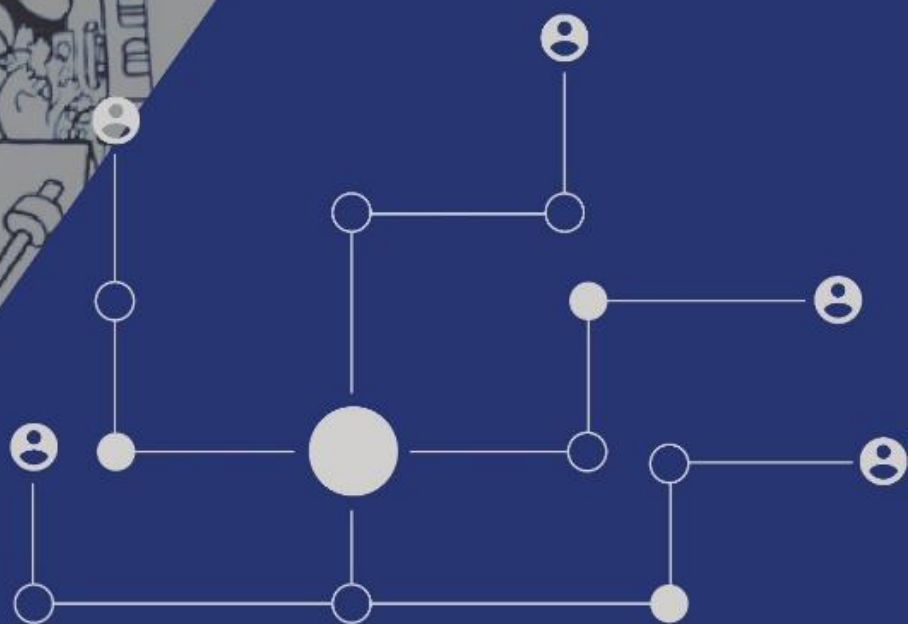# Regional Approach for development of a Smart Specialisation Strategy in the Southern Region

Executive Summary

The Southern Region of Ireland aims to achieve its vision of a resilient, inclusive, sustainable, and competitive economy by using an innovative policymaking approach known as Smart Specialisation. This report lays the foundation for the region's approach to Smart Specialisation and recommends priority areas for the region to focus its efforts, found using an evidence-based and participatory approach.

An array of methods was used to identify the priority areas, both quantitative and qualitative. These include stakeholder interviews and workshops, regional profiling and benchmarking, patent analysis and detailed SWOT analysis of key regional economic sectors. These analyses were broken down further into the Southern Region's three sub-regions of the Mid-West, South-West, and South-East.

The regional economy relies heavily on multi-national companies that specialise in areas such as Bioeconomy and Biomaterials, Electronics and Medical Technology, Pharmaceuticals, and Green Technology. Regional profiling and benchmarking with other European regions that share similar structural conditions to the Southern Region of Ireland reveal that although the region has the highest GDP per capita nationally, it also has the lowest real growth rate of regional Gross Value Added (GVA). This underscores Ireland's high dependence on Foreign Direct Investment and the influence of multinationals which inflate headline GDP figures, and points towards a need for more support towards indigenous growth. From benchmarking comparisons, the Southern Region ranks first in terms of specialisation in high-tech and knowledge-intensive sectors but the region faces significant challenges in terms of recent rises in unemployment as a result of the pandemic.
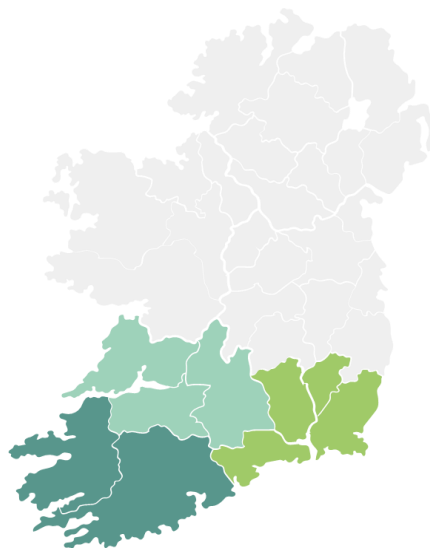
Strengths, challenges, opportunities, and key areas of technology specialisation were analysed in detail for the key economic sectors identified for the region and its sub-regions based on comprehensive desktop research, individual stakeholder interviews and the results of stakeholder consultation workshops. Broadly, strengths include the existing critical mass in the region, as well as the research and innovation capacity of the industries and higher education institutions, while challenges include funding obstacles and skills gaps in the workforce. Key sectors that were identified include Agri-Food, Bioeconomy, High-tech Manufacturing, Life Sciences, Blue-growth Industries, Energy, International Financial Services, ICT and Digital Industries and Tourism.

The results of the analyses culminated in a detailed table of 21 potential priority areas for the region, spreading across the key sectors, to be considered for smart specialisation, along with rationale and key stakeholders. The prioritisation framework gives an overview of top areas based on the private sector motivation to invest in areas with capacity and opportunity, but all should be strongly considered and evaluated by the region.

Completing the Entrepreneurial Discovery Process was beyond the scope of this report but explanations for important future steps in the EDP part of the Smart Specialisation Strategy are included. In addition to the EDP, these include a guide towards useful S3 policy instruments and the immediate next steps that the Southern Region should undertake in monitoring and evaluation mechanisms.

1 Contents

List of Figures

List of Tables

Glossary of Terms

AAGR – Average Annual Growth Rate

CSO – Central Statistics Office

Daas - Delivery as a Service

DETE – Department of Enterprise, Trade and Employment

EC – European Commission

EDP – Entrepreneurial Discovery Process

EPA – Environmental Protection Agency

EPO – European Patent Office

EPPC – Economic and Public Policy Consultancy

EU – European Union

FDI – Foreign Direct Investment

GDP – Gross Domestic Product

GVA – Gross Value Added

HEI – Higher Education Institution

ICT – Information and Communication Technologies

IDA – Industrial Development Authority Ireland

IoT – Internet of Things

IIoT - Industrial Internet of Things

IP – Intellectual Property

IRC - Irish Research Council

KET – Key Enabling Technologies

KPI – Key Performance Indicator

LEO – Local Enterprise Office

LQ – Location Quotient

MNCs – Multinational Corporations

MW – Mid-West

NACE – Statistical Classification of Economic Activities in the European Community

NUTS – Nomenclature of Territorial Units for Statistics

NUTS 1 - Ireland

NUTS 2 - Southern, North-West and Eastern-Midland

NUTS 3 - South-West, South-East, Mid-West

OECD – Organisation for Economic Cooperation and Development

PoC - Proof of Concept

R&D – Research and Development

R&I – Research and Innovation

RDI – Research, Development, and Innovation

REDF - Regional Enterprise Development Fund

Region – specifically in this report refers to the Southern Region of Ireland

RIS – Regional Innovation Scoreboard

RIS3 – Regional Strategy for Research and Innovation for Smart Specialisation

RSES – Regional Spatial and Economic Strategy

RTA - Relative Technological Advantage

SA – Specialisation Area

S3 – Smart Specialisation Strategy

SE – South-East

SME – Small and Medium Enterprise

SRA – Southern Regional Assembly

STEM - Science Technology Engineering Maths

SW – South-West

SWOT – Strengths, Weaknesses, Opportunities, and Threats

URDF - Urban Regional Development Fund

1 Introduction

The Southern Region of Ireland has the ambition to become one of the most Liveable, Creative & Innovative and Greenest regions in Europe, underpinned by a regional economy that is resilient, inclusive, competitive, and sustainable. Ireland is rated as one of the most open economies in the EU and has received significant FDI due to its competitive corporate tax rate, geography, high education attainment levels, EU membership, and favourable living environment. The Southern Region has benefited greatly from these FDI investments with several technology and life science multinational companies having a presence in the region. While the region has a very high GDP, it is heavily dependent on MNCs, making it vulnerable to potential corporate tax reforms. As the region faces major economic challenges, such as COVID-19 and Brexit, there is a need for the region to drive structural transformation and enhance local capabilities to make the region's economy fit for the future and ensure long-term inclusive prosperity. To achieve the vision of being a resilient, inclusive, sustainable, and competitive economy, the Regional Spatial and Economic Strategy (RSES), authored by SRA, identifies five principles: Smart Specialisation, Clustering, Placemaking for Enterprise Development, Knowledge Diffusion and Capacity Building.
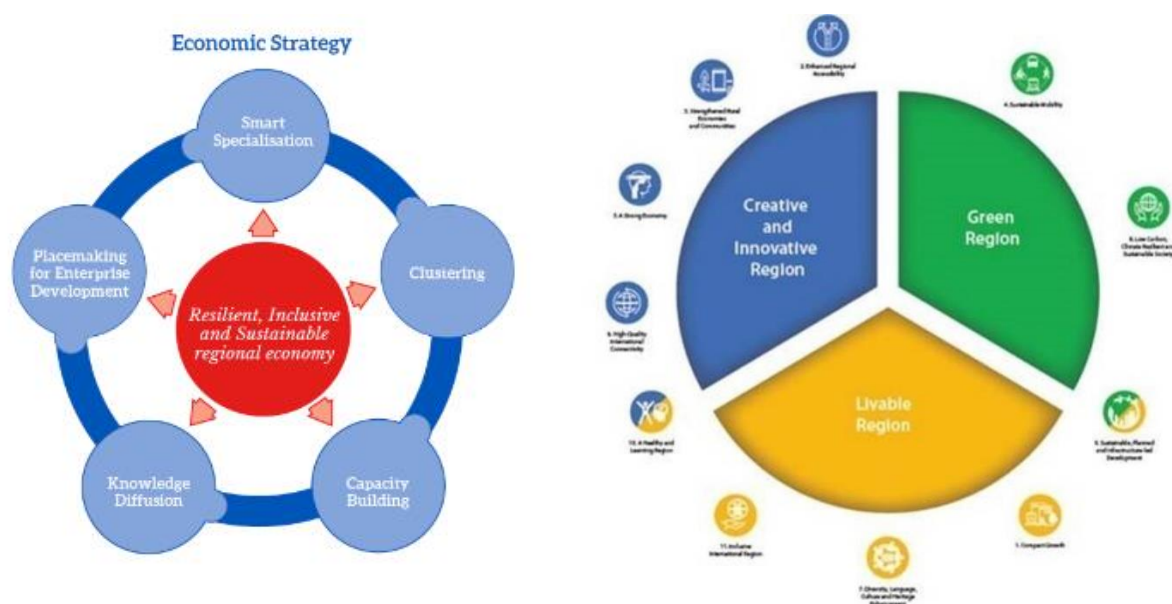
Figure 1: Regional Spatial and Economic Strategy for the Southern Region, SRA 2018

The smart specialisation policy focuses on the identification and further development of activities that are likely to effectively transform the existing economic structures through R&D and Innovation generating multiplier effects and boosting the diffusion of research and innovation across the region. The goal is to leverage the strengths and capabilities of the regional ecosystem by concentrating resources on the further development of these high potential activities to drive economic growth. As part of the EU cohesion policy, Smart Specialisation has gained momentum as a significant shift in innovation policymaking towards an evidence-based approach and an attempt to break with existing top-down horizontal innovation policies, based on scientific excellence and technology transfer. The formulation of strategies on region-specific strengths, potentials, and opportunities in the framework of S3 principles requires a balance between (1) policy planning marked by high levels of intentionality and strategic focus, and (2) equally high levels of self-discovery shaped by initiatives of the actors involved.

The Southern Regional Assembly is the Irish Partner on the Interreg Europe funded COHES3ION project, an interregional project focused on improving the performance and impact in the delivery

of innovation by Research & Innovation (R&I) actors of Smart Specialisation Strategy (S3) and linked ERDF Regional Programmes. This will be achieved through the integration of the regional dimension into S3 governance and policy considerations, thereby contributing additionally to regional cohesion in terms of growth and jobs. To help in achieving the agreed project outputs the SRA procured the services of Bable to support a regional approach for Smart Specialisation Strategy (S3) in the Southern Region. In alignment with the objectives of the COHES3ION project, the SRA is exploring how best to inform a regional Smart Specialisation approach and have identified key actions to facilitate this process. The initial step is to establish a framework for a Southern Region S3 through an in-depth analysis of the region's identified sectors as the basis for identifying the specific specialisations on which the region will base its research and innovation policies, interventions, and investment. This will form the basis for building a framework and informing the national S3 with relevant regional data.

This report details the findings of the first step that the Southern Region is undertaking towards defining a regional approach to S3 by identifying priority areas for the Southern Region through an evidence-based and participatory approach. The strategy builds on the findings of the Irish National S3 for Research and Innovation published in 2014 and the advisory report from EPPC on the Irish RIS3.

The report is divided into four sections: The *Methodology* section gives an overview of the process adopted to identify the priority areas for the Southern Region. The Main Findings section forms the core of the report, giving a detailed overview of the results from this work including a detailed regional profile, sectoral macro-analysis, detailed SWOT analysis for each key sector, the potential priority areas for the region and their prioritisation. The final section on the *Methodology Framework* outlines tools and methods that could be adopted by the Southern Region in the next steps towards fully developing their Smart Specialisation Strategy.

2 Methodology

This section outlines the work plan adopted from project kick-off in March 2021 to the delivery of the finalised report in May 2021. It also lays out the methodological approach taken for the identification of regional assets, international benchmarking with other regions in Europe, and the discovery of areas with the greatest potential for future development in the region. In addition to this, an overview of the stakeholder engagement process and the collaborative and holistic nature of the work done to map key sectors, understand local needs and demands, identify priority areas, and develop the Smart Specialisation Strategy (S3) framework for the Southern Region is also given.

2.1   Work Plan

In this initial S3 stage, a combination of top-down and bottom-up approaches was utilised to define potential thematic priority areas for the region based on comprehensive sectoral analysis and collective stakeholder inputs, and to develop a practical framework/toolkit to support further development of the S3, while ensuring policy alignment at national, regional, and local levels. Although the Entrepreneurial Discovery Process (EDP) was beyond the scope of this work -and would have been counterproductive at this early stage, a fully-fledged participatory process was undertaken to ensure the level of granularity needed to identify the potential areas as well as the key stakeholders to drive them forward. Furthermore, this was supported with BABLE's experiences in other relevant innovation strategies from across Europe, guiding the Southern Region's businesses, research organisations, educational institutions, and other key stakeholders to take the next steps to become an Innovative and Smart Region. The aim was to co-develop a Smart Specialisation Strategy (S3) framework/ toolkit for the Southern Region that enables and empowers the local stakeholders to pursue the S3 development and the Entrepreneurial Discovery Process (EDP).

