU face the challenges of the 21st century and remain globally competitive. Funding for cohesion initiatives is delivered through the EU's Multiannual Financial Framework (MFF).

One of the instruments that receives substantial funding from the MFF is the European Regional Development Fund (ERDF), which aims to strengthen economic and social cohesion by correcting imbalances between regions. The ERDF focuses its investments on several key priority areas, one of which is innovation and research. A key enabling condition to qualify for ERDF in 2021-27 is the development of a national or regional S3 to guide European and national investments in RD&I.

EUROPEAN GREEN DEAL

The European Green Deal is a response to the major environmental challenges that the world faces. It is a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use. It also aims to protect, conserve, and enhance the EU's natural capital, and protect the well-being of citizens from environment-related impacts. As part of a just and inclusive transition, it will pay attention to the regions, industries and workers who will face the greatest challenges. The Deal will accelerate and underpin the transition needed in all sectors.

The iterative, consultative approach used for the S3, empowering regions and stakeholders to focus on areas of current or future strength and identify areas which would benefit from sustainability supports and resource efficiency, acts in support of the transition required by the European Green Deal.

HORIZON EUROPE

Running from 2021-2027, Horizon Europe will be the most ambitious Research and Innovation programme in the world with a budget of €95.5 billion. Building on the achievements of Horizon 2020, Horizon Europe offers a broad range of opportunities for Irish researchers, innovators and Irish companies of all sizes in the pursuit of new discoveries, scientific and technological advancement and innovation. The goal is to ensure Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation.

Smart Specialisation Strategies are key to developing synergies between Horizon Europe and other EU smart growth-related instruments. Considering ways to blend or align EU Programme funding such as using ERDF or DIGITAL to improve and develop R&I eco-systems to prepare for Horizon Europe participation will be an aspect of this S3.

National Enterprise Innovation context

Through successive innovation and enterprise strategies, Ireland has successfully built research capacity in targeted areas of economic importance, a reputation for research excellence, a maturing national knowledge transfer system with European recognition, an increasing base of enterprises engaging in innovation activity, and a cohort of spinout companies from the research system that have won significant commercial success. Strategic national investments in Research, Development and Innovation (RD&I) have contributed significantly to:

- employment, export and investment growth
- the competitiveness of indigenous enterprise
- embedding the foreign direct investment base in Ireland
- the creation and application of new knowledge.

Reinforcing, refining, and scaling that success both nationally and at a regional level will be the policy challenge in coming years.

Ireland's current (RD&I) priorities are set out in various policy documents including:

- *Project Ireland 2040* - long-term, overarching national development strategy comprising the National Development Plan and the National Planning Framework
- *Innovation 2020* – Ireland's national strategy for research and development, science and technology 2015-2020. The Department of Further and Higher Education, Research, Innovation and Science is currently leading on the development of a new National Research and Innovation Strategy for 2021-27
- *Research Priority Areas 2018 to 2023* - Research Prioritisation aligns the majority of competitively awarded public investment in research with 14 priority areas
- *Enterprise 2025 Renewed* - Ireland's medium-term national enterprise strategy
- *Ireland's Industry 4.0 Strategy 2020-2025* – strategy for the digital transformation of the manufacturing sector and its supply chain.

Regional priorities are set out in:

- Regional Spatial and Economic Strategies (RSES) – NUTS 2 level strategic regional development framework
- Regional Enterprise Plans – NUTS 3 level enterprise development plans
- Ongoing reports and consultations being prepared for the selection of priorities for the use of EU cohesion funding in Ireland for the period 2021-2027.

This new Smart Specialisation Strategy will act as a bridge between national level enterprise RD&I priorities and regional priorities, ensuring policy coherence and connection between both.

At a broad, high level, current priorities for national enterprise-focussed RD&I investment are:

- enhancing the R&D capacity of SMEs
- driving industry-academic collaboration and clustering to support an internationally competitive enterprise base

- encouraging new technology adoption in Irish businesses
- funding state-of-the-art research infrastructure including for the benefit of enterprise
- international connectedness in the area of enterprise research and innovation
- supporting excellence in strategically important research areas.

Programmes for the delivery of these priorities include the Disruptive Technologies Innovation Fund, the SFI Research Centres Programme, Enterprise Ireland/IDA Ireland Technology Centres and Gateways, Knowledge Transfer Ireland and various RD&I funding supports from Enterprise Ireland, IDA Ireland and Science Foundation Ireland.

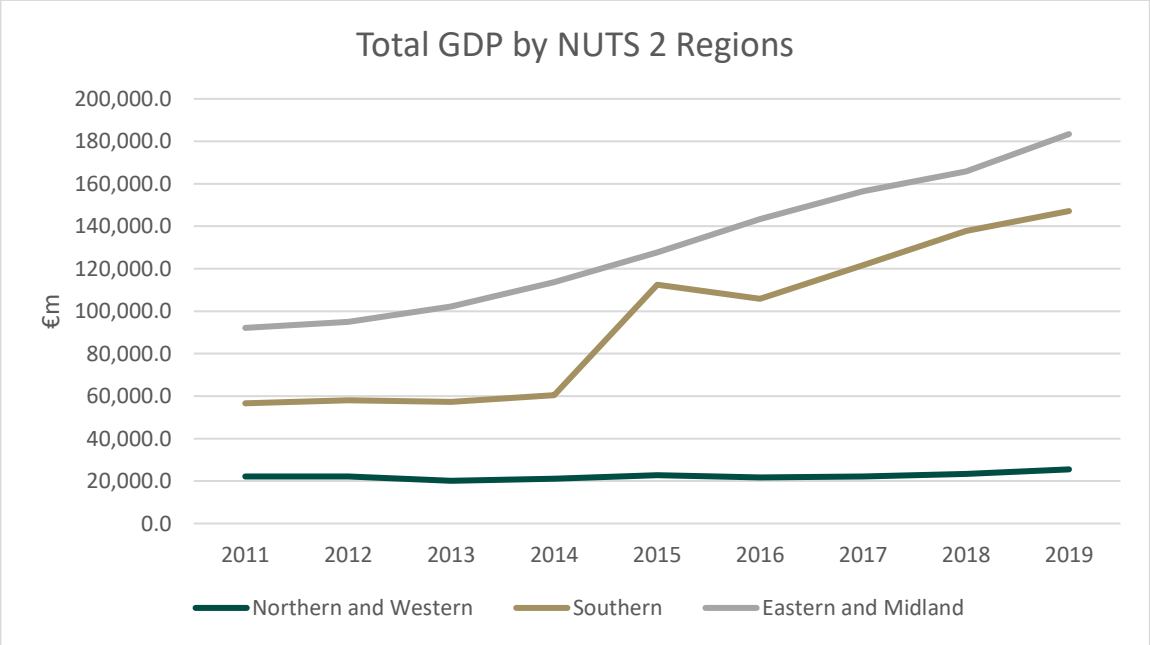
Ireland has increased its investment in RD&I over the past decade while also introducing a range of measures to improve commercialisation of research and build strong linkages between the higher education sector and enterprise. Ireland has committed to an investment intensity rate of 2.5 per cent GNP and while we have not yet managed to reach this target, it still remains an important goal. In 2019 Ireland invested 1.59% of its GNP in research and development, and 1.23% of its GDP.

Regional Enterprise Innovation context

All EU countries are divided into regions for administrative purposes and for determining the regional eligibility and co-financing rates for support from funds such as the ERDF. The regions are called NUTS (Nomenclature of Territorial Units for Statistics). Ireland is divided into the following NUTS regions:

- NUTS 1 – Ireland (1 region)
- NUTS 2 – Regional Assemblies (3 regions): Northern and Western Region, Eastern and Midland Region and Southern Region.
- NUTS 3 – Former Regional Authorities (9 regions): Midlands, Mid-East, Mid-West, West, North West, North East, South West, South East, Dublin.

Across the EU, the European Commission classifies regions within the Union as either being a "Less Developed Region", a "Transition Region" or a "More Developed Region", based on their GDP per head of population relative to the EU27 Average. The Commission recently re-classified the NUTS 2 Northern and Western Region from a "More Developed Region" to a "Transition Region" taking account of economic performance in recent years. Available data estimates that the Northern and Western region's GDP per capita was 78% of the EU average, while the region remained below 100% of the EU average in every year since 2007.



Source: Eurostat Regional economic accounts 2021 Eurostat - Data Explorer (europa.eu)

REGIONAL LEVEL STRATEGIES

Regional Spatial and Economic Strategies (RSESs)

The RSESs provide a long-term statutory strategic planning and economic framework for the development of the NUTS 2 regions in line with the National Planning Framework and the economic policies of the Government. The three Regional Assemblies of Ireland have developed their own RSESs, with each Assembly seeking to optimise the potential of the regions. Each RSES provides an evidence-based and place-based approach for growth and how it will be directed and managed over the next decade. Each RSES addresses issues such as employment, retail, housing, transport, water services, energy, digitalisation,

communications, waste management, education, health, sports and community facilities, environment and heritage, landscape, sustainable development and climate change.

The Regional Assemblies are responsible for co-ordinating, promoting and supporting the strategic planning and sustainable development of their regions through the RSESs. The Regional Assemblies are designated Managing Authorities for the ERDF co-funded programmes and also source European funding for Regional priorities, they promote coordinated public services, they monitor proposals which may impact on their areas, and they advise public bodies of the regional implications of their policies and plans.

Regional Enterprise Plans (REPs)

The nine REPs are an integral part of Ireland's enterprise policy, aimed at driving economic growth and sustaining better standards of living throughout Ireland. As a 'bottom-up' initiative, the Plans complement national level policies and programmes emanating from 'top-down' policies such as Ireland's national enterprise policy, Enterprise 2025 Renewed and the National Development Plan. They are informed by an understanding of unique local strengths and assets and enable more effective translation of national policy into regional and local impact through specific sets of local objectives that best realise these goals.

Nine Regional Enterprise Plan Steering Committees, chaired by private sector businesspeople and comprising representatives of the Local Authorities, LEOs, Regional Assemblies, Enterprise Ireland, IDA Ireland, Regional Skills Fora, Higher and Further Education Institutes, enterprise champions and others, oversee the implementation of the Plans. The Committees maintain the Plans as 'live' agendas which aim to be agile and responsive to both new opportunities and also new challenges, for example: Brexit, Climate Action, Digital Economy, and most recently, the Covid-19 pandemic economic impacts.

The first set of REPs to 2020 were launched in early 2019 and built on the success of the previous Regional Action Plans for Jobs which were operational up to the end of 2018. A new suite of REPs are being developed in 2021, alongside the new S3.

SMART SPECIALISATION AND REGIONAL INNOVATION

Realising the enterprise and innovation potential in all the regions, and thereby reducing disparities between regions, is a key aspect of this Smart Specialisation Strategy. The Regional Assemblies and the Regional Enterprise Plan Steering Committees are key stakeholders in the S3 process, with the Assemblies playing an integral role in the development of this strategy.

Smart Specialisation is one of the key economic principles adopted in each of RSESs. It is intended that the S3 will complement the work of the RSESs in creating an effective place based market-led business ecosystem, allowing all regions to fully utilise their competitive advantages with respect to enterprise innovation and to fully maximise growth in their economies.

The REPs are important vehicles in translating national level policies and strategies (including the Smart Specialisation Strategy) into regional and local impact. Regional enterprise innovation consultations for S3 are taking place as part of the REPs in addition to this online consultation. Smart specialisation is one of the four thematic areas for this cycle of the REPs (alongside resilience and recovery, transition and ways of working) and extensive consultation on S3 is being undertaken by Regional Enterprise Plan Steering Committees. The findings of the REPs consultations, in addition to this online consultation, will be integrated into a communication on Ireland's Smart Specialisation Strategy for the period to 2027. As this is an ongoing process, the strategy will be subject to continuous review over the coming years.