Table 1: Breakdown of work packages for the S3 framework development

WP1: Macro-Analysis & Benchmarking	WP2: Stakeholder Consultation	WP3: Mapping & SWOT Analysis	WP4: Framework & Recommendations
• Top-down sectoral strengths and strategic priorities • High-level challenges, market trends and opportunities transformation • Existing R&I initiatives to assess the level of innovation and critical mass in key sectors	• Current and emerging areas of innovation activity "on the ground" • A deeper understanding of the local needs, framework conditions and perceptions • Assess readiness and willingness to drive the S3 EDP	• Mapping S3 areas with high potential (based on capacity and opportunity) • Mapping key stakeholder and innovation activities • SWOT analysis on place-based capabilities, resources, externalities, complementarities	• Prioritisation criteria for selection of S3 areas • Recommendations on key stakeholders, enablers, and levers – (links with Smart Region) • Practical framework/toolkit to inform further S3 development. • KPIs for monitoring and evaluation

Table 2: Breakdown of work packages for the S3 framework development
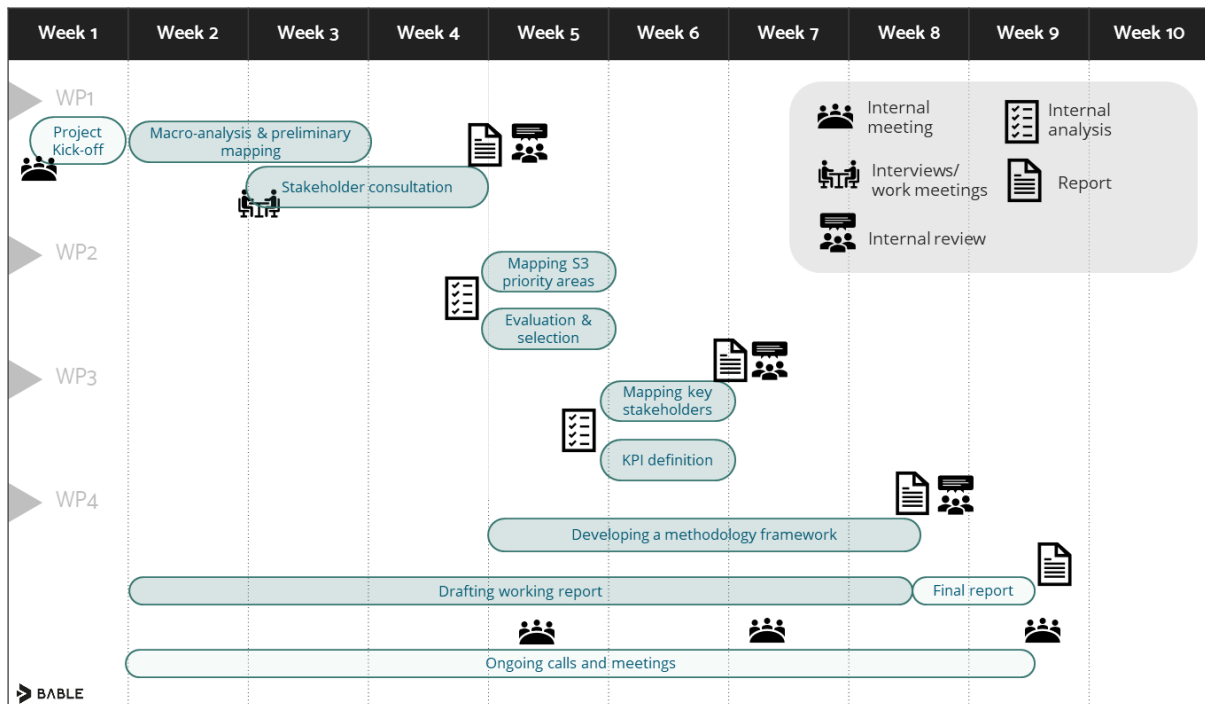
2.2 Methodological Approach

Smart Specialisation Strategies need to be based on a sound analysis of the regional economy, society, and innovation structure, aiming at assessing both existing strengths and prospects for future development. As a common principle, such analyses should focus on taking a more holistic view of innovation, encompassing all economic activities, and involving many sectors. Therefore, the analytical work conducted by BABLE aimed to shed light on the potential for knowledge-based transformation of the economy, based on information on the positioning of the regional economy in international value chains and the identification of specific key aspects. In particular, the analysis covers three main dimensions:

Table 3: Dimensions for S3 analysis

Regional assets	For a strategy well-rooted in the regional specificities (i.e., regional specific context), by assessing existing assets, evaluating major strengths and weaknesses, and identifying bottlenecks in the innovation ecosystem, as well as key challenges both for the economy and the society. Special emphasis was placed on capturing any existing patterns of differentiation, by examining emerging activities at the intercept of existing and well-established ones.
International benchmarking	For a strategy that looks beyond the regional boundaries, considering the region's relative position to other regions in Europe and its linkages to the global economy. Systematic comparisons and benchmarking with other regions allowed for the identification of comparative advantages, references, and best practices, as well as possible patterns of integration with partner regions.

Entrepreneurial dynamics	For a strategy geared towards a process of entrepreneurial discovery, by building a systematic understanding of the areas with the greatest potential for future development -ready to be tapped or encouraged, with a special focus on assessing the vibrancy of the regional entrepreneurial environment and its capacity to generate a significant flow of experiments and entrepreneurial proposals, to identify the activities that should be specifically supported.

Several methods can be used to support the identification of potential niches for smart specialisation, however, there is no integrated method that offers a single solution to this issue. A combination of quantitative and qualitative analytical methods, combined with stakeholder engagement approaches, provided an array of evidence that forms a suitable basis for the identification of priority areas. The main methods used are listed below:

Table 4: Methods utilised for S3 analysis.

Analytical Methods	Stakeholder Engagement
• Regional profiling • Benchmarking • Sector & cluster analysis • SWOT analysis • Patent analysis	• Stakeholder interviews • Working groups • Brainstorming workshops

2.3 Stakeholder Engagement Overview

Stakeholder engagements consisting of representatives from the public sector, private companies, research centres, and clusters were held over the span of a month. Preliminary desktop research was performed by BABLE to determine the key sectors of focus for the Southern Region. The sectors identified from the research were presented to stakeholders during the individual interview sessions and collective workshops in a bid to validate the findings, taking into consideration the local context and expertise possessed by each participant.

Interviews consisted of discussions around subjects such as key sectors, regional assets, unique selling points for the region, exports, knowledge transfer from research and innovation to business, position of local industries in the sectoral value chain, dependency on other regions, challenges faced in commercialising research, challenges faced by SMEs and start-ups in the digitalisation transition, cross-fertilisation of innovation between different sectors to be promoted, and measures taken to strengthen entrepreneurship in the sectors.

A total of 11 participants were interviewed across five sessions and the full list of organisations represented is given in the table below.

Table 5: Organisations represented for individual stakeholder interviews.

Public Sector	Research Centres/HEIs	Clusters/NGOs
• SW Regional Skills Forum • SE Regional Skills Forum • MW Regional Skills Forum • SE Business Innovation Centre • Cork Business Innovation Centre	• Munster Technological University • ArcLabs Research & Innovation Centre • RDI Hub	• Cyber Ireland • STEM South-West • Network Ireland Cork

The focus for the sub-regional workshops was getting additional inputs from a wider and more diverse audience, to provide a more general picture and address potential gaps from the inter-views. 90 participants from the key sectors, spread across the public and private sectors, were present. A breakdown of the representation for the workshops is shown below, both at the sub-regional and regional levels.

Figure 2: Stakeholder representation statistics at sub-regional and regional levels

3 Main Findings

This section forms the core of the report, detailing the main results from the work. It includes the regional profile for the Southern Region, its performance in key economic and innovation-related indicators against other similar regions in Europe, a macro analysis of the key sectors followed by a detailed SWOT analysis for each, and finally the identified priority areas and their prioritization.

3.1 Regional Profile and Benchmarking

3.1.1 General Socio-economic Profile

The Southern Region covers about 42% of the landmass of the Republic of Ireland (Eurostat, 2021) and it is divided into three sub-regions, namely, the Mid-West, South-East, and South-West sub-regions. In 2020, the estimated 1.6M inhabitants represented 33% of the country's population (CSO, 2020), growing at a steady rate that is projected to continue, reaching almost 2M inhabitants in 2040 (RSES, 2018).

Classified as a 'more developed region' according to the EU cohesion policy, **the Southern Region ranks 22nd out of all European regions in terms of regional GDP** and 2nd at the national level, with a GDP of €147.2b that accounts for 41.3% of Ireland's GDP[1] (Eurostat, 2019). The region has also the highest GDP per capita nationally, which was estimated at €88.5k in 2019[2] (CSO, 2020). However, the real growth rate of regional GVA was the lowest, at 4.3% in the same year[3] (Eurostat, 2020). The regional economy relies heavily on a range of multi-national companies that specialise in areas such as:

- Bioeconomy and biomaterials
- Electronics and medical technology
- Pharmaceuticals
- Green technology

Despite its strong economic performance, **the Southern Region faces significant challenges in terms of unemployment**. Since 2012, the regional unemployment rate has steadily decreased thanks to the economic recovery, reaching 5.5% in 2019 (Eurostat, 2021). However, following the pandemic, the unemployment rate soared to 6.4% by the end of 2020 (CSO, 2021). The region still records the highest rate in the country, remaining above the national average (5.7%), but below the EU level (7.3%). Considering the sub-regions, the South-East had the highest unemployment rate nationally (6.6%) on average over 2020[4], followed by Mid-West (6.1%), however, the South-West registers the second-lowest rate (5.1%) in the country (CSO, 2019). On the other hand, the region's employment rate showed a steady increase % between 2015 and 2019, growing from 64.1% to 67.4 (Eurostat, 2020); however, the employment rate dropped to 59.4% by the end of 2020, scoring below the national average (61.1%) (CSO, 2021). Overall, the impact of COVID on the Southern Region's labour market can be evidenced by the 55,989 people on the Live Register and the 91,311 people in receipt of the PUP[5] registered by the end of May 2021 – both figures being the second-highest among the three Irish regions (CSO, 2021); however, these numbers reduced considerably compared to end of January 2021, by -10% and -40% respectively.

---

[1] GDP at current market prices
[2] €77.8k and €28.4k in the Eastern and Midland and the Northern and Western region, respectively (CSO, 2021)
[3] 6.7% in the Eastern and Midland region, and 4.4% in the Northern and Western region; GVA at basic market prices (Eurostat, 2021)
[4] It should be noted that the figures for the last quarter of 2020 differ somewhat from the annual average, with the South-East recording the lowest rate (5.8%), compared to the Mid-west (7.2%) and the South-West (6.3%) (CSO, 2021)
[5] PUP – Pandemic Unemployment Payment

The presence of several universities, institutes of technology, research centres -both private and public, and a technological university help drive and support the innovation potential of the region. It represents an attractive area for investment due to the important role played by the IT industry. The region's strong focus on education and access to multiple research centres has fuelled the staffing and skill requirements of multinationals, making it a hotbed for Life Science, Technology, Multilingual and Engineering graduates. The population with tertiary education attainment registered 45.6% in 2020 (Eurostat, 2021), the lowest of all regions. Moreover, the participation rate in education and training (a.k.a. lifelong learning) was 9.7% in 2020, slightly above the EU27 average (9.2%) but below the national average (11%) (Eurostat, 2021)

Overall, the region's economy, as well as the Irish economy, has performed positively in recent years and is expected to continue to expand, albeit at a more stable pace. However, Covid-19 will have an impact on the Irish economy comparable to that of the EU. The EC's Spring 2020 projections foresee a decline of 7.9% during 2020 and an increase of 6.1% in 2021. Forecasts for the EU on average are similar, with a decline of 7.4% in 2020 followed by an increase of 6.1% in 2021. Nevertheless, although somewhat positive, the economic prospects of the regions remain clouded with uncertainty due to the still unclear situation that will follow Brexit.

3.1.2   Regional Benchmarking

A key to building sound innovation strategies for smart specialisation at the regional level is to identify opportunities for learning policy lessons and transferring practices from other regions. Using the Benchmarking Regional Structure Tool available at the S3 Platform, 15 regions have been identified which share the most similar structural conditions[6] to the Southern Region, and are relevant for innovation-driven development, such as social, economic, technological, institutional, and geographical characteristics. These regions are:
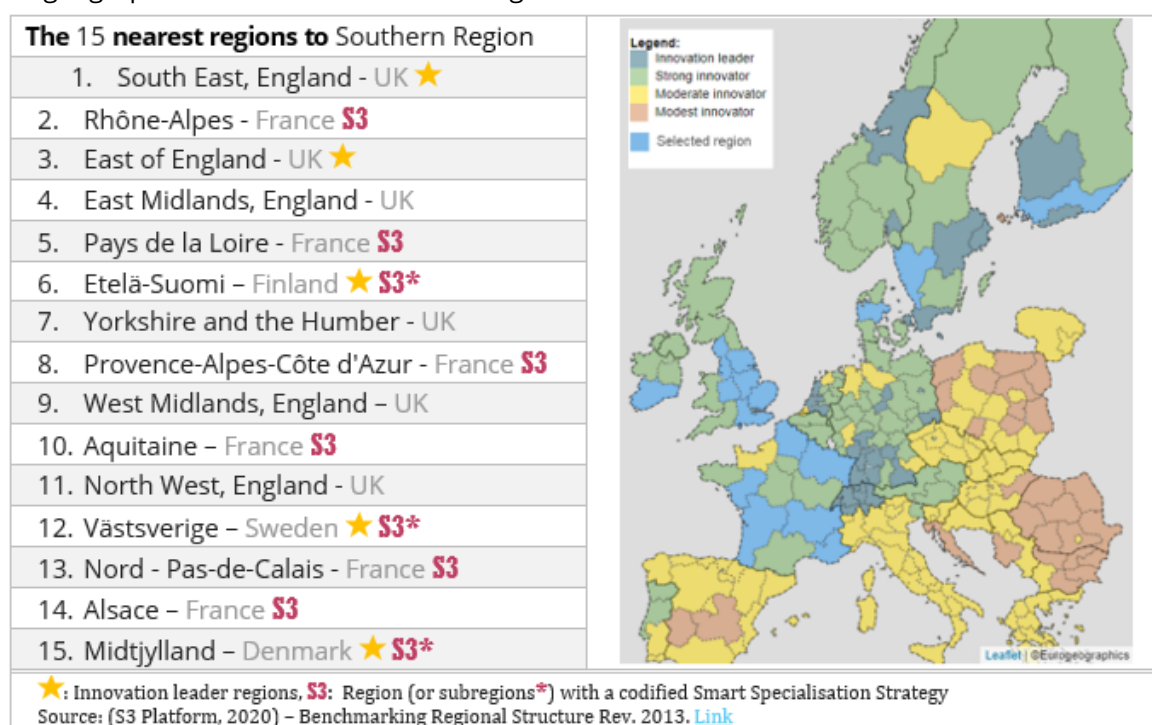
Figure 3: European Regions similar to Southern Region

As with the Southern Region, most of the selected regions are classified as strong innovators, except for 5 regions that stand out as innovation leaders (highlighted with one star). Figure 4 combines selected economic indicators for the regions, including averages for both the EU28 area and Ireland. The figure clearly shows the Southern Region's relatively advantageous position in terms of economic strengths (GDP per capita). However, it also evidences a considerably lower performance in terms of employment rate, which is below the EU28 average. All innovation leader regions feature employment rates beyond 72%.
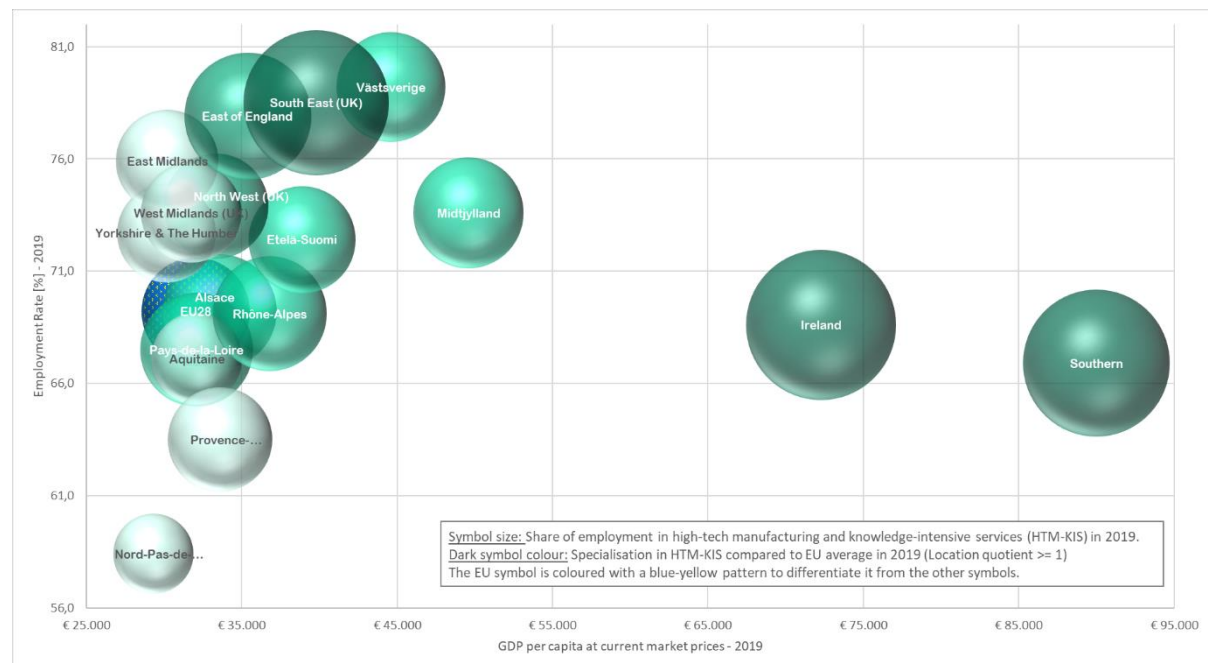
Figure 4. Regional benchmarking on selected economic indicators, based on Eurostat data and own calculations.

The graph reveals one defining feature of the region's current economic structure. As a small island, Ireland is economically dependent on external investment and, as such, the region has successfully attracted numerous foreign and multinational firms across many of its key sectors. This, in turn, has had a proportional impact on the productivity and contribution to the GDP of these key sectors. However, these low employment rates highlight the problems associated with a high concentration of jobs in these industries and, at the same time, indicate that indigenous firms may not be generating enough new jobs. Therefore, it is crucial to support the growth of both existing and new companies, while leveraging FDI's catalytic effect on indigenous growth.

On the other hand, while all regions are near the average (84.8% - Eurostat, 2020) in terms of share of employees with higher education degrees (not shown in graph), the Southern Region ranks first in terms of specialisation in high-tech and knowledge-intensive sectors (Location Quotient[7] of 1.9), followed by South-East, England (LQ of 1.8) and East of England (LQ of 1.4). Interestingly, the three Nordic innovation leader regions are as specialised as the rest of the EU, with the same location quotient of 1.0.

3.1.3   Assessing the region's innovation performance

Between 2011 and 2019, the Southern Region ranked as a Strong Innovator (+), according to the Regional Innovation Scoreboard, with an increasing innovation performance over time (+3.3%) relative to that in 2011 (see Figure 5). Although the region was able to raise its Innovation Index above

---

[7] Location Quotient (LQ) is essentially a way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation or any other aggregated area. It can reveal the degree of specialisation of the region with respect to different terms (e.g., employment, number of firms, etc.)

the national performance since 2011 (from 99.9% to 103%), its position relative to the EU average weakened (from 113.3% to 111.3%), though remained above average.

The regional performance shows relative strength for several indicators, such as marketing/organisational innovation and R&D expenditures in the public sector. For the latter, the score is above the national average (149%) and equal to the EU average (100%). Weak performance is instead registered for design applications, for which the region performs significantly below both the national and EU average (51% and 28%, respectively).

Figure 5. Southern Region's innovation performance between 2011-2019 relative to EU 2011, based on the Regional Innovation Scoreboard measuring framework. Source: (Regional Innovation Scoreboard Tool, 2019)

To give a better idea of the areas of innovation performance where the region can draw lessons from others, a comparison in terms of their performance on the different indicators of the Regional Innovation Scoreboard 2019 is shown in Table 6.

Table 6. Regional benchmarking on Regional Innovation Scoreboard 2019 performance indicators (RIS, 2019). The five innovation leader regions, as well as the Southern Region, are highlighted. The five innovation leader regions as well as the Southern Region are highlighted.

Category	Indicator	North West (UK)	South East (UK)	East of England (UK)	West Midlands (UK)	East Midlands (UK)	Yorkshire & The Humber (UK)	Västsverige (Sweden)	Etelä-Suomi (Finland)	Provence-Alpes-Côte d'Azur (FR)	Rhône-Alpes (France)	Aquitaine (France)	Pays de la Loire (France)	Alsace (France)	Nord-Pas de Calais (France)	Midtjylland (Sweden)	Southern (Ireland)
Human resources	1. Population with tertiary education	114,84	140,93	109,28	107,59	116,03	113,08	139,84	101,27	119,83	126,58	124,47	143,04	91,80	82,03	134,38	149,37
	2. Population participating in lifelong learning	130,10	152,48	124,75	111,88	130,69	138,61	298,06	252,48	152,48	227,72	189,11	207,92	159,22	149,51	247,57	78,22
Attractive research system	3. International scientific co-publications	87,12	185,63	178,37	128,29	131,85	146,48	128,92	186,78	134,93	148,96	105,61	101,72	85,95	66,78	148,90	147,91
	4. Top 10% most-cited scientific publications	125,32	148,34	172,28	142,81	121,12	129,40	116,53	105,11	106,51	106,16	105,50	97,15	96,14	83,71	113,87	113,39
Finance & support + Firm invest.	5. R&D expenditure in the public sector	77,10	99,13	109,14	67,81	72,49	86,21	113,88	105,07	124,21	118,39	86,57	78,01	93,66	73,15	127,89	102,54
	6. R&D expenditure in the business sector	96,71	119,31	155,46	119,71	113,63	69,55	152,50	99,06	115,69	127,02	82,55	81,05	69,45	68,24	107,45	101,20
	7. Non-R&D innovation expenditures in SMEs	118,66	99,17	48,78	118,13	110,70	120,04	110,07	68,82	96,54	139,23	135,07	95,78	119,58	91,41	103,59	116,74
Innovators	8. SMEs introducing product or process innovations	97,36	131,01	128,63	126,87	120,62	108,20	106,26	168,79	107,78	124,10	101,85	111,79	105,73	97,20	100,40	120,16
	9. SMEs introducing marketing or organisational innovations	110,73	105,83	112,04	99,03	106,80	91,40	108,83	125,81	126,28	124,79	106,33	117,26	125,92	108,67	115,47	129,68
	10. SMEs innovating in-house	101,50	136,05	132,33	130,31	125,45	112,56	109,49	170,16	109,83	125,96	100,05	112,35	103,76	96,07	139,76	127,14
Linkages	11. Innovative SMEs collaborating with others	233,27	264,07	264,07	264,07	258,85	264,07	86,34	190,51	116,02	141,00	111,36	131,26	85,65	83,79	109,63	114,52
	12. Public-private co-publications	115,18	163,65	222,67	80,70	120,70	110,68	244,90	105,12	106,21	125,68	91,40	92,72	85,46	73,46	120,45	110,28
Intellectual assets	13. PTC patent applications	82,35	104,47	134,70	98,16	78,79	79,44	156,82	107,98	94,86	152,47	74,43	71,14	86,95	85,12	146,65	56,98
	14. Trademark applications	46,10	104,42	98,49	83,99	70,00	77,84	155,91	116,80	85,84	69,30	70,97	42,90	51,98	35,10	172,87	37,26
	15. Design applications	38,50	87,63	77,40	106,71	64,06	90,54	108,67	81,36	66,29	84,89	65,67	88,93	55,52	80,05	147,64	27,14
Sales impacts	16. Employment high-tech & knowledge-intensive sectors	90,21	142,88	120,07	108,21	107,30	82,67	139,96	109,12	89,97	100,00	72,63	100,91	73,09	71,46	90,21	115,51
	17. Sales of new-to-market and new-to-firm innovations in SMEs	155,03	169,41	64,38	169,41	169,41	132,62	95,64	97,45	109,51	85,41	100,93	68,96	108,76	59,89	74,03	102,12
	Innovation index	105,80	136,00	128,98	121,06	117,46	112,56	138,84	126,47	107,35	120,84	98,28	98,37	91,54	79,63	127,34	116,59

Overall, the Southern Region is performing well, as demonstrated by its Innovation Index score of 116.59, which is not that far behind the leading innovation regions. Apart from standing out in some specific indicators, the region's areas of innovation performance differ greatly in terms of how well it performs:

- As regards **human capital,** the region ranks high in population with tertiary education, reflecting the region's track record in meeting the skills required by multinationals. However, the lower performance in lifelong learning may be a critical indicator for the region to focus on, given the massive transformations expected in almost all industries with the disruption of new technologies and digitalisation.

- The region has significantly low performance in terms of **intellectual property (IP)**. This not only affects the region's competitive technological advantage but also undermines its ability to specialise in niche areas that require high technological innovation. During our consultation activities, stakeholders from different sectors repeatedly pointed out the need to increase IP generation and exploitation, either by expanding R&D infrastructure or intensifying industry-academia collaborations.

- **Design applications** ranked the lowest, which is an important indicator of the region's technological creativity (invention) and the strength of its 'creative economy' – i.e., the result of the interrelations among technology, arts (artistic/cultural creativity), and entrepreneurship (economic creativity). In one of the workshops, a representative from the manufacturing sector highlighted the need to use creative input in product and service design to increase added value, instead of focusing too much on production efficiency. There is a need to nurture the creative industries, as they reflect an underlying creativity activity permeating the whole economy.

- Overall, the region's performance in **collaboration** is above average, but still far behind the strong performing regions on this indicator. All conversations with local stakeholders emphasised the need for strengthening interactions, especially with SMEs.

3.1.4 Profiling Regional Technological Advantages

The mapping of the technological competencies at the regional level can facilitate more comprehensive benchmarking exercises as well as complement the analytical efforts in a search for inter-regional cooperation and investment partnerships. In broad terms, it describes the knowledge creation processes and innovation activities that function as drivers of territorial competitiveness and employment. Moreover, mapping regional technological knowledge can be instrumental when defining the S3 thematic priorities as it can bring more details about specific potential technological areas of interest and investment.

As patents are the main output of technology-oriented R&D, the patent-based analysis serves as a starting point of this mapping process and given the level of disaggregation of the available data (at EPO Patent Register), it is possible to analyse the main patterns and trends at the global, national, and regional levels[8]. In addition, based on the International Patent Classification system (IPC), the World Intellectual Property Organisation (WIPO) developed a hierarchical classification scheme that groups IPC classes into 35 technological fields to facilitate country (and regional) comparison[9].

Using this as a basis, we analysed the technological profiling for the Southern, Eastern & Midland, and Northern & Western regions, using patent filings at EPO during the period 2015-2019, which

---

[8] Patent documents contain a wealth of useful information about the invention, such as the technical fields and the addresses of the different actors in the innovation process (applicant and inventors), which can be linked to regions and countries.

[9] https://www.wipo.int/export/sites/www/ipstats/en/statistics/patents/pdf/wipo_ipc_technology.pdf

were retrieved from the OECD REGPAT database (Jan-2021)[10]. Here, we exploit the location data for inventors to examine the technological capabilities of the three NUTS II regions (Southern, Eastern & Midland, and Northern & Western), with the underlying assumption that the inventor's location is a relevant proxy to the regional areas where technology and knowledge creation activities were carried out. We split the number of patent applications between the regional locations of inventors for each of WIPO's 35 technology fields. Table 7 summarises the relative technological performances of the three Irish regions.

Table 7: Global patent growth rates by WIPO technological field (2018-2019), relative regional performances in terms of patent activity (2015-2019), and top-performing regions in each field. Source: OECD REGPAT-2021 and own calculations.

	Overall Growth Global Patents (2018-		Southern	Eastern and Midland	Northern and Western	Total Europe		Top Performing Regions in each Area	
Digital communication	19,6%		44	168	27	12183	2423	Stockholm	Sweden
Basic communication processes	13,9%		20	11	1	2357	328	Oberbayern	Germany
Other consumer goods	10,5%		12	26	8	9776	887	Oberbayern	Germany
Materials, metallurgy	10,2%		8	8	2	10979	879	Oberbayern	Germany
Computer technology	10,2%		46	173	82	14609	2013	Ile-de-France	France
Control	8,3%		29	37	12	10378	1275	Oberbayern	Germany
Optics	7,4%		7	16	22	6603	985	Ile-de-France	France
Transport	6,6%		17	25	48	27828	3336	Oberbayern	Germany
Electrical machinery, apparatus, energy	5,5%		43	33	21	28693	2323	Stuttgart	Germany
Telecommunications	5,3%		31	85	14	5583	918	Oberbayern	Germany
Machine tools	4,8%		20	10	5	13566	1624	Stuttgart	Germany
Pharmaceuticals	4,4%		49	107	28	13332	1565	Ile-de-France	France
Measurement	3,8%		51	91	22	24994	2143	Oberbayern	Germany
Audio-visual technology	3,4%		9	22	32	7371	660	Ile-de-France	France
IT methods for management	2,7%		20	145	15	3635	495	Ile-de-France	France
Biotechnology	1,7%		51	64	19	11417	1231	Ile-de-France	France
Other special machines	1,5%		35	38	39	20304	1362	Oberbayern	Germany
Handling	1,4%		25	13	21	14390	1186	Emilia-Romagna	Italy
Medical technology	0,9%		168	204	257	19185	2688	Noord-Brabant	Netherlands
Chemical engineering	0,9%		42	59	22	13811	1053	Ile-de-France	France
Furniture, games	0,5%		12	18	16	8080	673	Detmold	Germany
Food chemistry	-0,2%		33	20	3	3456	322	Région lémanique	Switzerland
Surface technology, coating	-0,2%		9	13	4	8715	582	Düsseldorf	Germany
Organic fine chemistry	-0,5%		16	43	11	15058	1605	Darmstadt	Germany
Semiconductors	-0,6%		29	21	4	5993	636	Darmstadt	Germany
Thermal processes and apparatus	-0,6%		10	21	6	8126	703	Oberbayern	Germany
Environmental technology	-1,1%		11	19	4	6691	609	Ile-de-France	France
Analysis of biological materials	-1,5%		19	26	8	4414	497	Ile-de-France	France
Textile and paper machines	-1,9%		5	13	4	7100	432	Düsseldorf	Germany
Macromolecular chemistry, polymers	-2,1%		5	32	6	10368	1215	Düsseldorf	Germany
Basic materials chemistry	-2,1%		11	64	7	15230	2062	Düsseldorf	Germany
Mechanical elements	-2,2%		10	17	5	18825	1585	Stuttgart	Germany
Civil engineering	-2,3%		20	29	9	14950	1047	Arnsberg	Germany
Engines, pumps, turbines	-3,9%		19	33	6	15554	1565	Stuttgart	Germany
Micro-structural and nano-technology	-9,5%		5	2	0	862	84	Ile-de-France	France
Total			**941**	**1706**	**790**	**414416**			

The growth of patenting activities varies greatly across technological fields and patent activity may point to regional differences in terms of potential specialisation. The Southern Region shows relatively good performances in a broad set of technology fields, which in turn reflect the diversity of industries within the region.

Besides the assessment of relative regional technological performance in terms of patent growth rates, the Relative Technological Advantage (RTA) is also a common indicator of technological specialisation, which can be used to proxy and map the technological competencies of the three regions relative to all European regions. RTA values above 1 mean that the share of the region's patents in the specific technological field is higher than the EU's share of patents in this field, and thus, the region is said to have a relative advantage in the given technology. Similarly, RTA values lower than 1 correspond to fields where the region is said to be relatively less specialised.

---

[10] The REGPAT is a version of the PATSTAT database developed by the OECD where patents are linked to regions (NUTS3/TL3) according to the addresses of the applicants and inventors.