Regional Economic Context for Smart Specialisation

Enterprise innovation at a regional level is at the heart of Smart Specialisation. Addressing it at each stage in the development of Ireland's S3 is key to the evolution of the strategy, allowing stakeholders at all levels to provide their insights at each stage.

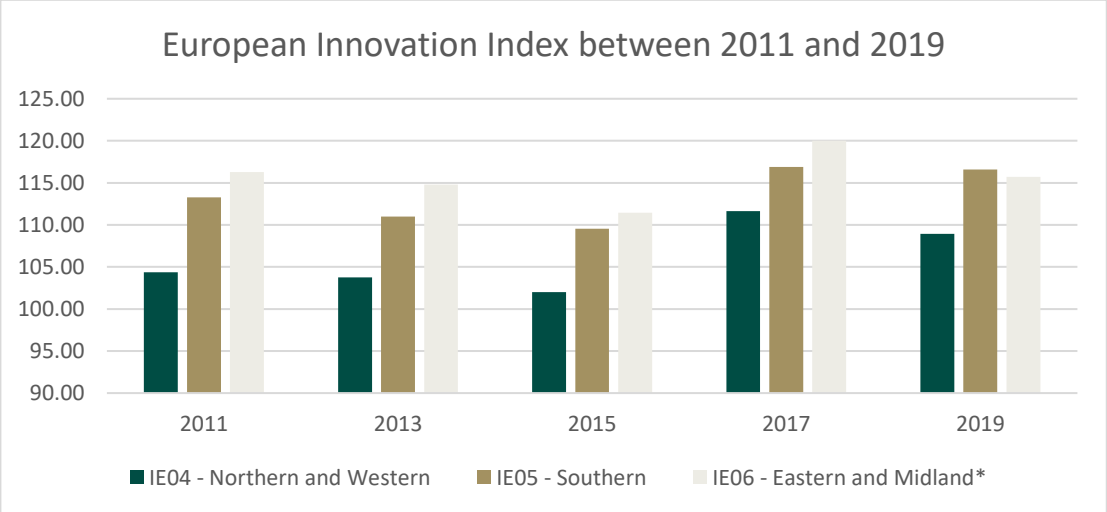
Northern and Western Region

As noted in the previous section, the European Commission has downgraded the Northern and Western Region from its previous status as a "*More Developed Region*" to a "*Transition Region*" for the funding period of 2021 to 2027.The Northern and Western Region is the only NUTS 2 Region in Ireland to hold such a status and such a position has been reinforced by the divergence between the region and its neighbouring NUTS 2 regions in Ireland with respect to several economic indicators including GDP per capita, labour productivity, skills development and digital infrastructure.

Reflecting the rural structure of much of the region, the Northern and Western Region's population density has been consistently below the Irish and EU 27 average since records began in 2012, with the region recording 35 residents per square km in 2019, versus the Irish average of 72 and EU average of 109. The lack of urban centres of scale is one of the development challenges faced by the region.

RESEARCH AND INNOVATION CAPACITY

Some of the region's development challenges in terms of urban centres of scale are evident in the EU Regional Innovation Scoreboard 2019. As per these findings, the Northern and Western Region is considered a "Strong Innovator", with the Southern and the Eastern and Midland Regions classified as being "Strong + Innovators"[1] due to their relatively higher index scores.



Source: European Regional Innovation Scoreboard 2019 (latest version)

[1] https:// ec.europa.eu/growth/sites/growth/files/ris2019.pdf

Of the three regions, the Northern and Western Region has experienced the greatest improvement in its innovation performance over time, rising by 4.6% relative to the baseline year of 2011. Such growth has brought the Northern and Western Region closer to the Irish average and above the EU average (104.2)[2]. That said, the Northern and Western Region – relative to the EU average – did record a below average index scores across a variety of innovation indicators including patent applications, lifelong learning, R&D expenditure in the public and business sectors, sales of new-to-market and new-to-firm innovations, employment in medium and high-tech manufacturing and knowledge intensive services and innovative SMEs collaborating with others.

One of the development challenges facing the Northern and Western Region includes the need for more investment in R&D to address the lagging productivity of domestic enterprises and to improve the resilience of its economy to external shocks.

SECTORAL STRENGTHS

Across the West there is a globally recognised cluster of health sector multinationals and indigenous companies, supported by active research assets, infrastructure and property solutions such the SFI Centre for Research in Medical Devices (CÚRAM) and the Medical & Engineering Technologies (MET) Gateway at GMIT, amongst others.

For the North West, key sectors of economic advantage include high value manufacturing (Pharmaceutical, Medical Devices and Engineering) along with ICT services, including software development and deployment for Financial Services/ Insurance. The Food and Marine sectors are also significant for the region. In addition, there are long-standing strengths in the audio-visual and creative sectors.

EI has three Technology Gateways in the region – MET, the Wireless Sensor Applied Research Laboratory (WiSAR) at LYIT and the Precision Engineering, Manufacturing and Materials Centre (PEM) at IT Sligo. The three Institutes of Technology in the North West are key resources in terms of skill development, research and industry-academic linkages with particular strengths in ICT, Manufacturing, Materials and Sustainability. NUIG hosts two SFI Research Centres – CÚRAM and iCRAG (geosciences) and partners with others such as MaREI (marine). It is also home to the Irish Centre for High End Computing (ICHEC).

NW Sectoral Strengths

- MedTech
- Life Sciences
- ICT
- Food/Agri-Tech
- Marine
- Financial Services
- Climate Action/ Sustainability
- Manufacturing
- Audiovisual/Creative

[2] https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/northern-and-western

Notable cluster organisations in the region include the Atlantic MedTech Cluster, the Irish Marine Network and the Donegal ICT/FinTech Working Group (see below).

EMERGING AREAS OF OPPORTUNITY

- New opportunities in MedTech
  MedTech is an industry of significant importance to the North West, not just in the cluster hub of Galway, but also in Sligo, Donegal and Mayo. Ireland employs the highest number of MedTech personnel per capita in Europe, employing 32,000 people over 300+ companies. The MedTech sector is epitomised by innovation, with a pace of change that is extremely high resulting in new and improved products being continually introduced. It is crucial that the North West retains its competitive edge in MedTech by continuing to adapt to meet opportunity. MedTech as a sector has been resilient during the COVID-19 crisis, however, the future challenge will be adapting to the new era of remote monitoring, biosensors and connected devices that is being accelerated by the pandemic. There may be an opportunity to deepen the links between Ireland's ICT and MedTech research and industry bases to create a competitive R&D capacity to develop and retain high-skilled research jobs in the region.
- Renewable Energy (esp. Marine)
  The Northern and Western Region has an opportunity to take advantage of its position on the Atlantic seaboard to develop significant capacity in the marine renewable sector. In the past, the primary focus within the State has been on land-based renewables, however, with technology advances in tidal energy, and off-shore wind becoming more cost-effective, this focus is likely to shift. Off-Shore renewables will be critically important if Ireland is to meet the energy targets set out for 2030. Wave energy, tidal energy, and offshore wind energy will continue to expand in line with technological advances and subject to feasibility, and environmental assessment. There are already many Marine Energy Test Sites located off the West Coast, including at Galway Bay (Marine Renewable ETS) and Belmullet, Co. Mayo, (full scale test facility and Wave Energy Converter to be connected to the National Grid). It is important that these and similar future projects are supported so that the NW can contribute and lead out on Ireland's commitments to Climate Change and reducing the usage of fossil fuels. A regional Marine Energy Hub could be considered to integrate focus and investment. In addition, the new airborne wind energy test site being developed in North Mayo represents an opportunity to develop capacity in a novel aspect of renewable energy.
- Innovation in Agri-Food
  The Agri-Food sector is vital to the region and particularly to Counties Monaghan and Cavan. For example, the agri-food industry alone accounts for over 60% of Monaghan's employment and 90% of the food produced within the county is exported. The agri-food sector is entering into a period of radical transformation underpinned by smart farming practices, growth in global demand and consumer sophistication. There is potential to develop Ag-Innovation clusters in the region - pushing convergence between farm, research, technology and commercialisation – with a commitment in the NW RSES to support this activity. There is also opportunity to explore increased specialisation and the development of novel or niche food products. Some existing initiatives in this space include the Teagasc Bia Innovator Campus in Athenry and the Monaghan Bio-Connect Innovation Centre, both representing models of Ag-Innovation infrastructure and support that could be replicated across the Northern and Western Region.
- Start-up incubation
  The lower cost of living and attractive financing and hub initiatives are key factors leading to a significant amount of start-up activity in the North West. In Galway, the start-up

ecosystem, includes GMIT's iHubs (also in Castlebar), the Galway Technology Centre (GTC), NUIG's new innovation district and the Halo Business Angel Network (HBAN) MedTech syndicate. The majority of start-ups in Galway are in ICT (especially ICT for Financial Services) and MedTech. In Donegal, the Local Enterprise Office recently launched the Scale-X technology accelerator for start-ups with potential for fast growth in ICT, fintech, health science, medical and other tech-based industries. There is potential to create a digitally connected innovation corridor connecting existing, emerging and new incubation spaces (including Portershed, Building Block Sligo etc.) that will attract businesses and industries working in the ICT and Med-Tech sectors and will network start-ups to develop potential scale partnerships.

Other areas of potential in the Northern and Western Region include game development (which could benefit from a cluster initiative in Galway), advanced manufacturing (the Digital Manufacturing Futures Centre in Sligo represents an opportunity for the digitalisation of manufacturing in the region and could form part of an advanced manufacturing 'triangle' with in SFI Confirm in Limerick and IMR in Mullingar) and in the complex biologics manufacturing aspect of life sciences (a high-value, rapidly expanding market with recent investments by Allergan (Westport), Abbvie (Sligo) and Chanelle (Loughrea) that may have cluster potential).

Eastern and Midland Region

Although the Eastern and Midland Region – as the main driver of growth in the Irish economy – performs relatively well across several key economic indicators, the region is also currently experiencing significant economic development challenges across variety of strategic areas. Over the past decade, a significant development challenge has been the rising level of intra-regional disparities, with the difference in disposable income per capita between Dublin and the Midlands increasing from a gap of €3,201 per capita in 2009 to a gap of €9,028 in 2019.

Further challenges are evident from several economic indicators – including but not limited to disposable income and deprivation rates – but also other indicators related to the productive capacity of the region's economy, including the distribution of urban centres, research and innovation capacity, high-value added sectors, third level attainment rates and exporting capabilities.

Although the Eastern and Midland Region's economy is specialized in various high-value added and export-oriented sectors such as ICT, biopharma, chemical manufacturing and Financial and Business Services, much of this enterprise activity is notably concentrated in Dublin. As a share of total employment and relative to the national average, the Mid-East was less reliant on sectors involved in "Medium High / High Manufacturing and Knowledge Intensive Services", with these sectors accounting for 50.2% of the Mid-East's employment base, as of Q4 2020. The Midlands also recorded a below average proportions of jobs in these sectors – with these types of jobs accounting for 44.4% of the sub-region's employment base in Q4 2020 – with the Midlands far more reliant – relative to the national norm – on low value-added sectors such as Agriculture and Accommodation and Food Services.

RESEARCH AND INNOVATION CAPACITY

As per the findings of the EU's Regional Innovation Scoreboard 2019, the Eastern and Midland Region is also considered a "Strong + Innovator". Despite this, the Eastern and Midland Region's index score has decreased in both absolute and relative terms since 2011.