SOUTHERN
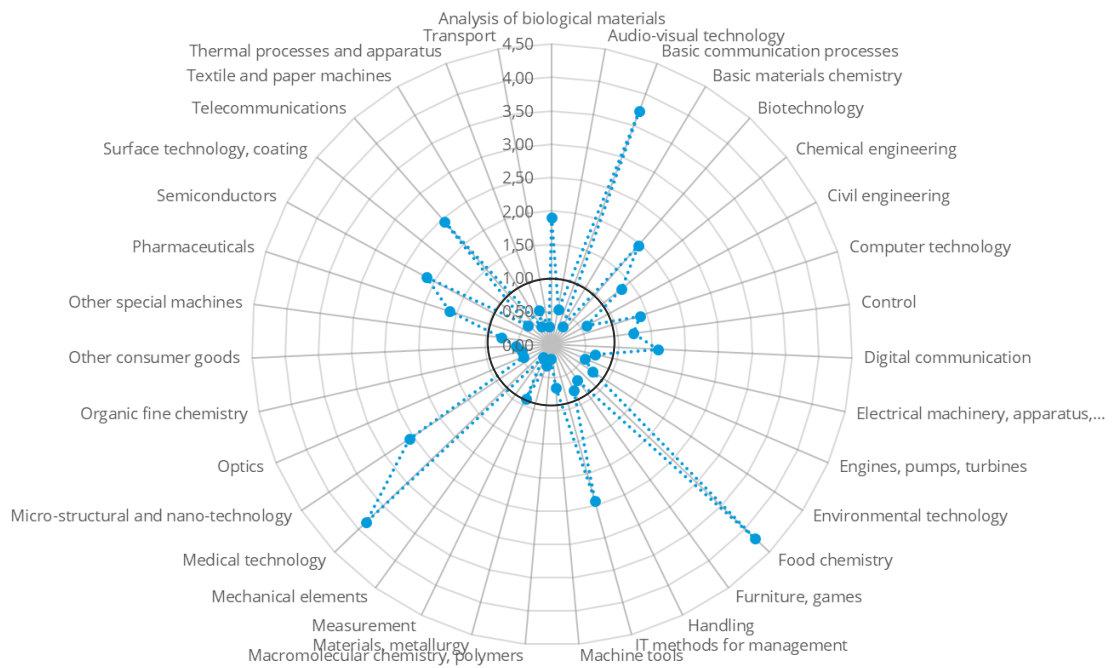
EASTERN AND MIDLAND
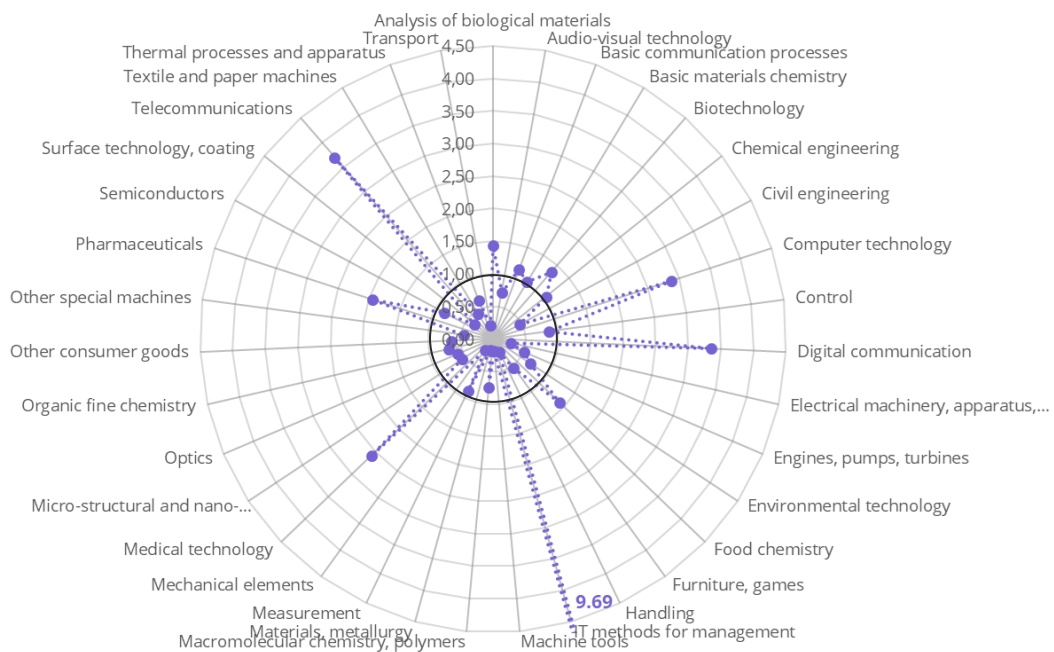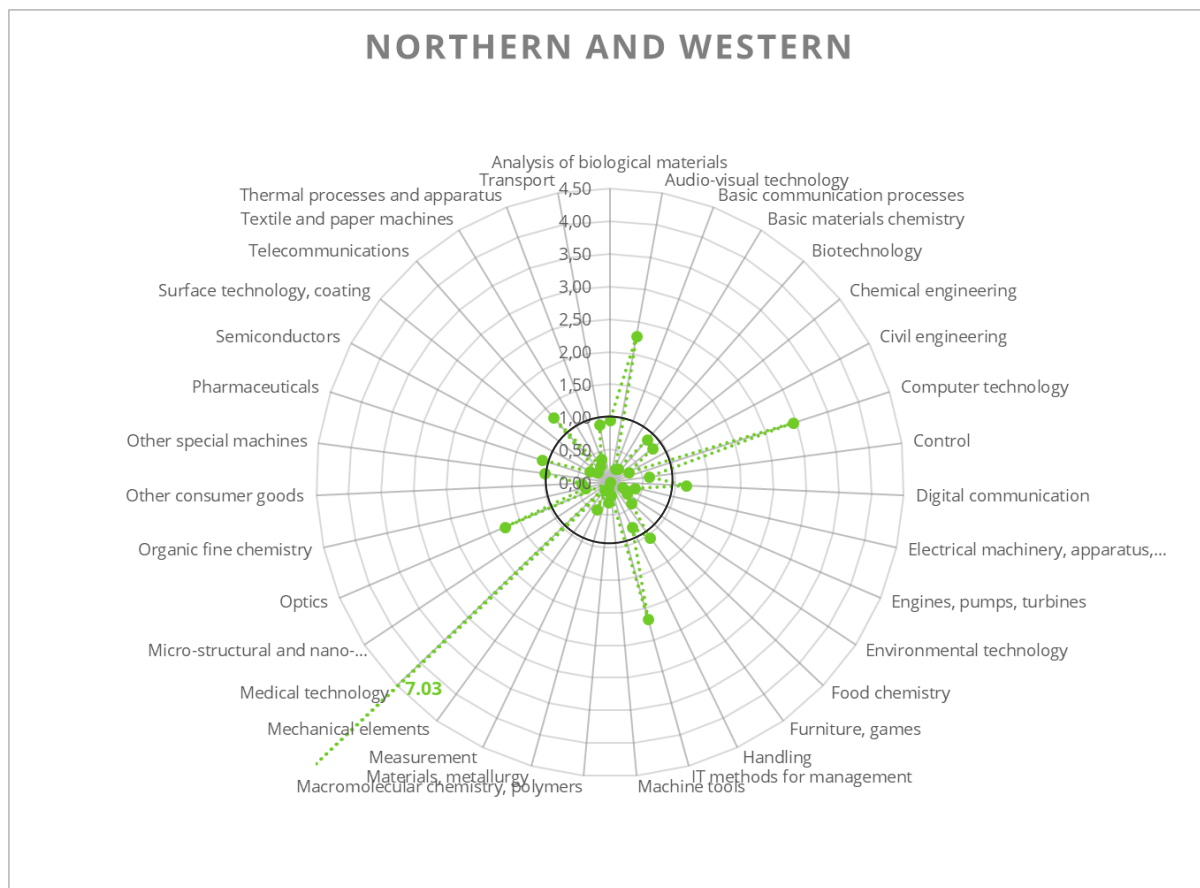
Figure 6 - Relative Technological Advantage (RTA) values of the Irish Regions. Source: OECD REGPAT-2021 and own calculations

The results of the technological advantages of the Southern Region highlight some of the key areas of specialisation that emerged from the consultation with local actors. For instance, Med-tech within the life sciences and pharma sector, and Food-tech within the agri-food sector. It is worth noting that the specialisation areas among the regions are not so different. While some regions perform better in specific areas than others, the technological advantages are certainly shared among the regions. This may reflect the centralised nature of the Irish research agenda; however, it presents an opportunity to identify specific complementary areas for cross-regional collaboration, differentiation, and specialisation.

Finally, Figure 7 shows the specialisation of the three regions respectively in the top five fast-growing and least five ubiquitous technological fields. Ubiquitous technologies are those where the highest number of regions are active in terms of patenting, therefore the least ubiquitous identify "niche" technology areas. In general, complex technologies requiring many pieces of knowledge tend to be less ubiquitous (Hausmann, et al., 2007).

TOP 5 NICHE TECHNOLOGY AREAS IN EUROPE
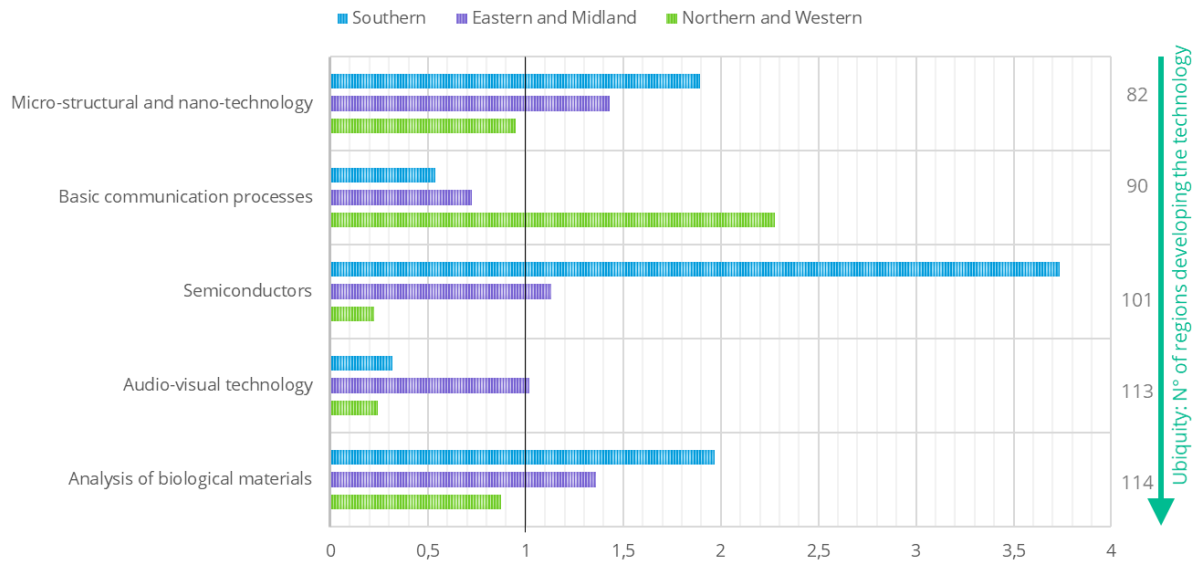
Figure 7. Regions' specialisation in the least ubiquitous technological fields. Only regions with more than 3 patents per year were considered in this analysis. An above-one index of specialisation in a ubiquitous field intends a proxy for the ability of a region to specialise in a 'niche' field (where few regions can develop technologies)

Given the current shift from sectoral dynamics to global value chains, it is relevant to identify niche areas with high transformative potential, especially for smaller open economies such as Ireland's. The Southern Region specialises in three of the top 5 niche areas, and they reflect strengths both in the development of ICT devices and biotechnologies.

3.1.5 Benchmarking the potential for industrial modernisation – Advanced Technologies for Industry (ATI)

The rapid rise of advanced technologies is transforming businesses, industries and society and it is profoundly changing the future competitiveness and employment dynamics of regions and nations. To design more appropriate Smart Specialisation Strategies, it is important to address main policy questions related to the maturity level and adoption rate of advanced technologies, the trends in key enabling factors such as skills, investment or entrepreneurship and comparison of the EU27 performance to key competing economies. To this end, the EC developed a conceptual framework (see Figure 8) for monitoring 16 Advanced Technologies for Industries[11] that are a priority for European industrial policy, aligning with (and replacing) the two previous EC initiatives, namely the Key Enabling Technologies (KETs) Observatory and the Digital Transformation Monitor (DTM).

---

[11] In the context of industrial modernisation, advanced technologies are defined as recent or future technologies that are expected to substantially alter the business and social environment. The definitions of the 16 ATIs can be found here.
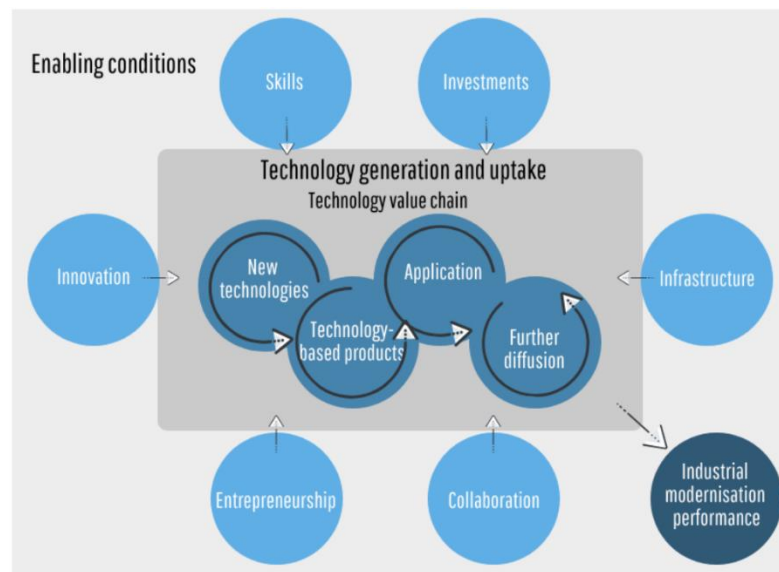
Figure 8. Conceptual building blocks to monitor advanced technologies for industry (ATI). Source: Technopolis Group – further developed following TBM, KET's Observatory and DTM.

In the context of S3, industrial modernisation is a key transformation path where manufacturing and services industries aim at maintaining or increasing their competitiveness by transforming and upgrading processes through the generation and use of advanced technologies. In this sense, industrial modernisation goes beyond the generation of new products and technologies and describe a change in firms' entire technology value chain.

Based on this conceptual framework, we attempt to indicate the region's position in terms of its potential for industrial modernisation, using the ATI Data Dashboard country composite indicators, which provides statistical evidence on the level of technology production and uptake at a national level. These composites range from 0 (lowest score) to 100 (the highest score) and allow country benchmarking. Although the level of aggregation is not at the regional level, it is fair to assume that, given the relatively small size of the Irish economy, the geographical proximity, and the centralised approach to innovation policies, the existing national technological value chains are to some extent available to firms across the regional territories.