Notwithstanding this decline, the Eastern and Midland Region continues to perform above both the State and EU average. However, relative to the EU average in 2019, the Eastern and Midland Region underperforms across a series of innovation indicators, such as trademark applications, innovative SMEs collaborating with others, lifelong learning, non-R&D innovation expenditure in the business sector, R&D expenditure in business and public sectors, sales of new-to-market and new-to-firm innovations, design applications and EPO patent applications

SECTORAL STRENGTHS

Dublin, as the capital city and the main population centre in Ireland, is a hotspot for innovation through world class research institutes, global enterprises leveraging a vast array of leading-edge technologies and a vibrant start-up scene. Dublin offers employment across a range of sectors and key industry focused research areas. Its main sectoral strengths are in ICT, Financial Services, Biopharma/Life Sciences and Engineering.

Dublin hosts seven technology centres, two technology gateways and eight SFI Research Centres; with specialities in the areas of ICT, Materials, Health and Wellbeing and Energy, Climate Action and Sustainability. Dublin is also home to NIBRT, the National Institute for Bioprocessing Research and Training. Notable cluster organisations have emerged in Dublin in the areas of MedTech, International Financial Services, GeoScience and ICT.

The Mid-East has well-established and growing concentrations of activity amongst multinational and indigenous companies in sectors such as ICT and High-Tech Manufacturing. There is also a strong financial services sector along the “M1 Payments Corridor”. There is a diverse agri-food sector in the region encompassing microenterprises through to companies of significant scale; in addition to food technology and innovation facilities such as the Boyne Valley Food Innovation District, Boyne Valley Food Hub and Teagasc Grange. Wicklow and the East Coast have an established screen creation sector with an internationally recognised screen industry cluster.

EME Sectoral Strengths

ICT

Advanced Manufacturing

Financial Services/FinTech

Engineering

Biopharma/Life Sciences

Food/Agri-Tech

Audiovisual

NUI Maynooth is located in the Mid-East with strengths including Business Process research through the Innovation Value Institute (IVI) and ICT through research partnerships with the SFI centres CONNECT and Lero.

In the North East DkIT collaborates extensively with industry in the region and has a number of research strengths particularly in the areas of Health, Energy and Sustainability. DkIT hosts the CREDIT EI Tech Gateway for Energy Efficiency.

The Midlands has particular strengths in Life Sciences, ICT, International Financial Services and Engineering. The region also has demonstrated capabilities in manufacturing processes

and technologies as demonstrated by the expertise of the Irish Manufacturing Research (IMR) facility and the academic/training programmes of the Athlone Institute of Technology (AIT) in this area. AIT also hosts two Technology Gateways – APT (polymer technologies) and COMMAND (ICT). AIT is to become part of Ireland's second Technological University based on a merger with Limerick IT. A notable clustering initiative in the region is the Engenuity Engineering Cluster to support market-led innovation, stakeholder collaboration and trade development in Midlands engineering companies.

EMERGING AREAS OF OPPORTUNITY

- New opportunities in ICT (AI, semiconductors)
  The current ecosystem around AI is well developed in the Eastern and Midland Region, with a highly established and robust FDI, SME and research base. Some interesting new activity in the region includes the Tangent AI accelerator programme, AI for climate research through the Terrain-AI project led by Maynooth University and CeADAR's work on AI for zero-defect manufacturing. Ireland has strong AI adoption rates - among the EU Member States, Ireland recorded the highest share of enterprises that used AI applications in 2020, with uptake set to increase significantly in the next three years[3]. In addition, the EU is setting ambitious targets for AI aiming to have 75% of EU companies using Cloud/AI/Big Data by 2030 and transforming Europe into the global hub for trustworthy Artificial Intelligence. However, increased global competition in AI markets will make it increasingly difficult for the region to defend its strong track record. The current multidisciplinary focus of AI research and the strong network of AI testbeds is an attribute of the region and there may be an opportunity to strengthen network of, and relationships between, AI research hubs and industry players as well as presenting a clear and coherent message on the AI offering available to enterprises to encourage increased take-up of AI solutions.

  Another area of opportunity in ICT for the region has been highlighted by the recent global shortage of semiconductors, which is having an impact on most manufacturing sectors highlighting the widespread integration of chips into consumer products from cars to toothbrushes. The Eastern and Midland region has a long-established presence in the semiconductor industry with representation across the entire value chain and the proven ability to deliver large scale projects across a range of business activities. With plans to boost chip manufacturing worldwide to address shortages and the EU looking to bolster its semiconductor ecosystem with a plan to produce 20% of the world's semiconductors under the Digital Compass Strategy[4], there is an opportunity for the region to build on its capacity and to engage with opportunities in the EU.

- New opportunities in FinTech
  The Eastern and Midland Region has a well-established capacity in FinTech, especially along the Dublin-Belfast Economic Corridor. It remains well positioned to see increased FinTech investment post-Brexit from banks and financial institutions choosing Ireland as the base for their European operations. Regulatory Technology (the management of regulatory processes within the financial industry through technology), or RegTech, is a growing opportunity for the sector, with the pandemic seeing companies seeking to digitise processes quickly while managing their regulatory requirements. There is also opportunity

[3] Irish business use of AI to 'increase significantly' (irishtimes.com)
[4] Europe's Digital Decade: digital targets for 2030 | European Commission (europa.eu)

to capitalise on the region's ICT and AI capacity to link LegalTech and RegTech and develop new solutions for the corporate services industry

- Low Carbon Economy
  There is an opportunity for the Midlands to develop significant capacity in the Low Carbon Economy and to support the employment of green technologies in enterprise. The new Empower Eco Hub (based in the former Bord na Móna complex in Lough Boora) will establish the Midlands' first social enterprise business model that integrates natural resources, enterprise, biodiversity, community, and social innovation with lifelong learning. The Empower Eco system will cluster Ireland's first connected regional ecosystem of sustainability, enterprise and eco-innovation projects in the Midlands. It has also secured funding to develop and launch Ireland's first dedicated sustainability business accelerator 'Accelerate Green' which will establish a pipeline of investible propositions in the sustainability and climate action sector. There is good potential to position Empower Eco as an international innovation hub and living labs complex for the Low Carbon Economy. Other related initiatives in the Midlands include the The Cube at Portlaoise, which will be a multi-point incubation hub for the development of a Low Carbon Centre of Excellence, and new windfarm projects at former Bord na Móna peatlands.

Southern region

Prior to the outbreak of COVID-19, the Southern Region's GDP per head of population[5] amounted to €88,460 in 2019, which was above the State average of €72,346 and the highest ratio recorded out of the three NUTS 2 Regions of Ireland. However, the distorting effect of Multinational companies should be borne in mind when considering the performance of the region. A better indicator to consider may be disposable income. Based on changes in disposable income per capita over the past decade, regional disparities – at a NUTS 2 Regional level – have been increasing, with the difference in average disposable income between the Southern Region and the Eastern and Midland Region – increasing from a gap of €1,333 per capita in 2009 to a corresponding gap of €3,403 in 2019. Rising intra-regional disparities also seems to be a significant economic development challenge facing the Southern Region, with the difference in average disposable income between its richest and poorest NUTS 3 Regions increasing notably over the past decade, rising from a gap of €96 per capita in 2009 to a gap of €2,038 in 2019.

RESEARCH AND INNOVATION CAPACITY

According to the EU's Regional Innovation Scoreboard 2019, the Southern Region's performance with respect to research and innovation capacity has improved relative to the State average since 2011. Compared to the EU average in 2019, the Southern Region recorded relatively weak performances with respect to R&D expenditure in the public and business sectors, lifelong learning, EPO patent applications, trademark applications and design applications

In this regard, a significant development challenge that has been consistently highlighted was the need for more investment in R&D in the Southern Region; an issue which is notably interlinked with the need to counter lagging productivity levels in domestic enterprises. This issue is of particularly importance for the Southern Region as total business expenditure on

[5] Current Prices: https://www.cso.ie/en/releasesandpublications/er/cirgdp/countyincomesandregionalgdp2018/

R&D[6] in the region amounted to €489 per head of population[7] in 2019, which was below the State average of €662.

Notably, from a labour market perspective, a total of 6,242 people were engaged as private sector R&D staff in the Southern Region in 2019, accounting for 0.79% of the region's labour force[8], which was the lowest ratio out of the three NUTS 2 Regions of Ireland and below the State average of 1.12%.

SECTORAL STRENGTHS

The South-West has a dynamic and broad enterprise sector, with a wealth of sectoral strengths and cluster activity. The dominant sectors are Life Sciences (in particular Pharma as noted by the presence of numerous multinationals and collaborative clusters), ICT (supported by research and tech centres such as Tyndall, IPIC, IMaR, MCCI, CAPPA and Nimbus and the clusters Cyber Ireland and IT@Cork) and Agri-Food (supported by research centres such as VistaMilk, APC and Teagasc).

Southern Sectoral Strengths

- ICT
- Advanced Manufacturing
- Food/Agri-Tech
- Automotive/Aerospace
- Pharma/MedTech
- Marine/Maritime
- Renewable Energy
- Financial Services
- Design

There is also significant potential in Medical Technology, International Financial Services and Renewable Energy (especially Marine Energy through the MaREI Centre).

The Mid-West has a strong Advanced Manufacturing base, as evidenced by the numerous high-tech manufacturing facilities based there and the region's significant research capability in this field (Confirm - SFI's Research Centre in Smart Manufacturing, the EI/IDA Pharmaceutical Manufacturing Technology Centre and the forthcoming IDA Advanced Manufacturing Centre). The region also hosts Ireland's National BioEconomy Campus located at Lisheen. The campus develops BioRefining technologies and works to strengthen existing sustainable agri-food production systems. The UL-based Dairy Processing Technology Centre and Shannon Applied Biotechnology Centre are also supporting agri-food in the region.

Shannon is home to the largest aerospace and aviation cluster in Ireland, with over 50 firms and growing. This cluster is supported by Shannon Group's International Aviation Services Centre and the Emerald Aerospace Group. The automotive sector is also significant for the region, supported by the Vehicle of the Future cluster and SFI's UL-based Lero Software Research Centre.

The South East has a concentration of firms in high value manufacturing (Pharmaceutical, Medical Devices and Engineering) along with International Financial Services.

[6] https://www.cso.ie/en/releasesandpublications/er/berd/businessexpenditureonresearchdevelopment2019-2020/

[7] NUTS 2 regional population estimates for 2019 and 2017 given that business expenditure on research and development related to 2019 and 2017. https://www.cso.ie/en/releasesandpublications/er/pme/populationandmigrationestimatesapril2020/

[8] Q4 2019 Labour Force

The SEAM and PMBRC Technology Gateways at WIT are key R&D supports to activities within the pharmaceutical and MedTech industries in the region. Food/Agri-Tech is also a significant sector with research support provided by WIT Walton Institute's activities in EU Agri-Tech projects and collaboration with VistaMilk. The Walton Institute is also a support for ICT in the region, along with the Crystal Valley Tech Cluster.

Unique among the regions, the South East has research strength in the design aspect of ICT and engineering, with the EI DESIGN+ gateway and the Centre for Design Innovation Hub (C4D) enabling companies to conceptualise, innovate, build and test new products and services.