Figure 10 and Figure 11 show the performance indicators in technology generation and technology uptake, respectively, for Ireland, the EU27, and the top-performing country in each category. Similarly, Figure 11 shows the performance indicators related to the specified enabling conditions. Technology generation (and exploitation) have been captured through robust indicators measuring patenting activity as well as production and trade of technology-based components in the EU countries. Selected trade indicators are represented in Figure 12 and Table 8. On the other hand, the level of AT uptake has been measured based on a variety of sources such as business surveys, text-mining of company websites, and available Eurostat indicators.
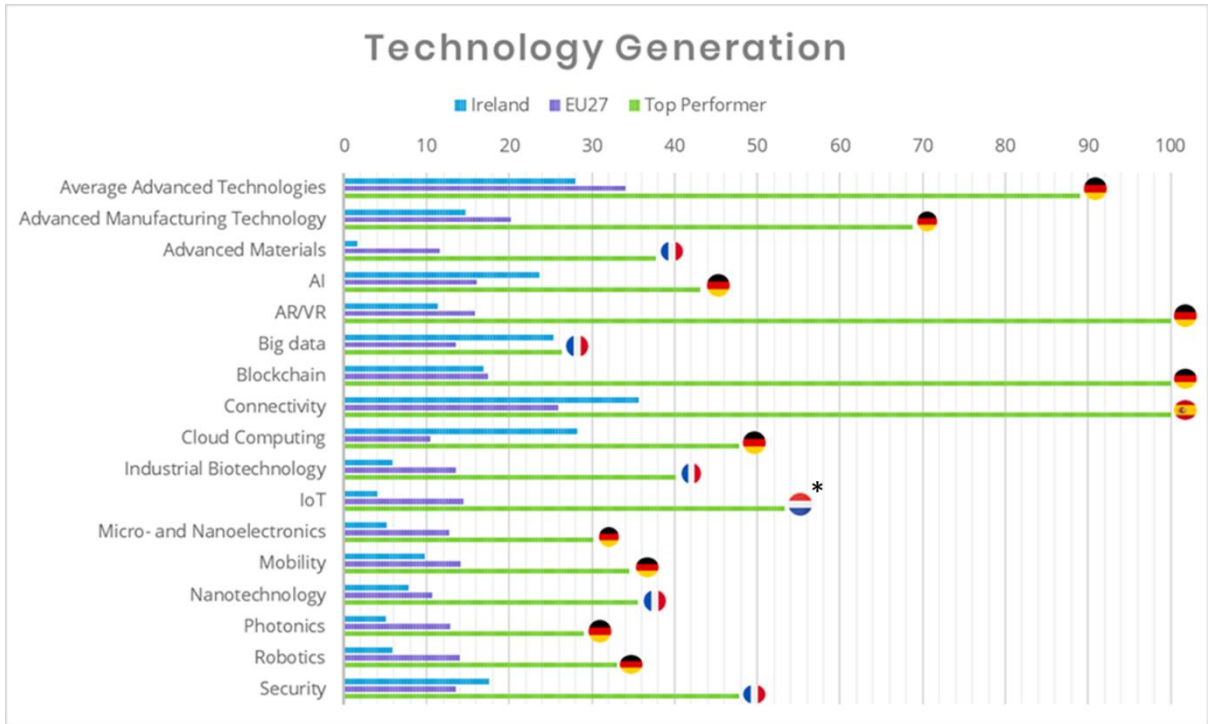
*Figure 9. Technology generation country composite scores for each Advanced Technologies for Industry (ATI), comparison between Ireland, the average on EU27, and the top performer country in each ATI. *Country flag represents the Netherlands. Source: (EC, 2020) – Data Dashboard: Advanced Technologies for Industries.*
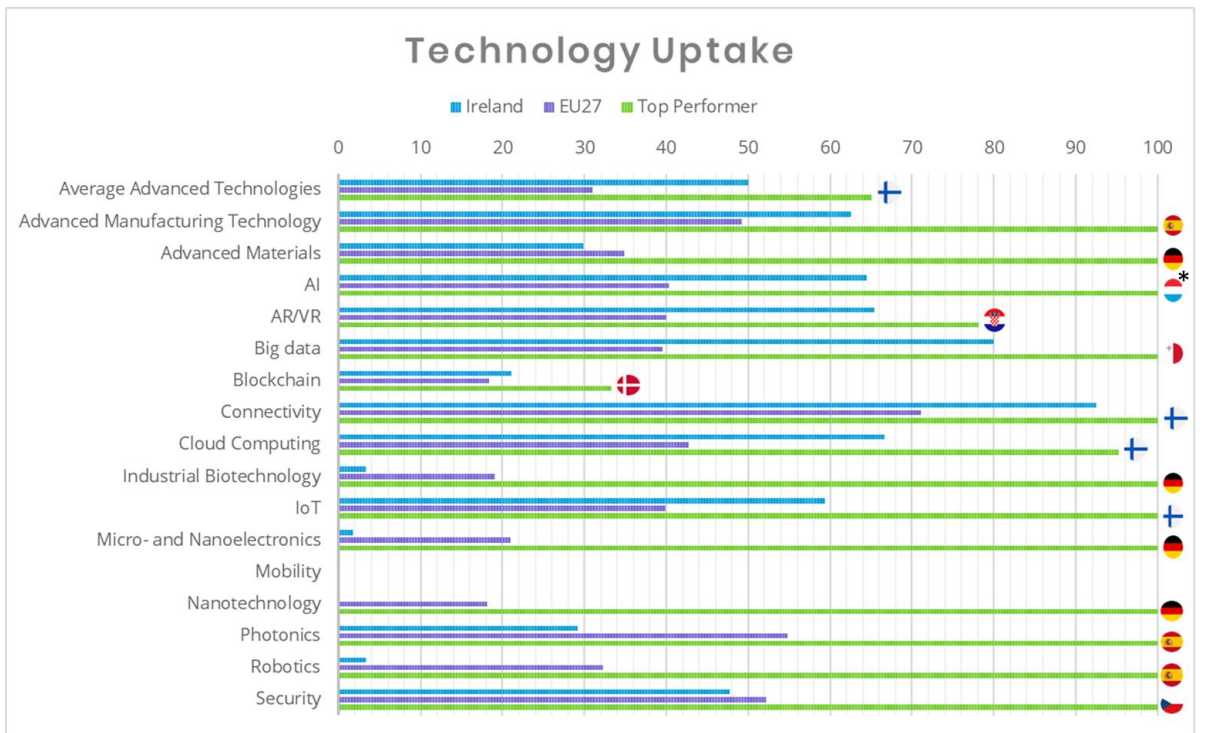
*Figure 10. Technology uptake country composite scores for each Advanced Technologies for Industry (ATI), comparison between Ireland, the average on EU27, and the top performer country in each ATI. *Country flag represents Luxembourg. Source: (EC, 2020) – Data Dashboard: Advanced Technologies for Industries*
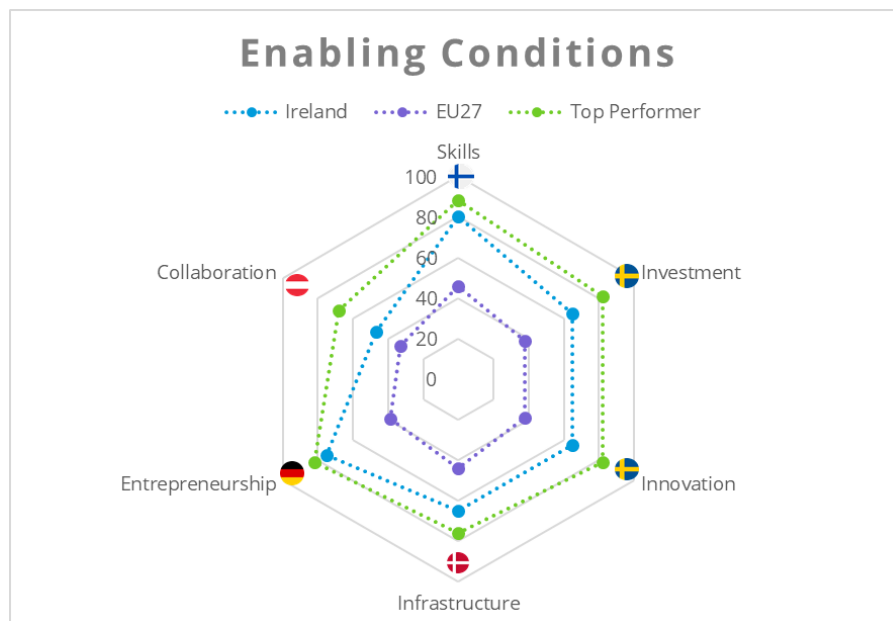
Figure 11. Country composite scores in enabling conditions for Advanced Technologies for Industry (ATI), comparison between Ireland, the average on EU27, and the top performer country in each indicator. Source: (EC, 2020) – Data Dashboard: Advanced Technologies for Industries

In terms of technology generation, Ireland ranks below the EU27 average overall and even more so compared to the top-performing countries. These results may indicate low patenting activity which in turn, reflect our earlier findings related to the region's underperformance in terms of intellectual property (Regional Innovation Scoreboard 2019). On the other hand, Ireland's level of AT uptake ranks significantly higher than the EU average overall, which could be attributed to its equally higher performance in each of the indicators related to the enabling conditions.

It is worth noting that **Ireland ranks above average in most ICT-related technologies**, such as AI, Big Data, connectivity, cloud computing, security and (almost) Blockchain, which provides evidence of significant technological capabilities within the wider digital industries sector. Looking at the number of Irish firms developing advanced technologies (Figure 12), the set of digital technologies represent the highest number of companies, after advanced manufacturing technologies. Comparatively, their share in the total number of AT companies in Europe is considerable, with IT being the highest, followed by big data and (cyber)security. Similarly, digital technologies present higher shares in global exports (Table 8).
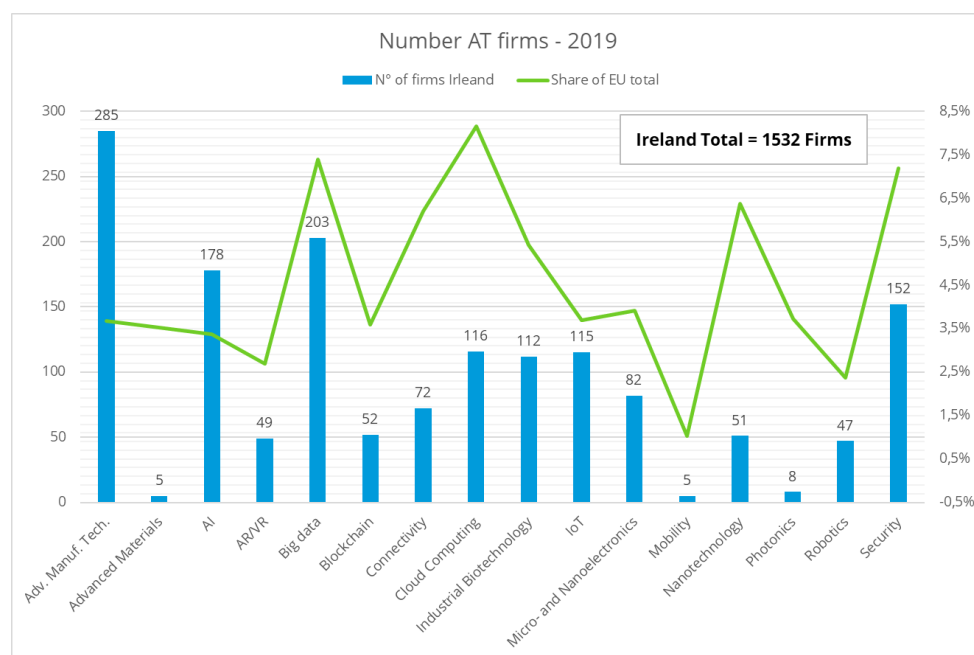
Figure 12. Number of AT firms in Ireland and their share in the EU total, referring to the number of firms developing and producing specific advanced technologies. Source: (EC, 2020) – ATI Data Dashboard

Table 8. Technology exploitation in terms of AT export activity, i.e., share in total AT global exports, trade balance and share in total exports. Data was unavailable for some technologies. Source: (EC, 2020) – ATI Data Dashboard

	Share in AT global exports (2018)		Trade balance (2016)		AT share in total exports (2018)	
	Ireland	EU27	Ireland	EU27	Ireland	EU27
All ATs	0,58%	17,89%	-2,48%	-2,48%	6,45%	5,70%
Adv. Manuf. Tech.	0,17%	32,04%	0,00%	27,87%	0,16%	0,86%
Advanced Materials	0,49%	31,83%	39,49%	-2,98%	0,34%	0,64%
AI	1,32%	20,64%	11,87%	6,39%	2,18%	0,98%
Big data	1,81%	19,49%	20,79%	-9,15%	1,77%	0,55%
Industrial Biotechnology	0,33%	32,35%	-51,72%	-10,63%	0,09%	0,25%
IoT	0,49%	22,91%	-16,59%	-11,52%	1,34%	1,83%
Micro-/Nanoelectronics	0,54%	7,56%	81,72%	-2,72%	2,58%	1,04%
Mobility	0,04%	24,79%	-64,66%	-5,85%	0,02%	0,38%
Nanotechnology	0,31%	26,57%	50,67%	-9,99%	0,09%	0,21%
Photonics	0,47%	16,95%	38,90%	1,24%	0,63%	0,65%
Robotics	1,22%	15,74%	83,33%	-7,58%	2,45%	0,91%
Security	0,21%	5,21%	-1,33%	-10,68%	0,39%	0,27%

3.2 Sectoral and Cluster Analysis

Smart specialisation aims to encourage structural change through investments into knowledge-based assets that will support the medium to long-term demands of the region. To analyse present and future economic specialisation, the existing industrial structure can be taken as the best approximation of the medium-term industrial structure, as very few regions undergo dramatic structural changes in the short and medium-term. Here, emerging industrial strengths within the range of existing sectors can be identified by their share in employment, value-added or exports.

The database needs to cover the entire population of firms so that the relevant shares of specific industries can be calculated. The main sources of statistical data needed for these purposes are

therefore the Business Register and Structural Business Statistics. For the Business Register, we use data from the provided GeoDirectory dataset, which reports the number of local units in each County, at a four-digit NACE-code level. In the case of Structural Business Statistics, the CSO datasets available for the region had critical limitations, as certain data points are withheld due to confidentiality issues. To overcome this obstacle, Eurostat statistics on high-tech industry and knowledge-intensive services were used instead, which comprise economic, employment, and science-technology-innovation (SIT) data describing manufacturing and services industries by technological intensity, following a sectoral approach based on two-digit NACE Rev. 2 codes, on NUTS1/2 level.

Table 9. Employment and Average Annual Growth Rate (AAGR) in Ireland and the Southern Region for aggregated economic sectors, and Degree of Industrial Specialisation (Location Quotient) compared for each NUTS2 region. Source: Eurostat and own calculations

Economic Sector	Southern Region			Ireland			Degree of Specialisation (Location Quotient)		
	Employment (2019)	Share of Employment	AAGR (2015-2019)	Employment (2019)	Share of Employment	AAGR (2015-2019)	Southern Region	North & Western	Eastern & Midland
Agriculture, forestry and fishing; mining and quarrying	46.600	6,4%	▼ -1,9%	104.900	4,5%	▼ -1,4%	1,42	1,69	0,53
High-technology sectors (HT manufacturing + HT-KI Services)	57.300	7,8%	▲ 1,5%	187.500	8,1%	▲ 2,4%	0,96	0,60	1,16
Manufacturing	105.700	14,5%	▲ 2,7%	253.600	11,0%	▲ 2,1%	1,32	1,32	0,70
High and medium high-technology manufacturing	38.600	5,3%	▼ -4,2%	83.700	3,6%	▼ -5,9%	1,47	0,94	0,75
Medium high-technology manufacturing	7.700	1,1%	▼ -14,3%	20.600	0,9%	▼ -14,3%	1,22	1,78	0,67
High-technology manufacturing	31.000	4,2%	▬ 0,5%	63.100	2,7%	▼ -1,1%	1,56	0,67	0,78
Low and medium low-technology manufacturing	67.100	9,2%	▲ 8,9%	169.900	7,4%	▲ 8,1%	1,24	1,50	0,68
Medium low-technology manufacturing	17.500	2,4%	▲ 4,1%	41.200	1,8%	▲ 4,8%	1,33	1,22	0,72
Low-technology manufacturing	49.600	6,8%	▲ 11,6%	128.700	5,6%	▲ 9,6%	1,21	1,59	0,66
Electricity, gas, steam and air conditioning supply; water supply and construction	56.100	7,7%	▲ 5,2%	173.000	7,5%	▲ 7,5%	1,03	1,08	0,96
Services	520.400	71,2%	▲ 2,2%	1.773.100	76,7%	▲ 3,2%	0,93	0,91	1,08
Wholesale and retail trade; accommodation and food service activities; activities of households as employers	157.400	21,5%	▲ 1,3%	486.600	21,1%	▲ 2,2%	1,02	1,03	0,97
Transport, warehousing and support activities; travel agency, tour operator and other reservation service and related activities	22.700	3,1%	▼ -0,9%	95.700	4,1%	▲ 4,6%	0,76	0,68	1,27
Total Knowledge-intensive services	289.300	39,6%	▲ 2,0%	1.039.400	45,0%	▲ 3,1%	0,88	0,85	1,12
Knowledge-intensive high-technology services	26.400	3,6%	▲ 3,0%	124.500	5,4%	▲ 4,5%	0,67	0,57	1,33
Knowledge-intensive market services (except financial intermediation and HT services)	42.200	5,8%	▬ 0,1%	162.500	7,0%	▲ 1,5%	0,83	0,63	1,24
Other knowledge-intensive services	201.300	27,5%	▲ 2,4%	648.900	28,1%	▲ 3,3%	0,98	1,02	1,00
Less knowledge-intensive services	231.100	31,6%	▲ 2,3%	733.800	31,8%	▲ 3,3%	0,99	0,98	1,01
Less knowledge-intensive market services	207.100	28,3%	▲ 2,4%	654.000	28,3%	▲ 3,6%	1,00	0,97	1,01
Other less knowledge-intensive services	24.000	3,3%	▲ 1,9%	79.700	3,5%	▲ 1,3%	0,94	1,03	1,00
Information and communication	25.200	3,5%	▲ 2,6%	123.500	5,3%	▲ 5,0%	0,66	0,55	1,38
Financial and insurance activities; real estate activities	21.500	2,9%	▲ 0,9%	112.900	4,9%	▲ 1,8%	0,59	0,49	1,41
Financial and insurance activities	19.500	2,7%	▲ 1,6%	103.500	4,5%	▲ 2,4%	0,60	0,49	1,42
Professional, scientific and technical activities	37.100	5,1%	▲ 0,8%	137.700	6,0%	▲ 1,6%	0,85	0,75	1,17
Administrative and support service activities	36.400	5,0%	▲ 8,4%	110.100	4,8%	▲ 8,2%	1,04	0,77	1,04
Public administration; activities of extraterritorial organisations and bodies	30.900	4,2%	▲ 1,5%	113.800	4,9%	▲ 4,8%	0,86	0,96	1,10
Education	60.800	8,3%	▲ 4,6%	183.200	7,9%	▲ 5,3%	1,05	0,94	1,00
Human health and social work activities	91.900	12,6%	▲ 1,9%	289.300	12,5%	▲ 1,9%	1,01	1,12	0,96
Arts, entertainment and recreation	15.800	2,2%	▲ 3,0%	53.600	2,3%	▲ 1,7%	0,96	0,96	1,04
Other service activities	16.500	2,3%	▲ 1,8%	56.600	2,4%	▲ 2,5%	0,96	1,17	1,00
Total - all NACE activities	**731.400**	**100%**	▲ **2,2%**	**2.310.800**	**100%**	▲ **3,1%**			

Table 9 provides a good overview of the region's current and future industrial structure in terms of employment and employment growth, respectively, as well as the degree of industrial specialisation in terms of the location quotient. In line with the general picture in Ireland, the service sector

accounts for the largest share of employment (71.2%), followed by manufacturing (14.5%), utilities & construction (7.7%) and agriculture, fishing, and mining (6.4%). On the one hand, the region is highly specialised in agriculture and manufacturing, particularly in high-tech manufacturing, which includes the pharma sector and the manufacture of computer and electronic products (see Table 10). On the other hand, the region does not appear to specialise in the services sector, though it is relatively low in knowledge-intensive services.