EMERGING AREAS OF OPPORTUNITY

- Renewable Energy
  The proposed redevelopment of ESB's Moneypoint in the Shannon Estuary, from a coal-burning power station to a green energy hub, has the potential to be a key development for the region over the next decade. The Moneypoint site would include a floating offshore wind farm, a wind turbine construction hub, a green hydrogen production, storage and generation facility and a Sustainable System Support facility, set to be the largest of its kind in the world. When complete, the Green Atlantic@Moneypoint facility would have capacity to power 1.6 million homes, save 1.8 million tonnes of CO2 equivalent per year and would allow Ireland to become a net exporter of renewable energy. This development could also present a good opportunity for the Southern region to become an international hub for Energy Innovation.
- New opportunities in ICT (Quantum)
  The Southern Region has a long-standing capacity in the ICT sector, with existing clusters in cybersecurity and tech. A new opportunity to develop more specialised ICT capacity presents itself in the context of the expansion of Cork's Tyndall National Institute, the country's largest research centre. Ireland's first dedicated Quantum Computer Engineering Centre (QCEC) will be based at Tyndall's new facility on Cork's North Mall. The rapidly emerging field of quantum computing will have a huge impact on the future of the ICT industry, and in the healthcare and finance sectors. QCEC will upskill Irish researchers in the area of quantum and will develop open innovation and collaboration between academia and industry, while supporting key Irish technology companies and SMEs.
- Advanced Manufacturing
  The Manufacturing sector has been transformed over the past twenty years by globalisation, technology and the growth of emerging markets. Ireland has responded to these fundamental changes by moving its manufacturing facilities and activities up the value chain by targeting high-value manufacturing operations that are knowledge, capital and skills intensive. The digitalisation of manufacturing processes represents an ongoing opportunity for Ireland, particularly in the Southern Region with its high concentration of Pharma, MedTech and ICT companies. Smart manufacturing specific research facilities (such as SFI Confirm) and sectorally focused manufacturing research facilities such as PMTC (pharmaceutical manufacturing) and SEAM (material science and additive manufacturing) are part of a network of high-tech R&D solutions for the region. To remain competitive in manufacturing, increased engagement with R&D and a focus on innovation will be necessary for all enterprises in the region from start-ups to large MNCs. There is an opportunity for the region to clearly articulate its RD&I offering to manufacturing and to drive further digitalisation initiatives.

- Connected and Autonomous Vehicles (CAV) Sector
  ICT based technologies have been instrumental in enabling the development and growth of technologies in many other fields such as applied science, engineering, health, and – potentially most significantly – transport and logistics. Ireland has several companies that supply components and software to the many major brands in the automotive sector, including some industry RD&I Centres for vehicle technology. The emerging CAV sector is a new opportunity for vehicle technology in the Southern Region. A group of industry, academic and public sector stakeholders have established a CAV steering group to explore the business opportunities of this technology for Ireland. A key objective is to identify Ireland's current CAV products and services and develop a shared vision of how best to position Ireland to capture potential opportunities, thereby leading to new investment, employment creation and growth of Irish exports. There remains much work to do both in Ireland and in the sector itself to enable widespread CAV adoption, with issues remaining around safety, privacy, digital infrastructure, impact on transport systems and cross-border travel. A renewed focus on addressing some of these challenges in Ireland would be of significant benefit to industries in the Southern Region.

Consultation Questions

In relation to the regional synopses above, we would like to hear the opinions of stakeholders on the enterprise strengths and opportunities in Ireland. Some questions stakeholders might consider are:

Q: Do you agree with the suggested areas of strength for the three regions as set out above? Are there other areas of strength in the three regions to be highlighted?

Q: What, in your opinion, are the key sectors in your region? What are the skills, assets and capabilities within your region?

Q: Which sectors could achieve critical mass in Ireland over the next seven years? Where are the opportunities and what needs to be done to unlock these opportunities?

Cross Cutting Issues

In line with the fulfilment criteria for a S3, as set by the European Commission in the Cohesion Policy legislative package, this consultation will consider the following cross-cutting issues in national innovation (the industrial transition aspect of the S3 requirements being split into digital transformation and green transformation):

1. Digitalisation and digital transformation
2. Green transformation for enterprise
3. Innovation diffusion
4. International collaboration on RD&I
5. Actions to improve the national or regional enterprise research and innovation system

1. Digitalisation and Digital Transformation

WHAT DO WE MEAN BY DIGITALISATION AND DIGITAL TRANSFORMATION?

Digitalisation refers to the use of digital technologies, data and applications to deliver scale, productivity and innovation advancements in in both established and emerging sectors. Using these digital technologies to create new or modify existing business processes, culture and customer experiences, as well as create new products, is referred to as digital transformation. The adoption of digital technologies is also a key element of innovation diffusion. The family of technologies underpinning digitalisation includes:

- artificial intelligence,
- high performance computing,
- digital fabrication,
- robotics,
- big data and analytics.

Digitisation, digitalisation, and digital transformation are three terms often used interchangeably, but mean different things.

- **Digitisation** is the process of converting information from a physical format into a digital one.
- When this process is leveraged to improve business processes, it is called **digitalisation**.
- The results of this process are called **digital transformation**.

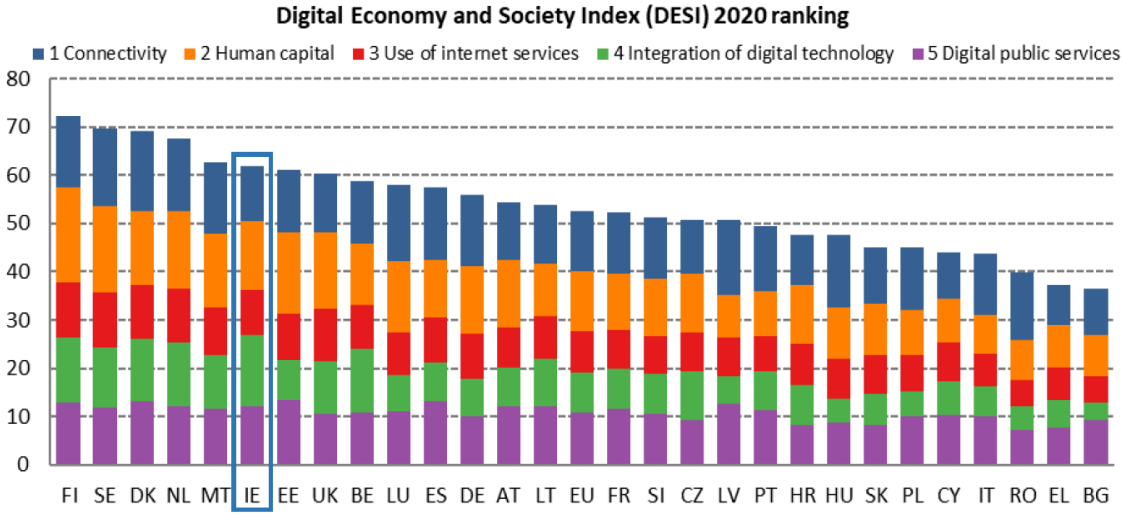
Digital technologies are disrupting market dynamics at increasing speeds and will create unprecedented opportunities for business as well as for economic growth in Ireland. The need for SMEs to adopt digital technologies (such as automation and secure remote working) has been highlighted by the recent COVID-19 crisis.

THE DIGITAL ECONOMY IN IRELAND

Looking at the broad picture of the digital economy, Ireland has, in recent years, been a strong and consistently improving digital performer in Europe. Ireland ranks 6th out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020.

The key indicator in the DESI that relates to digital transformation is the 'Integration of digital technology'. For the past three years Ireland has, and continues to, rank first in this indicator and has maintained a leading position in Europe in the use of e-Commerce by SMEs:

- 35% of them sell online and 18% sell to other EU countries, well above the EU averages of 18% and 8% respectively
- 29% of their total turnover comes from online sales, almost three times the EU average of 11%
- Irish SMEs also rank relatively highly on the use of big data, cloud services and social media. A 2020 CSO survey[9] shows that that 51% of all enterprises in Ireland indicated that they purchased at least one type of Cloud Computing service in 2020.

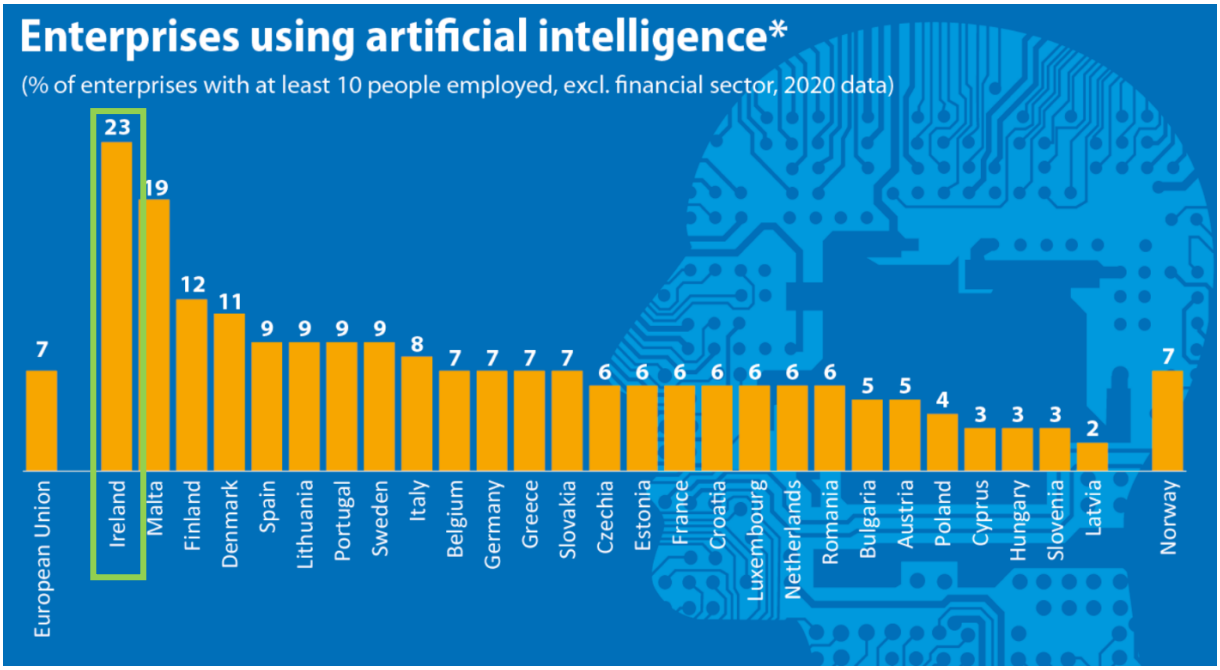


Source: Digital Economy and Society Index 2020

Among the EU Member States, Ireland recorded the highest share of enterprises (23%) that used AI applications in 2020 (see chart overleaf). However, more than half of the enterprises surveyed in Ireland (52%) have neither adopted AI, nor plan to do so[10]. To create long-term resilience, we will likely see further robotic automation and artificial intelligence (AI) within our supply chains to enable production to scale and shrink in response to sudden demand. Helping enterprises understand the benefits of advanced technologies for their businesses and developing initiatives to encourage the adoption of such technologies will be a key challenge for policy makers and the enterprise agencies in the near term.

[9] Information Society Statistics - Enterprises 2020 - CSO - Central Statistics Office

[10] European enterprise survey on the use of technologies based on artificial intelligence - Publications Office of the EU (europa.eu) (2020)



Source: Eurostat Artificial intelligence in EU enterprises - Products Eurostat News - Eurostat (europa.eu)

IMPACTS OF DIGITALISATION

In Ireland it is projected that there will be growth in high-tech and manufacturing employment over the next five years, but only under the assumption that enterprises in Ireland remain internationally competitive[11]. Digital capability will be a critical driver of that competitiveness, underpinning productivity growth and innovation in new goods and services across the value chain. However, evidence suggests companies often have difficulty in deciding when to invest in digital technologies, up to what level, and in which innovative field. Not enough companies know how to translate the use of technologies into economic impact, and how to build a new incremental business.