In terms of employment growth, the region lags the Irish average; however, all growth trends reflect the national direction of growth in each economic sector. Service industries seem to have a consistent growth which is in line with the average for the region (around 2.2%). While administrative and support service activities show the highest growth rate (8.4%), their specific NACE codes that fall into the knowledge-intensive service categories (2.0%) market services (0.1%), do not. The relatively higher growth (3.0%) of the knowledge-intensive high-tech services industries could indicate a potential area of emerging specialisation reflecting the region's technological strengths at the intersection with the service sector. Additionally, other service sectors that presented higher growth were education and arts, entertainment, and recreation.

In manufacturing, higher-tech industries experienced a decline in employment (- 4.2%) and notably medium high-tech industries (-14.3%), covering mainly the manufacture of chemicals, machinery, components, and other electrical devices (see Table 10). In terms of the number of local units, higher-tech industries remained relatively unchanged (0.2% AAGR) over the period considered. In contrast, low-tech industries showed significant positive employment growth overall (8.9%), which may reflect the region's strengths in food and beverage manufacturing, as these industries fall into this category. This strong performance translates into the capacity of the agri-food sector (as well as more traditional manufacturing sectors) to modernise, for instance, by building on early successes in the adoption of advanced technologies (see Section 3.3).

NOTE: employment growth is one of the various growth indicators (e.g., for sales, labour productivity, exports, or export intensity) that can serve as a basis for a longitudinal analysis of economic specialisation, i.e., looking at future opportunities by assessing the sustainability of traditional strong sectors in terms of growth and potential for development. However, the permanent job losses caused by the COVID-19 pandemic could change the outlook for some of the sectors that appear strong in our analysis. The same is true for the other growth indicators.

From the GeoDirectory dataset, we could use the data on the number of local units at a more disaggregated NACE Rev. 2 level to obtain more insights on specific areas of activity within the broader sectors, which have a higher concentration of local units. Table 10 provides such a list of activities in terms of a higher location quotient (>1). Areas within high-tech manufacturing we highlight pharmaceuticals, ICT devices and components, chemicals and biochemicals, production and processing machinery and equipment, air, and spacecraft; and from knowledge-intensive services: media, passenger and freight transport, education, medical and dental practices, nursing and elderly care, social work, arts, museum and historical sites and sports.

Table 10. List of NACE Rev. 2 Codes with a higher concentration of local units (Location Quotient >1) within the high-tech and knowledge-intensive industries in 2019. Source: GeoDirectory.

High-tech and knowledge-intensive industries (N° of local units in 2019)	List of NACE Rev.2 codes with a higher concentration of local units (Location Quotient >1)
Manufacturing industries (2692 units)	
High-tech manufacturing **(68 units)**	• Manufacture of pharmaceutical preparations • Manufacture of electronic components • Manufacture of computers and peripheral equipment • Manufacture of communication equipment (LQ>2)
Medium-high tech manufacturing **(160 units)**	• Manufacture of fertilisers and nitrogen compounds • Manufacture of perfumes and toilet preparations • Manufacture of glues • Manufacture of other chemical products n.e.c.

	• Manufacture of electricity distribution and control apparatus (LQ>2) • Manufacture of other electronic and electric wires and cables • Manufacture of non-electric domestic appliances (LQ>2) • Manufacture of fluid power equipment (LQ>2) • Manufacture of bearings, gears, gearing and driving elements. • Manufacture of other general-purpose machinery n.e.c. • Manufacture of agricultural and forestry machinery (LQ>2) • Manufacture of machinery for food, beverage, and tobacco processing • Manufacture of machinery for textile, apparel, and leather production (LQ>2) • Manufacture of other parts and accessories for motor vehicles (LQ>2) • Building of pleasure and sporting boats • Manufacture of air and spacecraft and related machinery (LQ>2) • Manufacture of bicycles and invalid carriages (LQ>2)
Knowledge-based services (19029 units)	
Knowledge-intensive high-tech services (689 units)	• Motion picture, video, and television programme distr. activities • Motion picture projection activities • Radio broadcasting • Wired telecommunications activities • Web portals • Other research and experimental development on natural sciences and engineering (not biotechnology)
Knowledge-intensive market services – excl. high-tech & financial services (4246 units)	• Sea and coastal passenger water transport • Passenger air transport • Freight air transport • Engineering activities and related technical consultancy • Photographic activities
Knowledge-intensive financial services (1083 units)	• Other monetary intermediation (not central banking) • Other credit granting (not financial leasing)
Other knowledge-intensive services (13011 units)	• Publishing of newspapers • Veterinary activities • General public administration activities • Regulation of and contribution to the more efficient operation of businesses • Defence activities • Justice and judicial activities • Public order and safety activities • Fire service activities • Technical and vocational secondary education • Tertiary education • Educational support activities • Medical and dental practice activities • General medical practice activities • Specialist medical practice activities • Dental practice activities • Residential nursing care activities • Residential care activities for the elderly and disabled. • Social work activities without accommodation for the elderly and disabled. • Performing arts • Artistic creation • Operation of arts facilities • Museum activities • Operation of historical sites and buildings and similar visitor attractions • Operation of sports facilities • Activities of sport clubs • Other sports activities

The approach put forward by the European Observatory for Clusters and Industrial Change (EO-CIC) could be a relevant starting point for the regions to identify and explore areas of emerging opportunities to foster the EDPs. The spectrum of possible actors and technologies to be monitored is largely reduced by focusing on the exporting industries – i.e., industries that sell products or services across regions and countries, as well as the emerging industries -as evolving and converging from existing industrial sectors, thus facilitating the identification and the setting up of tailored support. The EOCIC defines 51 exporting industries and 10 emerging industries based on four-digit NACE Rev. 2 codes.

Figure 13 and Figure 14 show the total number of local units for each exporting and emerging industry, respectively, as well as a comparison of the regional share by NUTS 3 level.
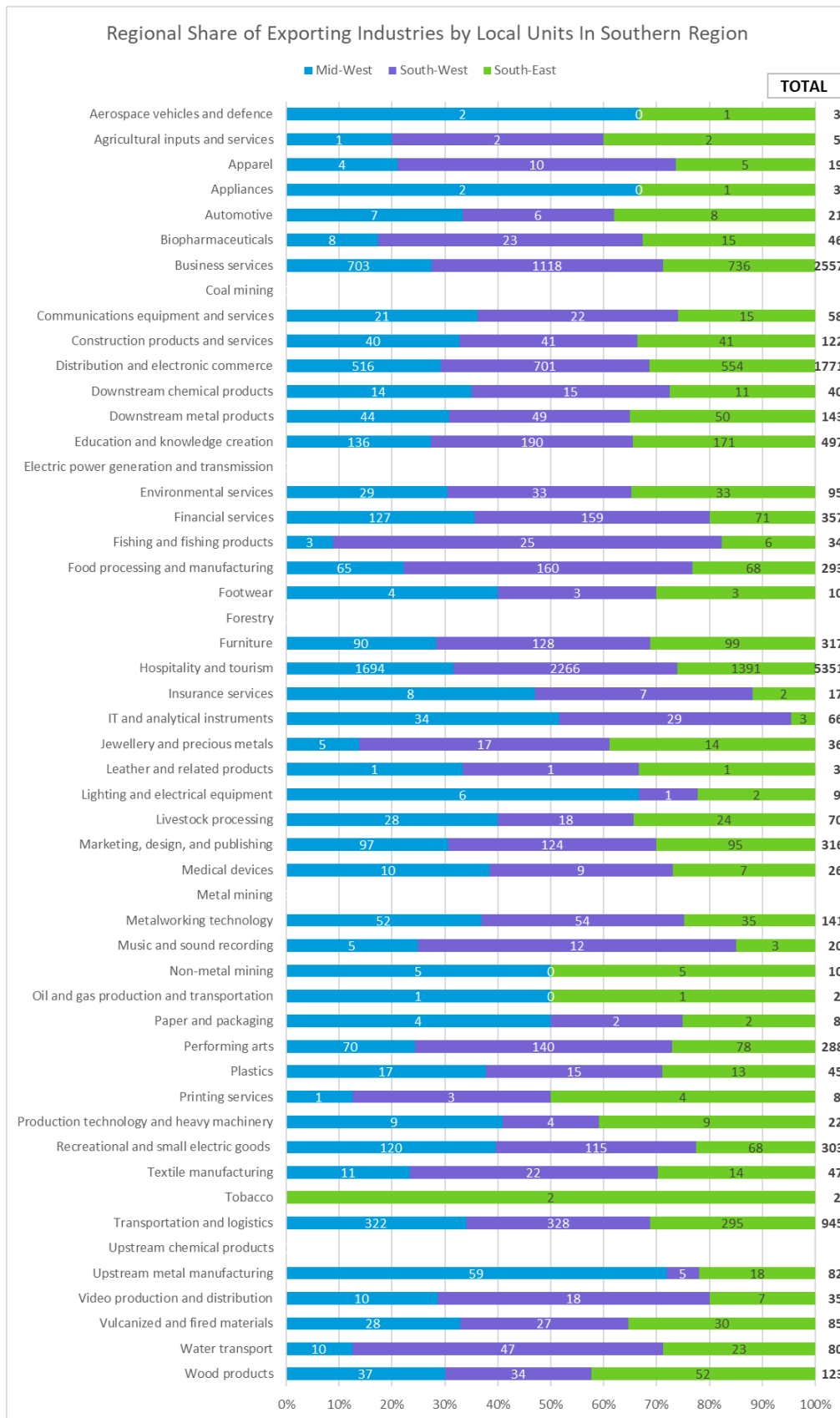
Figure 13. Regional share of exporting industries by the number of local units in the Southern Region compared at NUTS 3 level. Source: GeoDirectory and own calculations.
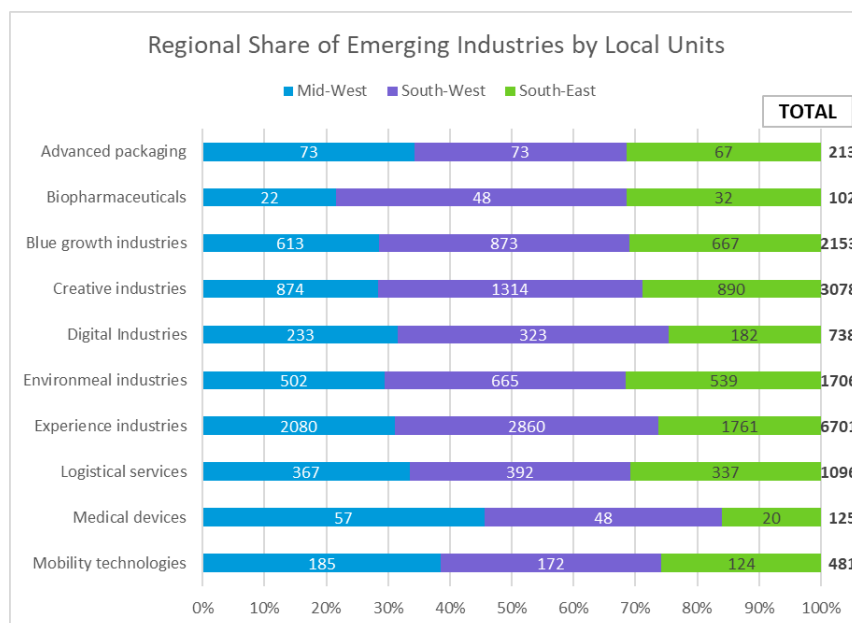
Figure 14. Regional share of emerging industries by the number of local units in the Southern Region compared at NUTS 3 level. Source: GeoDirectory and own calculations.

From both charts, it quickly becomes evident that for most of the industries there is a relatively homogeneous distribution of the number of local units among the three sub-regions. Almost all industries with considerable differences in their regional distribution are those with a smaller number of local units (<50). In terms of smart specialisation strategies, this relative regional homogeneity represents a positive aspect, as it means that many of the areas of specialisation to be prioritised will have a similar impact in each of the sub-regions, considering that the companies that could benefit from the targeted interventions are well distributed across the region. Some exceptions to the 'rule' are specific industries that seem to be more concentrated in the South-West, such as Business Services, Financial Services, Food Processing, IT & Analytical Instruments, Performing Arts, and Water Transport.

Taken together, these figures for each of the categories considered, especially the emerging industries, serve as an indicator to assess the potential scope of the different areas of specialisation concerning their target industries, which can be translated in terms of the opportunity presented by each S3 area.

3.3 Sectoral SWOT Analysis

SWOT analysis facilitates an evidence-based, data-driven look at the strengths, weaknesses and opportunities that must be addressed to create the environment for the industry to thrive.

The sectoral SWOT analysis for the Southern region was conducted based on comprehensive desktop research, individual stakeholder interviews, and collective stakeholder inputs via three stakeholder consultation workshops organised by BABLE for each sub-region. This gave a deeper understanding of the local needs, framework conditions, and innovation activities "on the ground".

From the region's industrial structure and specialisation in terms of local quotient and patent and cluster analysis, potential sectors for smart specialisation were identified by BABLE, and further streamlined through stakeholder inputs into the nine sectors presented below.

The SWOT analysis, therefore, outlines the sectoral strengths of the region and shows the current and emerging areas of innovation activity by key regional assets for the nine sectors. It also outlines the major challenges and areas of opportunity for each sector, as well as key areas of technological specialisation.

3.3.1   Agri-Food

The agri-food sector is Ireland's most important indigenous industry and encompasses primary agriculture, food and beverage production, fisheries and fish processing, and forestry outputs. The sector plays a vital role in Ireland's economy and has an even bigger impact in rural and coastal areas of the country. In the Southern region, 6.6% of the workforce is employed in agriculture, forestry, and fishing, compared to 4.6% for Ireland as a whole, with the Mid-West leading the way with 8.3% employment in the sector[12]. The region's countryside is home to high-quality farmland with high agricultural yields and developing the sector is a high priority.

Key Strengths
- The agri-food sector in the Southern Region is well-developed and makes a significant contribution to employment in the region.   - Economic activity in the agri-food sector produces a far bigger return than equivalent activity in other traded sectors of the economy since agri-food companies' source 74% of raw materials and services from Irish suppliers, compared to 43% for all manufacturing companies[13].   - The Southern Region is home to world-class research centres of excellence and third-level institutes, leading the direction of change in the sector through collaborative research and innovation.   - Key players and companies in the Irish dairy industry are concentrated in the Southern Region. The region also hosts most specialist dairy farms in Ireland.   - Food for Health Ireland (FHI), a multi-million-euro project, has produced 4 new functional components from milk through the combined expertise from State Agencies (EI, Teagasc) and academia (UCD, UCC, UL).   **Mid-West**   - The Dairy Processing Technology Centre, hosted by the University of Limerick and funded by Enterprise Ireland and Dairy Industry Partners, is a centre of excellence for dairy processing research and innovation.   - The University of Limerick operates a Food Science Research Centre and has a growing research interest in food, health, sport, and human performance.   **South-West**   - The South-West has a significant track record in food innovation and world-class research and development capabilities in food ingredient development.   - Formal strategic alliances in food research between Teagasc and UCC focused on three main thematic areas: Food & Health, Food Science & Technology, and Food & the Consumer.   - Teagasc in conjunction with UCC is currently investing in innovative food processing and new technological solutions for the design of novel healthy products for the prepared consumer foods sector. The project is funded by DAFM and has the potential to build new scientific capabilities and transferrable technologies to the food industry.   - UCC hosts the world-class Alimentary Pharmabiotic Centre, which specialises in research on the gastrointestinal bacterial community and serves as a repository for functional food ingredients.   - The VistaMilk SFI Research Centre, hosted by Teagasc at Moore Park in Fermoy, facilitates the deployment of new knowledge, new technologies and new decision support tools to maximise the efficiency and effectiveness of the entire dairy production chain. It aims to

---

[12] Q4 2020 Labour Force Survey, Central Statistics Office. https://data.cso.ie/table/QLF07
[13]https://www.teagasc.ie/rural-economy/rural-economy/agri-food-business/agriculture-in-ireland/

develop new and advanced technologies to transform the already world-class dairy sector into a global leader in sustainable Agri-Tech.

- Dairymaster, a world leader in Agri-Tech and Agri-Engineering, and a major manufacturer and exporter of cutting-edge dairy equipment, is located in Co Kerry.
- The Agri-Tech Centre of Excellence (ACE) at MTU Kerry facilitates learning and development in the Agri-tech sector. It also identifies and shares best practices for learning and development.
- DAFM and the Marine Institute co-founded Nutramara, a national research programme in marine functional foods and ingredients research aimed at developing high value-added products. The programme is delivered by Teagasc.
- Kerrygold, the no.1 butter brand in Ireland and the second best-selling brand in the US is produced in the region. It exceeded €1 billion in retail sales for the first time in 2018.

South-East
- The South-East region has distinct competitive advantages in the agri-food and agri-tech sector, with leading global food and agricultural companies headquartered in the region.
- WIT plays a central role in the digital transformation of the agri-food sector in Europe and is the designated Ireland/UK co-ordinator for the €20m EU-wide SmartAgriHubs project, which acts as a one-stop-shop for farmers across the EU and agri-food industry to access agri-tech research supports.
- The Precision Agriculture Centre of Excellence positions Ireland and the South-East to the fore in responding to the growing global agri-tech and smart farming opportunity. Teagasc and WIT's Telecommunication Software and Systems Group (TSSG) will be delivering advanced ICT to Ireland's agri-food sector.
- Teagasc operates an Open-Source Sustainable Farm in Kildalton College, aimed at developing economically and environmentally viable farming methods that are beneficial for local biodiversity and rural communities whilst still delivering high-quality food and providing a high standard of animal welfare.
- The Nutrition Research Centre Ireland (NCRI) at WIT supports multi-disciplinary research and provides a platform for scientists to exchange knowledge and gain further understanding into the study of human well-being. It provides a unique space to research clinical nutrition, amongst many other research areas.

Key Challenges and Opportunities

- Currency fluctuations and the uncertainty in the trading relationship with the UK and Northern Ireland post-Brexit have had a major impact on prices in the meat and dairy industry.
- Knowledge dissemination and collaboration between academia and the industry regarding new value chains should be improved. Mentorship opportunities, accelerator programmes, and guidance with specialist commercial knowledge should also be promoted to support small and medium scale enterprises.
- The difficulty in accessing funding and lack of awareness of existing supports are major barriers to scaling up at processing levels and the adoption of innovative technologies.
- There is a need to address the environmental challenges that arise from increased pressure on limited land and marine resources to meet domestic and export requirements. This, therefore, calls for the development of more sustainable production processes in all aspects of the sector.
- There is a lack of technical capacity amongst local farmers to drive the transformation from traditional methods to smarter practices. Programmes that facilitate the transfer of engineering and ICT skills should be developed.

- Comprehensive high-speed rural broadband and road infrastructure should also be developed to support the adoption of SMART agriculture-based technologies and improve supply logistics.
- Challenges that arise from the shift towards a low carbon economy is being observed in traditional industries like manufacturing and agriculture. Therefore, there is a need to build resilience, while supporting emerging opportunities in the sector.

Key Areas of Technology Specialisation

- **Nutritional food & high-value ingredients:** Opportunities for the agri-food sector is largely being driven globally by innovation in new flavours and product varieties. Some of the major factors behind this are the changing diets of consumers and the technological advancements in food characterisation. Enhanced nutritional and functional foods, nutraceuticals, and high-value food and marine ingredients are potential areas of specialisation for the region.
- **Precision agriculture and smart farming:** Precision farming is a key element to the development of eco-efficient, resource-efficient, and competitive agriculture. It involves the use of digital technologies, including IoT and automated agricultural machinery, for the sustainable intensification of primary food production. Potential areas of specialisation for the region include precision farming, agricultural and environmental diagnostics, advanced data analytics, VR/AR agri-tech, and blockchain in agri-tech (emerging).
- **Sustainable livestock management:** This entails the adoption of intelligent livestock management systems to improve animal production sustainably, using the same number of resources. Potential areas of specialisation for the region include plant and animal genomics, breeding strategies, and sustainable management.

3.3.2 Bioeconomy

Bioeconomy has experienced significant growth in activity in recent years and is an area of strength for Ireland owing to the natural resources and infrastructure available. In a quest to become more sustainable and resource-efficient, companies of all sizes are diversifying into the production and conversion of renewable biological resources, by-products, and waste streams into value-added products. Bioeconomy encompasses all sectors and systems that rely on biological resources and has the potential to support new jobs and grow Ireland's economy while achieving green targets of reduced carbon emissions and sustainability.

Key Strengths

- There is an abundance of renewable feedstock in the region, such as seaweed, manure, food waste, and biomass, which can be converted into biofuels, chemicals, and construction materials.
- There is a strong collaboration between the industry and academia which fosters cutting-edge advancements towards a globally competitive and sustainable bioeconomy.
- There is a willingness to learn in the region that creates a good atmosphere for cross-sectoral partnership towards sustainable development.

Mid-West
- Shannon ABC, an Enterprise Ireland funded technology gateway hosted by LIT and Munster TU, has significant expertise in bioresources detection, identification, characterisation, and valorisation, and collaborates with industry and other research centres to deliver this expertise in applied settings.

- The collective effort of the University of Limerick, UCD, TCD, NUIG, and Teagasc, brought about the establishment of the Bioeconomy SFI Research Centre (BiOrbic), one of the top bioeconomy research centres in the world.
- The University of Limerick is leading the BioWILL project funded by Interreg NWE, focused on "zero waste" biorefinery utilising all fractions of willow feedstock to produce high to medium based bio-chemicals/materials, renewable energy in the form of biomethane production, and natural fertilisers.
- The National Bioeconomy campus at Lisheen is a critical piece of infrastructure that will work with food companies and other sectors to develop biorefining technologies based on renewable biological resources. The Innovation and Piloting facility provides the national ecosystem with an opportunity to accelerate ideas to the market, helps to de-risk new technologies, attract further investment, and build international links.

South-West
- The launch of the Circular Bioeconomy Cluster South-West in 2021, accelerates the momentum of the growing circular bioeconomy in the region.
- Ongoing collaboration between Teagasc and the University of Cork on the PECTIPACK project, which is focused on developing eco-friendly packaging materials from waste sources of fruit pulp.
- Renewable Gas Forum Ireland is leading the AgriBio-CNG initiative, which involves the coordination and development of a cluster of 6-8 anaerobic digestion biomethane plants in Munster.
- Project GRAZE is being developed by Gas Networks Ireland in Mitchelstown, Co Cork, to accommodate the anaerobic digestion plants developed as part of the Agribio-CNG project. It consists of the development of a large-scale central injection hub on the Irish gas network, along with a fleet of gas storage trailers and trucks, to transport biomethane by road to the injection hub. An alternative means of transport will also be through direct grid connection.
- The Whitegate Energy Park, a national asset for bio-energy, has the potential to deliver 25% of the country's energy needs. It is responsible for the production of a significant element of the national bio-fuel substitution target. Technology developments could provide the potential to store carbon dioxide from electricity generation in depleted offshore reservoirs.

South-East
- Lisheen is one of only six regions in the EU granted the Model Demonstrator Region (MDR) status awarded by the European Commission, for the development of the bioeconomy by utilising domestically available feedstock such as biomass, waste, or CO_2.
- The National Bioeconomy campus at Lisheen is a critical piece of infrastructure that will work with food companies and other sectors to develop biorefining technologies based on renewable biological resources. The Innovation and Piloting facility provides the national ecosystem with an opportunity to accelerate ideas to the market, helps to de-risk new technologies, attract further investment, and build international links.
- Presence of several European funded projects, one of which is the €22m AgriChemWhey project led by Glanbia and aimed at developing a state-of-the-art biorefinery for the conversion of by-products of the dairy industry into high-value bio-based products.
- Establishment of a digital innovation hub in South-East Ireland through the ICT-BIOCHAIN project focused on lignocellulose, manures, and horticulture value chains. Through this hub, region-specific bio-resource data models, as well as best practices, expert knowledge, and information regarding biomass supply chain sustainability, are provided by leaders and experts in the field.

Key Challenges and Opportunities

- There is a need to scale up biorefining and bioprocessing in the region to bring about significant economic impacts. Regulations should also be put in place to manage competing land uses and optimise "end-of-life waste".
- Due to the transdisciplinary nature of the bioeconomy and its wide array of applications, identification and prioritisation of sub-sectors are crucial to build scale in the ecosystem, improve the focus of programmes and projects, synthesise research, focus funding, and attract more foreign direct investment to the region.
- Promotion of research-industry gateways, regional clusters, and working groups to lead the way in opportunity mapping for the sector, strategy alignment, identification of skills and monetary gaps, implementation of projects with the potential to increase activity, creation of a thriving environment for small and medium scale enterprises, and collaboration with international counterparts.
- There is a need for enhanced seed funding in the built environment, as well as investor networks that are less risk-averse and take a long-term return view. Commercial investment in green solutions should also be incentivised to encourage more investment in sustainable solutions.
- More youth engagement should be done to attract and retain young talents in the region. Lifestyle gaps across the region should also be bridged to encourage the retention of a qualified workforce.
- Education centred around sustainable living and circular economy should be introduced to kids in pre-school, primary, and secondary levels.

Key Areas of Technology Specialisation

- **Bio-based economy:** This encompasses the production and conversion of renewable biological resources and waste streams into value-added products. Subsectors for specialisation for the region include biorefining, sustainable lactic acid, biodegradable plastics, bio-based fertilisers, biomaterials, natural chemicals, microalgal biofuels, food biotechnology, circular bioeconomy.

3.3.3 Blue Growth Industries

Ireland is an island nation and is highly dependent on its marine resources for trade, fishing, energy, and tourism. It is of particular importance to the Southern Region, which hosts four of Ireland's five ports of national significance: The Port of Cork, Shannon Foynes Port Company, Port of Waterford, and Rosslare Europort. Marine industries that have growth potential include fishing and aquaculture, marine biotechnology, and offshore renewable energy.

Key Strengths

- Ireland has strong wave, tidal and offshore wind energy resources. This provides a unique opportunity to develop an indigenous ocean energy industry and to become an international destination for testing and demonstrating ocean energy devices and marine sensors.
- The Southern Region is home to state-of-the-art test sites to support the translation of technology research from a laboratory environment to a real-world environment for ocean sensing and marine energy products and services.
- Research projects such as SmartBay, SmartCoast and Smart Catchment Projects funded by Marine Institute and EPA.

- The region has many companies in the SMARTOCEAN strategy cluster engaged in the development of high-tech marine products.

Mid-West
- The Mid-West is a net contributor to electrical power generation supplying Ireland with electricity primarily from Moneypoint and Ardnacrusha. There are also several wind energy developments across the region. ESB's Moneypoint wind initiative will deliver 1-1.5GW of energy[14]. ESB International also has an off-shore Wave Energy test site off the coast of Clare and tidal action renewable energy investigations have taken place in the Shannon Estuary.
- Shannon Foynes Port initiative to develop additional offshore wind production.
- A hydrokinetic turbine is proposed at Shannon Estuary.
- The Shannon Estuary has the largest wave energy resource and the best wind regime in Europe and is a unique infrastructural asset in Kerry.
- The Smart Bay Marine & Renewable Energy Test Site in Galway Bay installed a fibre-optic and power subsea cable, which gives it a unique ability in Europe to deploy devices underwater.
- Shannon Foynes Port Company is Ireland's second-largest port operator and largest bulk port company.
- Research institutes include the Mobile and Marine Robotics Research Centre, hosted at the University of Limerick.

South-West
- There is a concentration of activity in marine technology, biotechnology, and boat building in the South-West as well as considerable potential for off-shore renewables.
- Research institutes include the Hydraulics and Maritime Research Institute and Coastal and Marine Resources Centre, both hosted at the University College Cork.
- Cork is also home to the Centre for Marine and Renewable Energy (MaREI). MaREI runs the 'Entrepreneur Ship': the world's first business incubator dedicated to marine and energy companies.
- The Port of Cork is a Tier 1 International multi-purpose deep water port facility run by the Port of Cork Company Ltd. with strategic assets for the Marine Economy in the South-West including Ringaskiddy, Marine Point, Whitegate and Bantry.
- The Cork Harobour Area/ Cork Harbour Economy is a nationally scaled entity and includes four Strategic employment locations: Ringaskiddy, Little Island, Carrigtwohill and Whitegate/ Aghada.
- The Shannon Estuary has the largest wave energy resource and the best wind regime in Europe and is a unique infrastructural asset in Kerry.

South-East
- The South-East contains two ports of national significance in the Port of Waterford and Rosslare Europort (both Tier 2 ports).
- Proposed offshore wind projects include Helvick Head, Waterford; Celtic Sea Array, Waterford and Kilmichael Point, Wexford. Belview Port and Rosslare Europort have huge potential to service offshore wind as well.
- The South-East is home to emerging innovation in the areas of subsea cabling and fishing.
- The Waterford Institute of Technology funds a Sustainable Marine Research Group with focus areas that include bioremediation of toxic heavy metal species using seaweed biomass, environmental biomonitoring, and isolation of bioactive compounds from sustainable marine sources.

---

[14] https://www.irishtimes.com/business/energy-and-resources/moneypoint-power-station-to-become-major-base-for-renewable-energy-1.4532323

Key Challenges and Opportunities

- An opportunity lies in improved Marine Spatial Planning and implementation of the new National Marine Planning Framework. Marine spatial planning is an integrated planning framework to allocate the spatial and temporal distribution of human activities in marine areas. Activities include developing string spatial data analysis, modelling and decision support capabilities to create coordinated marine and coastal planning and licensing to maximise the potential for the Blue Economy.
- A growing skills gap was identified as a challenge by regional stakeholders. These gaps are especially prominent for professions such as site operatives and installers.
- An opportunity for the major ports of the region to build offshore wind capacity was identified by stakeholders.
- Creating the dynamics required to effectively harness the great "ocean wealth" available is the main challenge outlined in the Government's Integrated Marine Plan for Ireland, with policies such as the National Marine Planning Framework reflecting as such.
- Managing fisheries sustainably is a major challenge for all of Ireland. Ireland exceeded 51 per cent of fishing limits in 2020 and is the second-worst country in the EU for overfishing.[15]
- The Brexit Agreement has introduced new challenges to the fishing sector, particularly in restricting access to key U.K. fishing waters.

Key Areas of Technology Specialisation

- **Wave, tidal and wind energy production:** These are the main ways to harness the region's oceans to generate low-carbon, renewable electricity. Increasing renewable energy capacity is in line with the region's sustainability and carbon emissions goals.
- **Marine Technology:** Engineering and innovation for greater use of the marine environment. These technologies include marine sensors, subsea remotely operated vehicles, anti-fouling wiper equipment, subsea power cables.
- **Sea vegetable aquaculture and product development:** Growing seaweed and other macroalgae for use in food, agricultural and cosmetic products.
- **Microalgal biofuels:** Microalgae are of high interest for use as alternate biomass for biofuel production due to their low land use, fast growth rate and high productivity.
- **Marine biotechnology** is marine technology that uses living materials. Uses include marine-derived drugs, enzymes, and biomaterials (e.g., glues and bone replacement).
- **Smart Ports and Harbours/ Smart Shipping:** This entails using digitalisation and technologies including, artificial intelligence, the internet of things and 5G to stimulate innovation for port and shipping operations including transport, logistics, safety, and sustainability.

3.3.4 Energy

The Irish Government's policy laid out in *Ireland's Transition to a Low Carbon Energy Future 2015-30 and Climate Action Plan 2019* makes it clear that it is an objective to promote change across sectors to achieve reduced GHG emissions, improve energy efficiency and increase the use of renewable energy sources. The Southern Region has strong assets and opportunities to lead the way in the energy transition while creating valuable jobs and attracting international investment for the Region.

---

[15] https://www.independent.ie/business/irish/ireland-is-second-worst-in-the-eu-for-overfishing-39169431.html

Key Strengths

- While more than 50% of the electricity generated in Ireland is produced in the Southern Region, the share of renewable energy as of 2017 was only 26% with substantial share of coal in the energy generation (OECD 2020)[16].
- The region has the best solar resource in Ireland.
- The region has vast wave, offshore wind, and tidal potential (See Section 3.2.3 above).

Mid-West
- Plentiful zinc resources in the Region could be used to produce zinc-air batteries and the University of Limerick is a global leader in battery research.
- The University of Limerick has partnered with NUI Galway, Shannon Development and Silicon Valley's Irish Technology Leadership Group to launch a major renewable energy hub known as Shannon Energy Valley. The goal is to create a 'world-class cluster' of sustainable and renewable energy companies between Galway and Limerick that attract international investment and generate high-end employment.
- The Centre for Energy Efficiency and Deep Decarbonisation is based in Limerick Institute of Technology campuses.

South-West
- The Tyndall Institute's International Energy Research Centre (IERC) is an industry-led collaborative research centre in the field of integrated sustainable energy systems and is jointly funded by the Irish government and industry members. It is one of the largest funded technology centres in Ireland.
- Energy Cork is an industry-driven cluster pursuing coordinated actions to strengthen enterprise and employment within the energy sector.
- The planned Celtic Interconnector will connect the Irish grid to the mainland European grid through France, providing grid security to Ireland and fostering sustained development of Ireland's renewable energy resources, particularly wind. The substation at Knockraha, Cork was identified as the best location to connect from the Irish side.
- The South-West is a net exporter of renewable energy production into the national grid.