Digitalisation requires investment by enterprises to innovate and by people to learn new skills. This means encouraging greater investment by enterprises in research, development, innovation and digital skills. It also requires new business strategies to guide the digital transition as well as forming specialised teams to exploit opportunities that will arise.

Companies in the manufacturing sector are particularly exposed to the impacts of digitalisation. The global manufacturing landscape is becoming more competitive - large developing economies are achieving increasingly sophisticated manufacturing capabilities and becoming more successful in winning large-scale manufacturing campaigns. Accelerating the adoption of digitalisation will not only ensure we can compete for FDI on a global stage; it will offset the obsolescence of existing facilities and will address several broader manufacturing challenges by increasing production efficiency, driving more energy efficient, resource efficient and sustainable production, and facilitating the servitisation of manufacturing (leading to new jobs, more exports and more revenue). As a small economy, with a limited domestic market, a high export orientation is one of the characteristics of the

[11] Irelands-Industry-4-Strategy-2020-2025.pdf (enterprise.gov.ie)

manufacturing sector. Exported goods from Ireland in 2020 were recorded at €160 bn, a 5% increase on the previous year despite the pandemic[12]. This is a good indication of the current robustness of the sector, but with increasing global competition, potential international tax reforms and ongoing technological acceleration, complacency is not an option for Ireland.

There are indications that the pandemic has hastened the update of new digital solutions such as secure remote communications, large-scale tele-working, developing new business models such as moving from B2B to direct-to-consumer, automating end-to-end operational processes etc. A number of recent private business surveys have indicated that COVID-19 is accelerating digitalisation of operations, with one study showing that 81% of Irish CEOs have seen the digital transformation of their business accelerate in 2020[13].

CURRENT DIGITALISATION POLICY AND PROGRAMMES IN IRELAND

The Irish **Industry 4.0 strategy** was launched in December 2019 and work is at an advanced stage to develop a new national digital strategy and an artificial intelligence strategy.

The **Disruptive Technologies Innovation Fund** is a €500m fund available to support innovative and transformative technology investments. The fund is a key policy initiative to achieve digital transformation in various sectors of economic importance. Only projects that involve collaboration between businesses, SMEs and researchers are eligible for funding.

Enterprise Ireland offer a number of supports for digital transformation including a learning platform (eiLearn), funding for consultancy and feasibility studies (LeanPlus/Exploring Innovation), capital investment funding, R&D grants and training costs for staff (LeanTransform).

The **Enterprise Ireland/IDA Ireland Technology Centres** and the **Technology Gateways** are key drivers of enterprise digitalisation in Ireland. Technology Centres such as **CeADAR** (Ireland's national centre for applied data analytics and AI) and **Irish Manufacturing Research** (Ireland's Advanced Manufacturing and Digitalisation centre) and Gateways such as **Nimbus** (applied IoT) and **TSSG/Walton** (cloud, AR/VR) have specific expertise in digitalisation technologies. **SFI Research Centres** such as **I-Form** (advanced manufacturing) and **Confirm** (smart manufacturing) are also key research resources addressing complex digitalisation challenges in partnership with industry.

Tyndall National Institute in Cork is Ireland's largest research centre. With a focus on ICT and related technologies such as electronics, photonics and deep-tech, it is an important facility for addressing digitalisation changes for industry. To help employers and workers manage the industrial transition brought about by digitalisation, a range of training and skills supports have been developed by the Department of Further and Higher Education, Research, Innovation and Science.

The nine **Regional Skills Fora** help employers connect with the range of services and courses available across the education and training system, including upskilling for workers in digital

[12] Goods Exports and Imports December 2020 - CSO - Central Statistics Office

[13] Digital Acceleration - KPMG Ireland (home.kpmg) (2020)

technologies. Over 70 **Skillnet Networks** work with businesses in specific sectors, developing bespoke, State subsidised solutions to meet existing and emerging skills needs.

Consultation Questions

It is hoped that this S3 consultation will provide further, contemporary insight into the digitalisation challenge facing Irish enterprise, and we would like to hear from stakeholders about their experiences and suggestions for what more can be done to help. Some questions stakeholders might consider are:

Q: Is digitalisation impacting your sector or region? How?

Q: Could your business or sector benefit from new digital technologies? What support would you need to adopt these technologies?

Q: How can we improve the alignment of the country's ICT and digitalisation expertise, initiatives and investments?

2. Green Transformation for Enterprise

WHAT DO WE MEAN BY GREEN TRANSFORMATION?

Green transformation refers to processes within industries or companies that lead to reduced environmental change impact. With the increasingly prominent problems of global resource consumption, environmental pollution and greenhouse gas (GHG) emissions; green transformation is becoming a necessity for many businesses.

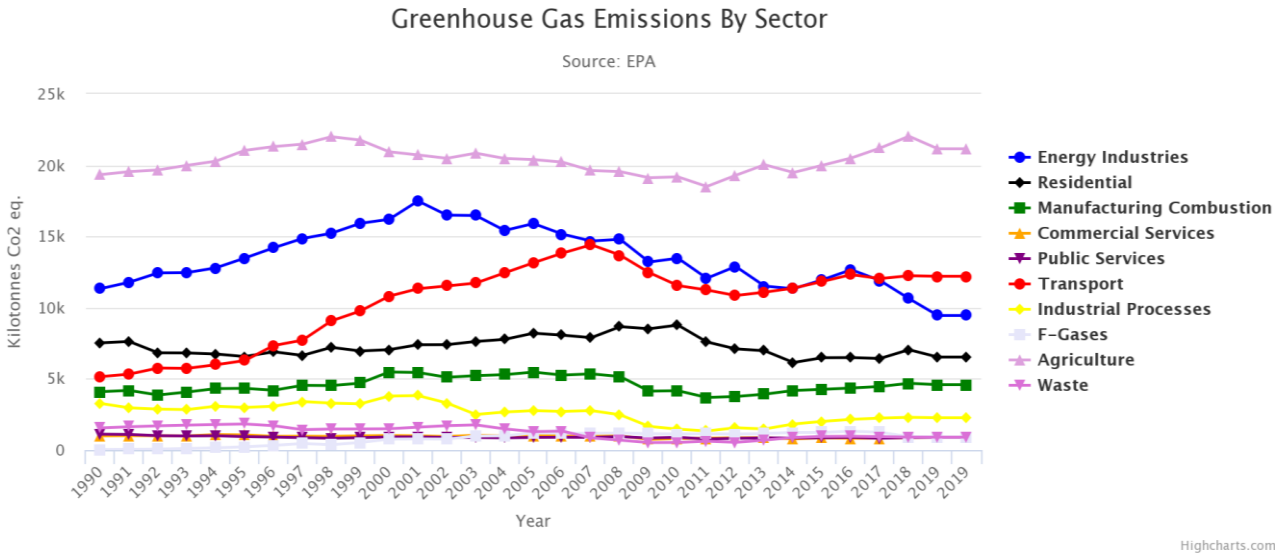
Climate action is one of the most pressing and pertinent issues facing the Irish economy and society. Enterprises that make the move early to reduce their carbon footprint will be more resilient to climate change impacts and there are significant opportunities for both existing and new firms to provide the goods and services that will be needed to decarbonise our economy. In addition, driving environmental and resource efficiencies and achieving improved sustainability by establishing and embedding continuous improvement systems and behaviours will enhance the competitiveness of many industries in Ireland.

CURRENT ENTERPRISE POLICIES FOR CLIMATE ACTION

In 2018, Ireland had the third worst emissions of greenhouse gases per capita in the EU at 12.6 tonnes of carbon dioxide equivalent per capita. Ireland's emissions were 53% higher than the EU28 average of 8.2 tonnes[14]. The enterprise sector is responsible for 13.3% of Ireland's total GHG emissions[15], 68% of which are accounted for by large energy-using companies

[14] CSO Environmental Indicators Ireland 2020
[15] Current Situation:: Environmental Protection Agency, Ireland (epa.ie)

(alumina, cement, food, pharmaceuticals, and ICT) operating in the EU emissions trading scheme (ETS).



Source: epa Environmental Indicators :: Environmental Protection Agency, Ireland (epa.ie)

The Department of Enterprise, Trade and Employment (DETE) will contribute to wider Government targets for greenhouse gas emissions from 2021 to 2030 and to achieving net zero emissions by 2050. It will do so by implementing policy changes in conjunction with a series of actions across its remit for the enterprise sector.

The Department's strategy for reducing enterprise emissions over the period to 2030 is as follows:

- Implement measures to reduce emissions in high emitting sectors, identified in the Climate Action plan 2019 through increasing the use of alternative fuels (e.g., solid recovery fuels/waste) in cement production; and switching from oil to biomass or electricity in food processing.
- Identify other highest users of fossil fuels – particularly those using oil, coal, or Liquified Petroleum Gas (LPG) in manufacturing processes and incentivise these enterprises to adopt new technologies, and other abatement initiatives.
- Work with the wider enterprise base through the development of an online portal - 'Climate Toolkit 4 Business' - which will enable businesses to calculate their carbon footprint (from energy, waste, water and transport) and develop a plan to reduce emissions. The portal's toolkit will act as a roadmap for enterprises, tailored to their sector and size, and direct them to relevant incentives.
- Contribute to the development of effective regulation and standards at an EU and national level that will drive decarbonisation. We will identify sectors where standardisation activities related to carbon abatement are ongoing, and where new standards are required.
- Leverage our investment in RD&I such as in technology centres and applied research programmes, to assist in the low carbon transition.

- Integrate climate action into all aspects of departmental and agency activities, with our agencies committing to achieving net zero by 2050 and incorporating climate impacts into project evaluation processes.
- Exploit the economic and employment opportunities that arise for businesses and society in the transition to net zero, including in renewable energy development, building retrofitting, sustainable products and associated supply chains.

The Climate Action Plan also outlines steps to reduce emissions from the enterprise sector as part of its commitment to achieving a net zero carbon energy systems objective for Irish society. Under the Plan, a Just Transition Review Group has been established within the National Economic and Social Council (NESC) to monitor the ongoing transition and to identify the specific needs of workers, businesses and communities.

The Climate Action and Low Carbon Development (Amendment) Bill 2021 will support Ireland's transition to Net Zero and achieve a climate neutral economy by no later than 2050. It will establish a legally binding framework with clear targets and commitments set in law, and ensure the necessary structures and processes are embedded on a statutory basis to ensure we achieve our national, EU and international climate goals and obligations in the near and long term.

The OECD Economic Survey of Ireland (2020)[16] notes Ireland's strong innovation outputs in ICT and biotechnologies, however, it points out a lag in environmentally related inventions, which is a concern given the pressing global need to combat environmental pressures and the fact that the market for such new technologies is likely to expand over the coming years. As part of its regional development strategy, DETE and its agencies will encourage new sustainable investments in the regions and promote the growth of entrepreneurial activity with a focus on the green agenda. As part of the refresh of the nine Regional Enterprise Plans, climate action and just transition will be key themes for the stakeholder consultation in each region.

PROGRAMMES TO DRIVE THE GREEN TRANSITION FOR ENTERPRISE

DETE and its agencies promote research and innovation including in areas that help enterprises make their products and operations more energy efficient and sustainable. As Ireland transitions to a low carbon economy, innovation will play an even greater role in the evolution of firm-level productivity over time. In recent years several initiatives have been developed to support enterprises in their green transition. These are not only delivered by DETE and its agencies, but also by Government Departments such as the Department of Further and Higher Education, Research, Innovation and Science; the Department of Environment, Climate and Communications and the Department of Agriculture, Food and the Marine.

The recent third call for the **Disruptive Technologies Innovation Fund** (DTIF) included '*Economic Impact and Sustainability*' as a new criterion for selection. This incorporates the commitment in the Climate Action Plan for all NDP funds to prioritise the selection of low-

[16] OECD iLibrary | OECD Economic Surveys: Ireland (oecd-ilibrary.org)

carbon investments. Looking ahead, the Department will explore the opportunity to run a climate action focused call under the DTIF.

Enterprise Ireland's Climate Enterprise Action Fund is a suite of initiatives to help prepare companies for the low carbon, more resource efficient economy of the future. Included in this are the **Climate Action Voucher** to help companies prepare a sustainability plan, **Green Start** grants to hire a Green consultant/trainer to undertake a short in-company assignment, **Green Plus** grants to develop a high level of environmental management capabilities and the **First Steps to Green Competitiveness** guidebooks.

Through the **Enterprise Ireland/IDA Ireland Technology Centres** and the **Technology Gateways** RDI activities are funded to assist in the green transition and to leverage the private sector knowledge base and investment in delivering climate related objectives, including at a regional level. The **Dairy Processing Technology Centre** develops technologies and approaches that will deliver reduced carbon and greenhouse gas footprints in the dairy industry. **Irish Manufacturing Research** have expertise in sustainable manufacturing and lead on **CIRCULÉIRE**, the first cross-sectoral industry-led innovation network dedicated to closing the circular innovation gap and accelerating the net-zero carbon circular economy in Ireland. The **CREDIT** Gateway in DkIT is focused on energy efficiency, with expertise in solar, wind and ocean energy and will assist companies to make both their products and their manufacturing operations as energy efficient as possible.

The **SFI Research Centres BiOrbic**, **MaREI** and **VistaMIlk** operate in the green transformation space and work with enterprises to develop solutions to climate challenges. BiOrbic works in Bioeconomy research, including seeking solutions for the agri-food and marine sectors. MaREI is the SFI Research Centre for Energy, Climate and Marine, focusing on defined global challenges such as the Energy Transition, Climate Action and the Blue Economy. VistaMilk drives sustainability in the dairy supply chain through innovation and new technology development.

The national network of **Local Enterprise Offices** operates the free **Green for Micro** programme to help prepare small businesses for the low carbon, more resource efficient economy of the future.

The **Climate Action Fund** (CAF) was established to provide assistance and financial support to projects which will help Ireland achieve its climate and energy targets. The Fund will allow for the development of innovative initiatives which, without this support, may not otherwise be possible to accomplish. The CAF will have a number of calls for applications, which may include calls focusing on specific sectors.

The **SEAI Energy Academy** is a free online training resource offering a wide range of courses and modules focussed on all areas of energy efficiency and energy management for business, including upskilling for staff, to help save energy and lower costs. The SEAI also offer a range of **energy efficiency grants** for business and an **Accelerated Capital Allowance** tax incentive scheme that promotes investment in energy efficient products & equipment.

Skillnet, the national agency for workforce learning, has developed **Climate Ready** to offer leadership and skills support for enterprises who want to develop their operational and

strategic sustainability. Also in the skills area, **Springboard+** offer training courses related to Climate Action and Just Transition leading to qualifications in areas where there are employment opportunities in the economy.

Bord Bia's Origin Green is the worlds' only national food and drink sustainability programme and enables the industry to set and achieve measurable sustainability targets that respect the environment and serve local communities more effectively.

Consultation Questions

We would like to hear from stakeholders about their experiences and suggestions for what more can be done to support green transformation in Irish enterprise. Some questions stakeholders might consider are:

Q: What opportunities can you see as arising from Green Transformation for your sector or region?

Q: What challenges exist for enterprises trying to reduce emissions or introduce sustainable practices?

Q: How could government or enterprise agencies assist you in meeting those challenges?

3. Innovation Diffusion

WHAT DO WE MEAN BY INNOVATION DIFFUSION?

Innovation is of crucial importance for countries and regions, to strengthen economic growth and find solutions to societal challenges. Innovation does not only take place by creating knowledge (for instance through research and development) but also by learning from others. Such learning processes enable the diffusion or transmission of innovation, and can help companies, regions or countries to catch-up to higher productivity levels. Innovation diffusion is of particular importance for SMEs and start-ups and reflects the process through which these firms gather knowledge, information, and innovations from outside and use them to introduce their own innovative products or processes. It refers, for instance, to the adoption of new-to-the-firm technologies, the introduction of new management techniques, the digitalisation of certain processes, or the introduction on the market of a new product.

Innovation diffusion relates to three sets of factors:

- The local and national **framework conditions**, which affect a firm's incentives and capacities to adopt innovations. Examples of framework conditions are the regulatory framework, market conditions, access to finance and skills, and infrastructure.
- The functioning of the **channels** through which the diffusion can take place. These channels include supply chains, workers careers and mobility, academic-business collaboration or knowledge intensive business services.

- The presence and functioning of a variety of **intermediary organizations** that help companies build the capacity for innovation adoption, identify external resources, and share knowledge among peers.

THE IRISH INNOVATION DIFFUSION LANDSCAPE

In the Global Innovation Index[17] Ireland remains a strong innovation performer and is the top economy worldwide in knowledge diffusion and knowledge impacts, a good indication of the strength of our enterprise agencies in driving innovation impacts. Some of the initiatives concerned with supporting knowledge exchange include:

Knowledge Transfer Ireland (KTI) is the national central point of reference for industry-academia partnership and research commercialisation. They operate a network of Technology Transfer Offices (TTOs) and industrial liaison offices in Ireland's HEIs and research organisations to help companies and investors access the expertise, talent and state-of-the-art equipment in academic facilities. KTI also helps businesses and spin-outs from academic research to identify and license new technologies and intellectual property (IP) relevant to their business and assists with R&D funding support.

Enterprise Ireland/IDA Ireland Technology Centres help Irish companies and multinationals to work together on market focused strategic R&D projects in collaboration with research institutions. The eight Technology Centres in the programme are resourced by highly-qualified researchers who provide a unique ecosystem for collaboration in areas identified, by industry, as being strategically important.

Enterprise Ireland Technology Gateways are a partnership with the Institutes of Technology and Technological Universities to deliver technology solutions for Irish industry close to their market needs. The 16 gateways are open access points to industry of all sizes to explore research partnerships with academia and link in with wider resources in the Irish research infrastructure.

SFI Research Centres: The network of 16 SFI Research Centres link scientists and engineers in partnerships across academia and industry to address crucial research questions. The centres support both basic and applied research, spanning a wide range of sectors at varying levels and stages. The Centres have signed 900 collaborative research agreements with 470 companies around the world (230 in Ireland)[18] and attract industry which make important contributions to Ireland's economy, and expand STEM educational and career opportunities.

EI Campus Incubation: EI funds both business and bio-incubation centres on college campuses across Ireland which provide space and support for start-up companies. Supports include: access to mentoring on key aspects of business development, such as market research and finance; proximity to research teams in the college and the use of R&D facilities on-campus. Campus incubation facilities exist across all HEIs in Ireland. There are over 200 companies, employing over 1,000 people based in Irish incubation centres funded by Enterprise Ireland.

EI Commercialisation Fund: The aim of the Commercialisation Fund Programme is to improve the competitiveness of the Irish economy through the creation of technology-based start-up companies and the transfer of innovations developed in Higher Education Institutes and Research Performing Organisations to industry in Ireland. The programme funds the

[17] Economy Reports & Analysis | Global Innovation Index 2020
[18] SFI Annual Report 2019

development of innovations at all stages of the commercial pipeline to the point where they can be commercialised as new products, services and companies.

Innovation Vouchers: €5,000 vouchers in more than 40 registered knowledge providers in exchange for innovative solutions to small business challenges.

Innovation Partnerships: This programme supports collaborative research projects between Irish Higher Education Institutes and companies. The financial support is provided to the college with a financial input also required from the partner company.

Disruptive Technologies Innovation Fund: DTIF facilitates collaboration between Ireland's research base and industry in support of the development and adoption of new disruptive technologies and applications, which will in turn help build new technologies for world markets and strengthen the competitiveness of the enterprise sector.

In the private sector there are also a number of industry organisations and industry-driven clusters that support the knowledge-sharing, networking and collaboration necessary for innovation diffusion, these include **Chambers Ireland**, **Ibec, IRDG** and a wide network of cluster organisations such as the **Atlantic Med-Tech Cluster**, **Cyber Ireland**, **Crystal Valley Tech** and many more.

Consultation Questions

It is hoped that this S3 consultation will provide further, contemporary insight into the challenges facing Ireland for innovation diffusion, and we would like to hear from stakeholders about their experiences and suggestions for how we can improve the system. Some questions stakeholders might consider are:

Q: What are the barriers for innovation diffusion in Ireland? How can these barriers be broken down? Are their regional differences in these barriers?

Q: What channels for diffusion are used by your business or sector?

Q: How can we enhance collaboration between industry and the higher education sector?

4. International collaboration on RD&I

WHAT DO WE MEAN BY INTERNATIONAL COLLABORATION?

To form a robust Smart Specialisation Strategy, it is necessary to look beyond Ireland itself and recognise what others are doing. To specialise in something, it's vital to know how a country's strengths and priorities relate to those of others. While it might not be possible or appropriate to do the same thing that others are concentrating on, there might be opportunities to collaborate and build synergies with other countries.

International cooperation maximises the impact of international and national investment in research and innovation. It contributes to the development of Ireland as a research and enterprise partner, underscoring and enhancing the excellence of our research and innovation system and facilitating engagement with the Irish diaspora. A key plank of our engagement in international cooperation is participation of our researchers and enterprise in the EU Framework Programmes for Research and Innovation. We have performed well in winning competitive funding under these Programmes. The majority of funding is secured by our Higher Education Institutes, with the balance being won by enterprise and public bodies.

INTERNATIONAL COLLABORATIVE INITIATIVES IN IRELAND

Building long lasting and meaningful relationships with international partners of excellence is important to drive Ireland's research and innovation performance. Research and innovation are increasingly international and collaborative endeavours. There are a number of strands to Ireland's international collaboration:

- Participation in the EU R&I framework programmes – this is the most effective mechanism for the Irish R&I community to collaborate with their counterparts in other countries. Ireland has drawn down €1.14 billion in competitive funding under Horizon 2020 to May 2021. The new programme, Horizon Europe, was officially launched in February 2021 and will have a budget of €95.5 billion for the seven-year period, 2021-2027.
- Bilateral cooperation with a small number of countries – this helps build innovation capacity, facilitate researcher mobility and allow for economies of scale. Strong partnerships are already in place with the US, the UK and China; and
- Membership of the key International Research Organisations (IROs). Ireland is a member of the ten key IROs – the European Space Agency, the European Southern Observatory, the European Molecular Biology Laboratory, the European Molecular Biology Conference, EUREKA, COST, CECAM, ESOC, ELIXIR and LOFAR.

INTERNATIONAL COLLABORATION FOR ENTERPRISE RD&I

Participating in international collaborative research brings benefits that accrue not only to our researchers but also to our enterprise base. The benefits include access to shared infrastructure and facilities, and collaboration in addressing global societal challenges.

Horizon Europe

Horizon Europe is the new EU research and innovation framework programme which will have a budget of around €95.5 billion for 2021-2027. Ireland's track record in European research programmes is well recognised throughout Europe and beyond. The National Support Network for Horizon Europe's goal is to build on that track record, providing hands-on assistance to Ireland's researchers and companies to actively participate in Horizon Europe. This network, led by Enterprise Ireland and overseen by the Department of Further and Higher Education, Research, Innovation and Science, is made up of 32 national delegates and national contact points covering all areas of the programme. The network is drawn from 10 State agencies and Government departments, and is the main structure to provide guidance, practical information and assistance on all aspects of participation in Horizon Europe from Ireland.

European Space Agency (ESA)

A principal objective of Ireland's membership of ESA is to facilitate innovative Irish companies to develop leading edge space technologies for commercial exploitation in the global space and non-space markets. Irish industrial capability in space technology is highly diverse, including structures, materials, microelectronics, photonics, telecommunications, radio frequency and life sciences. There is also a growing number of Irish companies active in the "downstream" sector in developing products for the related ground segment systems as well as end user equipment, services and applications which utilise space-based systems. Opportunities exist for Irish companies in developing and adapting technologies for the commercial space market, technology spin-out from space to non-space and in developing innovative applications and services that utilise space systems.

EUREKA Programme

EUREKA is the world's biggest public network for international cooperation in R&D and innovation. Eureka is open to SMEs, large companies, universities and research organisations, offering opportunities to combine expertise, exchange knowledge and enhance resources. EUREKA projects focus on the R&D of close-to-market products, processes or services. EUREKA does not fund projects but evaluates the collaborative project plan and endorses it as EUREKA approved project. Project consortium members can self-fund or, if eligible, are funded by national agencies such as Enterprise Ireland. EUREKA has a number of sub-programmes such as cluster and network projects.

Digital Europe Programme (DIGITAL)

Digitalisation of enterprise is increasingly recognised as a significant opportunity for driving productivity and growth in economies internationally. The EU has placed digitalisation of industry as a key component as it develops a long-term vision for the EU's industrial future; it recognises digital transformation is at the core of the next industrial revolution and that boosting the uptake of digital technologies along and across industrial value chains and promoting firm growth is key to Europe's growth and competitiveness. The European Commission estimates that digitalisation of manufacturing could add €110 billion per year to Europe's industry base. A forthcoming initiative under DIGITAL will see the development of a network of **European Digital Innovation Hubs** to support businesses and organisations in their digital transformation and to disseminate the latest advances in cybersecurity, Artificial Intelligence (AI) and High-Performance Computing (HPC). Ireland intends to have between two and four hubs in this network, which will be operational by early 2022.

European High-Performance Computing Joint Undertaking (EuroHPC)

Ireland is a founding member of EuroHPC, a European Union initiative which will build supercomputing and data infrastructure and support research and innovation in the domain. The Irish Centre for High-End Computing (ICHEC) is the National EuroHPC Competence Centre. In 2020 ICHEC launched its SME Accelerator programme, securing matched EU funding to provide leading-edge HPC services to Irish users from industry. Through this initiative, Ireland will have access to European HPC infrastructure, allowing Irish researchers and SMEs to access Europe's most advanced supercomputers. It will also bring opportunities for possible future collaborations with other EuroHPC participating states, including shared infrastructure access, upskilling and increased RD&I activities. Ireland's investment in EuroHPC will build on the existing national HPC service in order to strengthen the availability of HPC for academics and SMEs in Ireland, including access to computing and storage capacity, training and performance engineering.

ICHEC also hosts a Quantum Learning Platform to facilitate application development, research and innovation, training and education in the field of Quantum Computing, contributing to Ireland's smart economy.

Consultation Questions

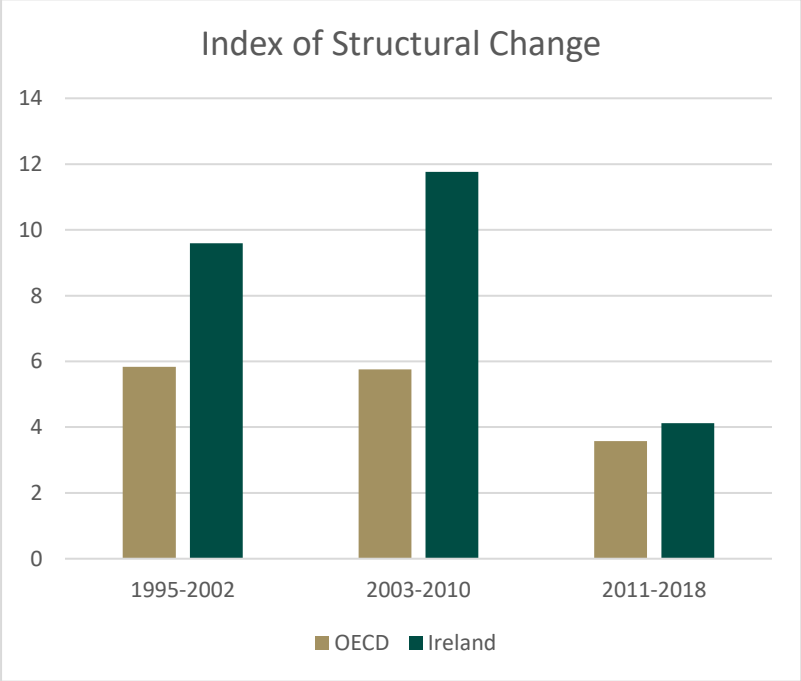
As a small, open economy, Ireland relies on external demand and international markets for sustainable and continued growth. The market for innovation and research is also global – international cooperation in research and innovation plays an important role in the development and sustainability of our innovation and research system. Some questions stakeholders might consider are:

Q: What areas of research or industry sectors does Ireland have an international competitive advantage in? How can we build on that advantage?

Q: In what areas or sectors should we be concentrating our international research collaboration activity? What supports do these areas or sectors need to be competitive on a world stage?

Q. How can Ireland's regions use Ireland's international links and memberships to support their strengths and emerging areas of future opportunity?

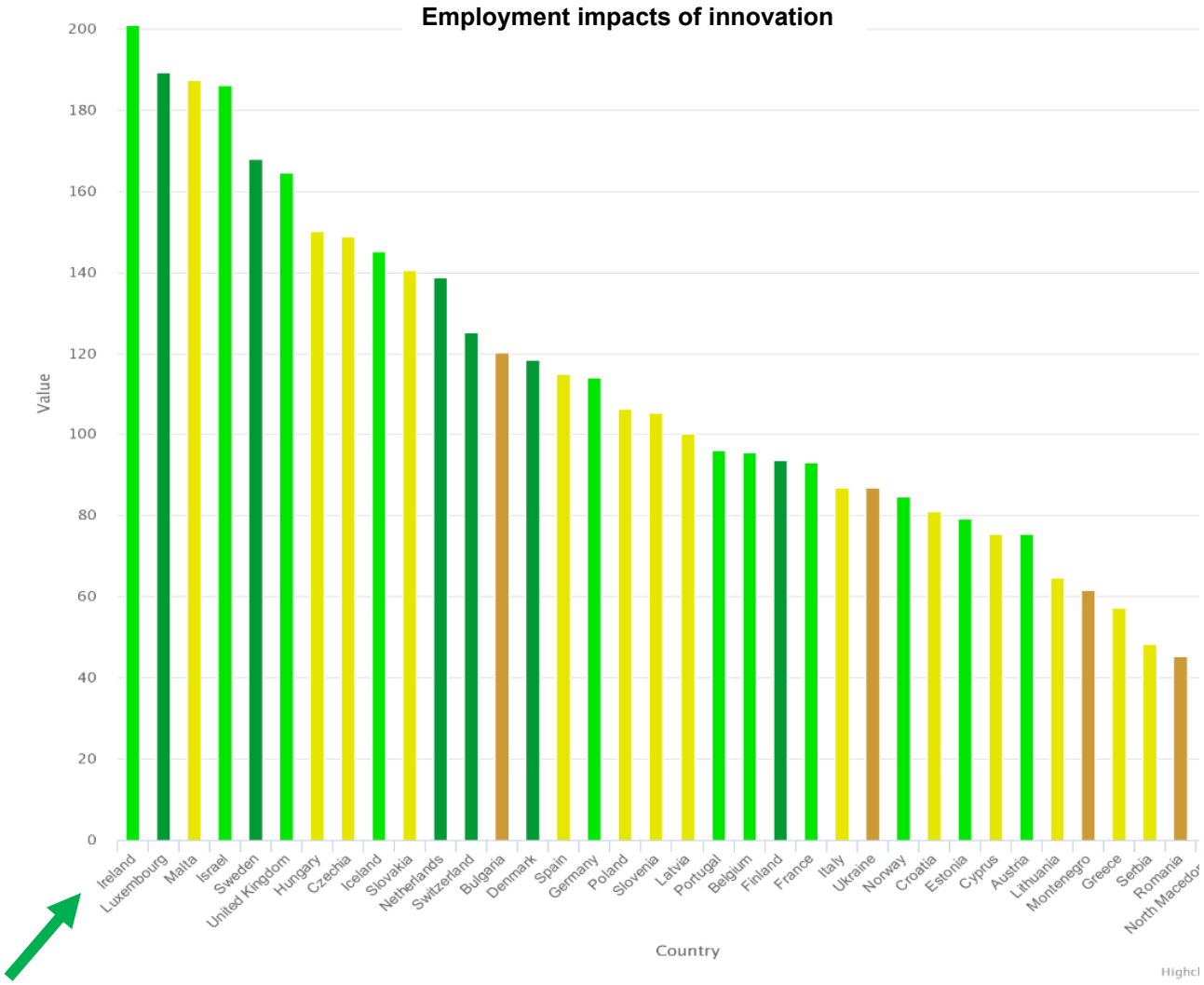
5. Actions to improve the national or regional enterprise research and innovation system



Source: OECD *StatLink* https://doi.org/10.1787/888934079744

Structural economic change has been a persistent feature of Ireland's past three decades, more so than in most other OECD countries. This is reflective of the ability of the economy to adapt to new demographic, economic and technological trends. Since the mid-1990s, the average real wage has increased by over 50% in Ireland, compared with around 30% in the United States or the average OECD country. These trends have coincided with growing innovation activity, increased infrastructural support for RD&I through initiatives such as PRTLI, and the expanding role of technology in the Irish economy.

In 2020, Ireland was ranked as the 9th most innovative country in the European Innovation Scoreboard. Ireland led on several key sub indicators related to R&D for enterprise, including the employment impacts of innovation. This measures the impact of innovation on employment and includes two indicators measuring employment in knowledge-intensive activities and employment in fast-growing firms in innovative sectors.

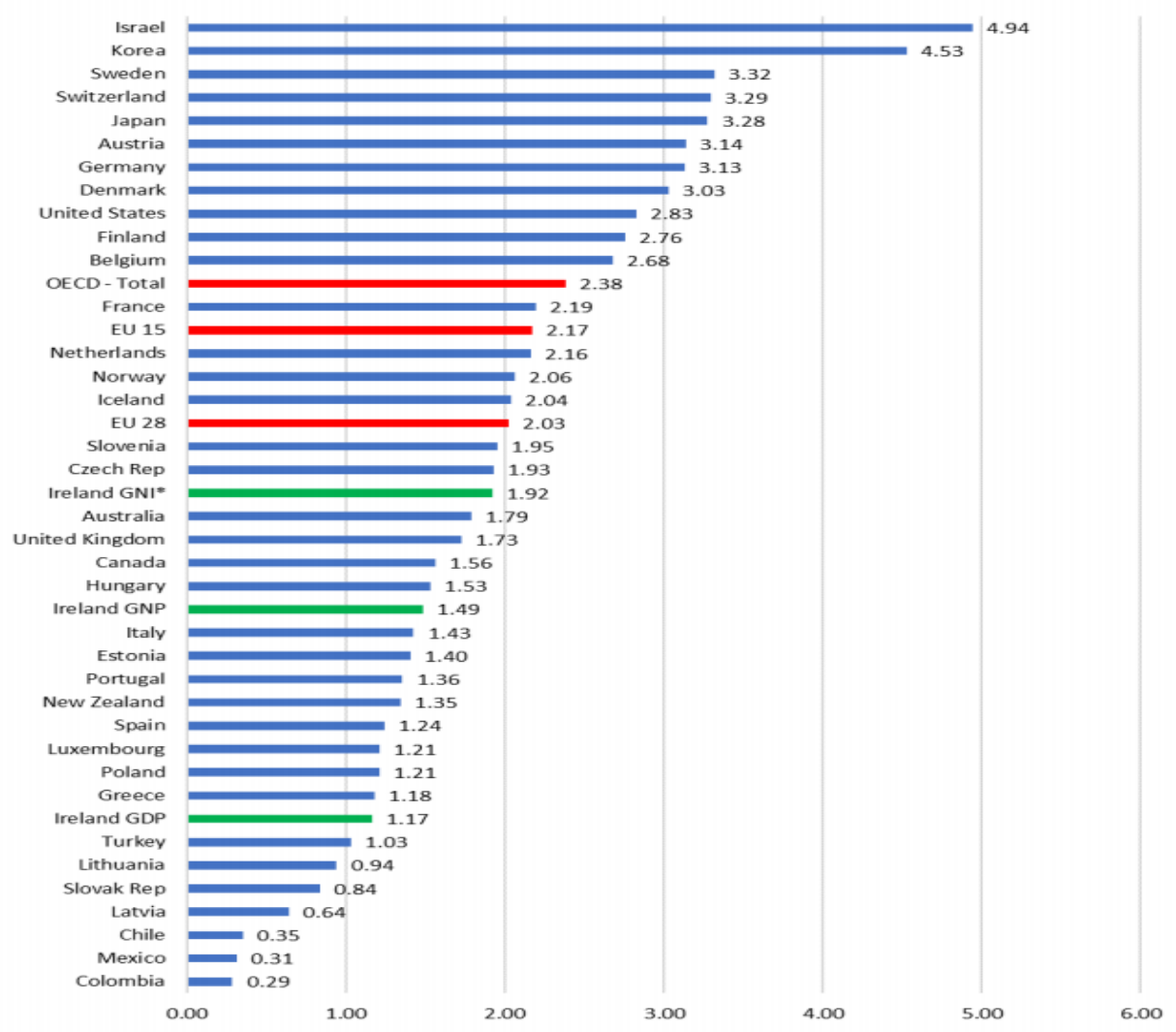


Source: European Innovation Scoreboard Edition 2020 (interactivetool.eu)

Ireland is considered a strong innovator[19]; however, the country continues to lag other EU countries in the level of investment in RD&I. Innovation 2020, the last national strategy for research, development, science and technology, contained a commitment to increase public and private investment in R&D (GERD) to reach 2.5% of GNP by 2020, which was reiterated in the National Reform Programme. However, that goal was not reached, despite significant increases in R&D investment since 2014. The estimate for GERD at the end of 2019 is in the region of 1.59% of GNP.

[19] European Innovation Scoreboard

International comparison of Civil GERD as a % of GDP/GNP/GNI* 2018



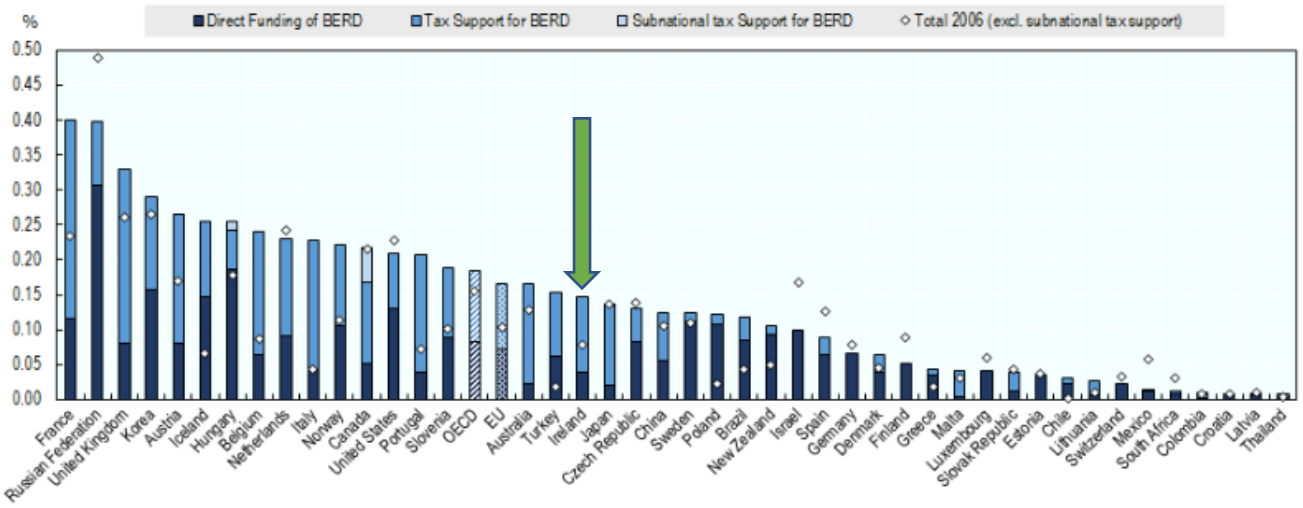
Source: The R&D Budget 2019-2020, DETE[20]

Economic studies (OECD, WEF etc) and European Commission Country Specific Recommendations have all identified Ireland's comparatively low levels of direct public funding for RD&I (GBARD) as an area of concern. The low direct funding levels are also an inhibiting factor in Ireland's performance on economic indicators (European Innovation Scoreboard, Global Innovation Index, Global Competitiveness Index etc).

Business expenditure on R&D (BERD) accounts for 74.46% of overall R&D in 2019, which is a good indication of smart industrial transformation. However, BERD remains below the EU average and is highly concentrated in foreign-owned firms. Indirect support (i.e. tax credits) remains the main instrument of public support for business R&D in Ireland (accounting for 80% of total public support). The chart overleaf shows direct government funding and tax support for business R&D as a percentage of GDP in the OECD countries for 2018, with 2006 being used as a comparison year.

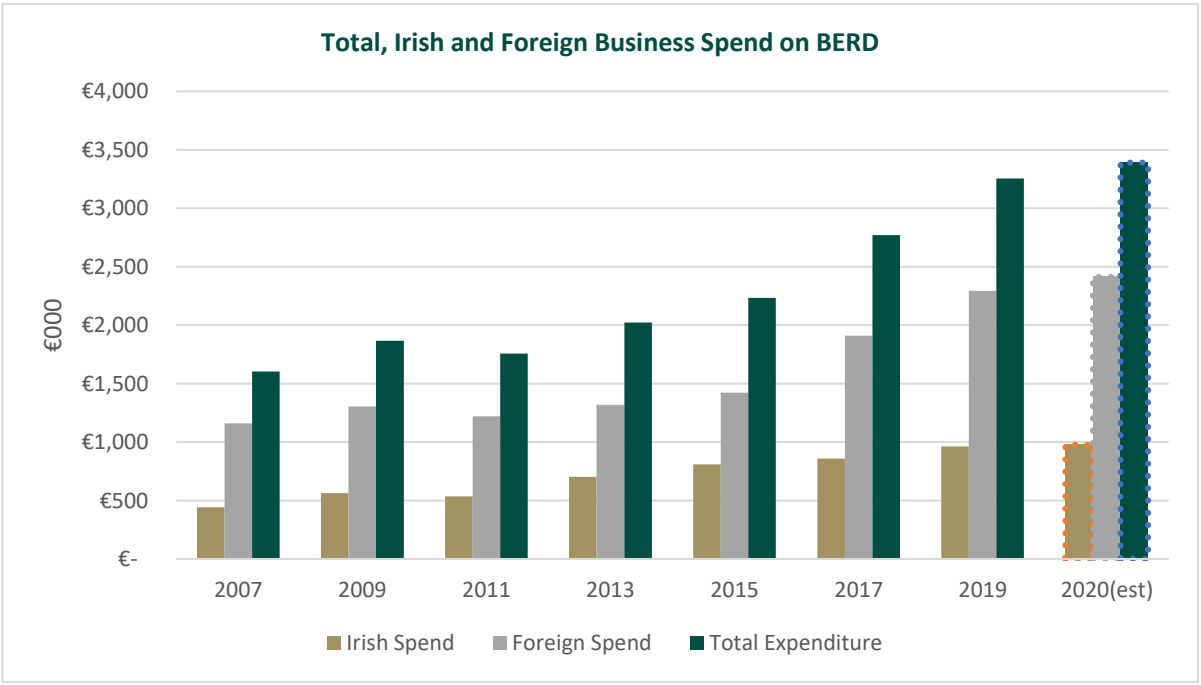
[20] gov.ie - The R&D Budget 2019-2020 (www.gov.ie)

Direct government funding and tax support for business R&D, 2018 as a % of GDP



Source: OECD R&D Tax Incentives Database, March 2021 | Data and notes[21]

Foreign-owned firms account for the majority of R&D expenditure (70%), however, three-quarters of all R&D expenditure by Irish firms is carried out by SMEs, reflecting the dual structure of Irish enterprise base[22]. The "innovation gap" is illustrated by the BERD data below which points to a significant gap between foreign and indigenous firms in terms of R&D expenditure and activity.



Source: CSO BERD 2019-2020

[21] Measuring Tax Support for R&D and Innovation - OECD
[22] Business Expenditure on Research and Development - CSO - Central Statistics Office

There is scope to improve the innovation potential of Irish SMEs by addressing some of the hampering factors to RD&I activity, which can include lack of funds, innovation costs and lack of skilled employees. Even though grant aid exists, innovation policy emphasises tax credits to stimulate firm-level R&D investments. These tax credits are effective but might not be as useful to start-ups and innovative young firms in emerging sectors. There may be other tools needed such as loan guarantees, risk finance instruments or initiatives for developing innovation capabilities. Improved RD&I grant initiatives could be explored, which would also address the low government R&D funding levels. Recent, novel RD&I grant initiatives such as the Disruptive Technologies Innovation Fund have bolstered Ireland's direct funding intensities, and the popular take-up of such instruments demonstrate the demand in Ireland's economy for such modes of intervention.

The enterprise sector was central to Ireland's recovery during the last recession and will be crucial again as we rebuild after the pandemic. As a small open economy, we need enterprises that are resilient and competitive in international markets. Improving the environment for Irish enterprises to innovate will be key to their survival and key to our national economic recovery.

Consultation Questions

An innovation gap exists between large multinationals and indigenous SMEs in Ireland. Irish SMEs will require enhanced supports to innovate to ensure their competitiveness and survival. Some questions stakeholders might consider are:

Q: Which RD&I initiatives have been successful for your sector/region? Which programmes should continue? Which RD&I programmes for enterprise are not working?

Q: How do we generate a stronger, unified ecosystem approach to RD&I across the country to strengthen the visibility of our RD&I supports?

Q: How do we target RD&I spend in a way which maximises impact for the economy and which addresses the market failure evident in low RD&I in the indigenous SME sector?