South-East
- Research expertise in bioenergy applications for Ireland in the transport, heat, and electricity sectors at Teagasc.
- The counties of Carlow, Kilkenny and Wexford are actively collaborating with the 3 County Energy Agency (3CEA) to support investment in the low carbon economy in the South-East.
- The 3CEA recently secured €1.4 million under the Climate Action Fund to support the transport sector in reducing fuel consumption and emissions from vehicles.
- The Greenlink interconnector will connect Ireland's grid with the UK's and the Irish substation is located in County Wexford. The interconnector has a nominal capacity of 500 megawatts.[17]
- The South-East has strong solar potential with a high proportion of the successful RESS Provisional Auction Results being from the South-East.
- Ireland's first Nearly Zero Energy Building (nZEB) training centre is in Enniscorthy.

Key Challenges and Opportunities

---

[16] https://www.oecd.org/cfe/Ireland-Regions-and-Cities-2020.pdf
[17] https://www.greenlink.ie/post/planning-application-finalised-for-450-million-interconnector

- **Energy storage:** A major challenge for intermittent renewable energy production.
- **Funding challenges:** This was identified as a challenge by multiple stakeholders during the workshops.
- **NIMBY concerns:** "Not in My Backyard" refers to people's resistance to having renewable energy infrastructure near them, despite being in favour generally.
- **Finding sustainable energy avenues within the existing infrastructure** refers to energy aspects such as improving building efficiency, without the need to build entirely new infra-structure.
- **Low proportion of energy-efficient homes:** A low percentage of audited homes have a Building Energy rating between "A" and "B", particularly in the Mid-West and South-East sub-regions.[18]

Key Areas of Technology Specialisation

- **Biorefining and biofuel production:** biorefining is the process of separating biomass into its building blocks (proteins, fats etc.). These building blocks can then be converted into bio-fuels for transportation, heat and more.
- **Battery management systems:** Batteries emerged as a strong theme in the stakeholder workshop on energy. Battery management systems monitor and regulate the charging and discharge of batteries.
- **Grid Solutions:** Reliable energy transmission is a key element of climate resilience and for enabling the greater integration of renewable energy. Innovative grid solutions include Smart grids and meters that offer greater flexibility and optimize energy distribution.
- **Marine-related energy production** (See Section 3.2.3 above)

3.3.5 High Tech Manufacturing

The manufacturing sector has a substantial impact on the Irish economy, with an estimated GDP contribution of 35.5% in 2015, and 400,000 direct and indirect jobs linked to it. The sector is mostly composed of SMEs that employ 54.4% of the workforce in manufacturing, although the large share of manufacturing value-added (88.5%) is generated by companies with more than 250 employees. At the sub-sectoral level, manufacturing is specialised in the following sectors: pharmaceuticals and chemicals, food and drinks, computer and electronics, medical devices technologies, and the production of mechanical and electrical equipment (i.e., the engineering sector). The Manufactur-ing 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 to become the strategic hub of choice for global companies.

Key Strengths

- Manufacturing, being one of the major employers across the sub-regions, is an important sector for the region.
- The region hosts companies of significant scale in manufacturing and services, with manu-facturing in life sciences and agri-food being of major significance.
- The region is especially attractive to global technology companies due to its connectivity to Europe and North America through water and airways, the strong skills force, and the Eng-lish language.
- The region hosts several research centres focused on manufacturing.

---

[18] https://www.cso.ie/en/releasesandpublications/er/dber/domesticbuildingenergyratingsquarter12021/

Mid-West

- Manufacturing is the single largest employer in the Mid-West and Limerick and the surrounding region host a variety of applied research centres for manufacturing. In addition, Mid-West hosts a large cohort of automation firms such as Modular Automation, SL controls, DesignPro, etc.
- The CONFIRM Digital Innovation Hub in Limerick developed with support from SFI is focused on the application of digital innovation across the manufacturing value chain. The research areas within the hub focus on Data Analytics, Product and Process Control, Enterprise Modelling and Simulation, Software Systems, Network Systems and IoT, Sensors, Robotics & Control, and Material Processing.
- The Rapid Innovation Unit at UL is Irelands' first hospital-based innovation hub for medical device innovation. RIU aims to apply cutting edge 3D printing technologies to address previously unmet clinical needs to enhance patient quality of life.
- The Irish Digital Engineering & Advanced Manufacturing Cluster (IDEAM) is the one-stop shop for Irish manufacturing SMEs for all aspects of digital transformation and Industry 4.0.
- There is a concentration of indigenous manufacturing companies under the Emerald Aerospace Group (EAG), in and around the Mid-West. Members are indigenous SMEs, with expertise in sectors such as precision engineering, metal treatments, plastic injection moulding & thermoforming, 3D Printing, composites, and fabrication.
- The P.T.M.A (Precision Turned Parts Manufacturers Association of Ireland) is a Trade Organisation established over 25 years ago with the mission to further the growth and development of the Precision Turned & Machined Parts industry in Ireland.
- The LINC Engineering Network supports companies from East/West Limerick and North Cork to grow and scale their business.

South-West

- The South-West hosts manufacturing facilities from global companies including but not limited to Stryker, Boston scientific, Apple, Pfizer, Analog Devices, Johnson & Johnson, PepsiCo, and Dairymaster.
- Large scale and high-value manufacturing operations are important enterprise strengths and assets across the Cork Metropolitan Area, with many global companies in technology, engineering, life sciences and food and beverages. The Cork Metropolitan Area is home to large scale and high-value manufacturing operations, with many high-tech global companies opening bases in the area.
- CAPPA (Centre for Advanced Photonics and Process Analysis), a research centre of Munster Technological University (MTU), conducts both applied and fundamental research on photonics for applications in areas as diverse as telecommunications, medical devices, food, and pharmaceuticals manufacturing.
- Dairymaster, based in Kerry, is a leading manufacturer of milking equipment, with customers in 40 countries. It has pioneered advances in areas such as milking parlour equipment, automatic scrapers, automatic cow feeding systems and farm management software. Dairymaster makes 95% of its parts in its highly automated site in Kerry, supporting 370 jobs and average growth in sales of 20% per annum for over ten years.
- The STEM South-West cluster, established in 2019, is an industry-led cluster promoting and nurturing STEM education in the region.
- The Bridge network supports the transfer of technology from academia to industry.

South-East

- Ireland South-East is a world leader in engineering and advanced manufacturing technologies and processes. It is supported by a newly formed industry lead cluster group 'Engineering the South-East' and by a network of centres of excellence in precision engineering, 3D manufacturing, rapid prototyping, and lean and process excellence.

- The Additive Manufacturing facility at SEAM supports research in biomedical Implants, bio-medical devices and sensor embedding in metal. SEAM has completed research projects for companies that use polymers in medical devices, biotechnology, engineering, and coatings.
- The regional research centres have a strong focus on applied research particularly in the areas of applied material, additive manufacturing, artificial intelligence, prototype development and testing.
- The WIT is home to the Academy of Lean Enterprise Excellence.
- Engineering the South East is an industry-led cluster incorporating companies, education providers and government agencies working collectively to promote, support and develop engineering for the benefit of the South-East.
- IT Carlow offers Life-Long Learning Opportunities (LLL) in the region, being one of the largest LLL providers in the country.
- The region has a strong track record in accessing EU funding (H2020 and Cascade) to support research in Manufacturing. Over the first and second calls under the REDF, the South-East secured significant funding across six projects covering various emerging sectors such as 3D manufacturing, design innovation and the bioeconomy. The research centres also regularly include local SMEs in the Horizon proposals which can be leveraged further.

Key Challenges and Opportunities

- Between 2000 and 2017, all three regions (NUTS II) in Ireland experienced a decline in the share in manufacturing employment. With a reduction of 7.5 percentage points in the share of employment in manufacturing, the Southern region recorded the largest decrease. (OECD Regions and Cities 2020)
- The decline in manufacturing employment since 2015 has coincided with a reduction in man-ufacturing gross value-added in Eastern and Midland, and Southern regions and with an increase of gross value added in Northern and Western regions during the same period. (OECD Regions and Cities 2020)
- In the 1980s, the closing of company sites from Ford, Dunlop and Verolme in the Southern Region led to a steep decrease in employment. The heavy dependence on the sector high-lights the need for the region to stay innovative in the sector to spur future growth and em-brace disruptive technologies in the manufacturing sector.
- Skills shortage due to rapid technological advancement is one of the major challenges in the sector. There is a need for upskilling and reskilling of workers through new and amended programmes in higher institutions, as well as training initiatives in the industry that address digital deficits among older workers. There is a need to make young people aware of the opportunities and generate interest in the sector.
- There is a significant gap in investment into later stage Technology Readiness Level (TRL) innovations in Smart Manufacturing.
- While the industry is strong in production, there is a need to invest in the design and R&D phase for risk reduction.
- The industry is currently heavily reliant on FDI and needs to develop a strong indigenous ecosystem. The industry faces the challenge of effectively linking SMEs with MNCs.
- There is a need for a strong cluster to support collaboration in the industry.
- Scaling up manufacturing facilities is a challenge.
- The region is not very strong at showcasing success stories and marketing strengths.
- There is a need for Higher Education Institutions to focus on Innovation.
- The connection and co-working between HEI and Industry need to be further strengthened.

- Pressure on existing sub-suppliers of civil aircraft to meet growth levels is intensifying. There is therefore an opportunity to increase Ireland's market share in the global sub-supply chain of Aircraft Manufacturing.

Key Areas of Technology Specialisation

- **Additive Manufacturing:** Additive manufacturing is a new technological trend driven by the growing demand for customized pharmaceutics and medical devices. 3D printing enables the production of personalised medicines and easily altering the drug-release characteristics, increasing traceability (e.g., by printing barcodes directly on pills), and decentralising the production model, shortening the figurative distance between final consumers and the producers. Embedding sensors into products while manufacturing is also an important trend in the manufacturing industry.
- **Industry 4.0:** Industry 4.0 combines production methods with state-of-the-art information and communications technology. The transformational technologies include IoT, Cyber-Physical systems, smart manufacturing, smart factories, cloud computing, cognitive computing, artificial intelligence, etc.
- **Efficient and Sustainable Manufacturing:** Sustainable manufacturing is the creation of manufactured products through economically sound processes that minimize negative environmental impacts while conserving energy and natural resources. A growing number of companies are treating sustainability as an important objective in their strategy and operations to increase growth and global competitiveness.
- **Biopharma manufacturing:** Biopharmaceutical manufacturing is characterized by using advanced technologies, harnessing new scientific advances, and driven by a highly complex research and development (R&D) enterprise. The major technological innovations include continuous manufacturing, process analytical technology, single-use systems, improved drug delivery systems, downstream processing techniques, etc.

3.3.6 Life Sciences

Ireland's Life Sciences sector has grown rapidly from modest beginnings in the 1960s to reach global significance. Collaborative clusters in Pharmaceutical, Biotechnology, Medical Devices and Diagnostics have been a key element behind this remarkable growth in a sector that accounts for 32% of GDP (c.€140.6 Bn in exports). (CSO 2019)

Key Strengths

- The Southern Region has a strong focus on pharmaceuticals, med-tech and health tech with several manufacturing plants, innovation centres and supporting local ecosystem based in the region.
- Biopharmaceuticals and Medical technology are key industries on a national level, attracting more FDI in the region. All the world's top 10 pharmaceutical companies have substantial operations in Ireland and 8 of the top 10 global medical technology companies are in Ireland (IDA). Manufacturing excellence in biopharmaceuticals is a hallmark of Ireland's success in the sector. This is constantly driving growth and Ireland has seen continued capital investment averaging at €1 billion per annum over the last 10 years. Circa €2 billion invested annually in Biopharma R&D by IDA client companies with an additional €1billion in CAPEX added each year (IDA). Ireland is the global leader in the production of drug-eluting stents and 75% of global orthopaedic knee production comes out of Ireland. By establishing their manufacturing in Ireland, this industry has great geographical proximity to the mainland

European markets. Easy international shipping across the Atlantic is very beneficial for pharmaceutical exports to North America. In addition, the advantageous tax regime and corporate tax relief strengthen FDI.

- There are several funding opportunities available within the sector that companies and research centres can leverage (e.g., Sláintecare Integration Fund, Enterprise Ireland's Innovation Vouchers and Innovation Partnerships, IRC Enterprise Partnership Scheme, European Funding, etc.)
- Key companies in the region include Bostons, Medtronics, Johnson & Johnson, Becton, Dickinson, AbbVie, Pfizer, Abbott and so on.

Mid-West

- The Mid-West hosts world-class multinational companies in the medical and health tech industry with sister sites in the US, Europe & Asia.
- There is a strong local ecosystem of smaller companies that are supporting multinational companies by providing automation and auxiliary services.
- The CONFIRM Digital Innovation Hub located in Limerick offers shared research facilities, access to state-of-the-art equipment and a broad ecosystem of stakeholders. The research and innovation centres offer a testbed to test and learn from manufacturing health care products in the R&D facilities.
- The PMTC (Pharmaceutical Manufacturing Technology Centre) based out of the University of Limerick, was established in 2013 and is led by industry. It has a clear vision to make Ireland the global hub of pharmaceutical process innovation and advanced manufacturing through applied research into advanced technology solutions. The research focuses on cleaning, process control & optimisation and applied data analysis and utilisation.
- The Rapid Innovation Unit at the University of Limerick provides direct research support to develop clinical immersion-based health technology. They provide cutting edge 3D printing technologies to address clinical design needs.
- Located at University Hospital Limerick, the Clinical Research Support Unit (CRSU) supports clinical research across the University, UL Hospitals sites and primary community care health settings. CSRU provide facilities for clinical trial planning, oversight, and governance of clinical trials, monitoring and inspection of the trials, and providing supporting documentation.
- The National Bio-economy Foundation at Lisheen, Co. Tipperary supports companies in bio-economy research and commercialization.
- The SSPC (Science Foundation Ireland Research Centre for Pharmaceuticals) centre in Limerick offers a state of the art Crystallisation, Isolation and Drying Test-Bed which is the first of its kind globally, a Mass Spectrometer to enable protein identification and characterisation fundamental to the understanding of cellular function, a Process Flow Spectroscopy facility allowing real-time observation of pharmaceutical process reactions which is the first of its kind within the EU, and a new Biological Processing Testbed, BioPOINT.
- BD, a leading global medical company, invested €21million into BD's research centre Ireland in Limerick in 2018. It focuses on product and software development, clinical research instrumentation and prototype development.

South-West

- The South-West has a strong Life Sciences sector comprising Pharmaceuticals, Biologics Manufacturing, and Medical Technologies, supported by global business services, process engineering consultancies and a range of specialist service providers serving the industry.
- As of 2018, the Cork city and county had close to 14000 people employed in pharmaceutical, biopharma and medical technology companies making the life sciences industry one of the most important sectors for Cork. 32 companies are operating in the sector in Cork, 23 in the pharmaceutical or biopharma category and nine medical technology companies.

- The Synbiocentre use synthetic biology to convert novel ideas into early-stage products with potential for subsequent commercialisation in the Biotechnology Sector.
- UCC Offers a Postgraduate course in Clinical Research which is the first of its kind in Ireland.
- APC Microbiome centre supports research in intestinal microbiota influence health and disease.

  South-East
- The South-East is renowned as a national cluster for life sciences, with a strong record of pharmaceutical and medical device companies, and over 8,000 directly employed in the sector and 17,000 employed within the broader Life Sciences sector.
- SEAM (South Eastern Applied Materials) is focused on Applied Research and Development facility based in WIT focused on Materials research. SEAM is involved in several biomedical/biomaterial projects in both large market areas and niche market technologies. The Additive Manufacturing facility at SEAM supports research in biomedical implants, biomedical devices and sensor embedding in metal.
- The PMBRC applied research centre in WIT supports R&D activities within the pharmaceutical and healthcare industries. The research themes include pharmaceutical analysis, material characterization and pre-formulation, Novel sensing and process technologies, Drug delivery and formulation, biomedical research, and molecular biotechnology.
- Kinetic Labs, a purpose-built science innovation centre, offers full services including laboratory and office space to rent to support businesses in their research.

Key Challenges and Opportunities

- There is a strong Health-tech cluster in Galway and Dublin with several research centres such as Bio Innovate Ireland. There is a strong need for specialisation in the Life Sciences sector for the Southern Region to sustain economic growth and complement the other regions.
- Stakeholders, during the workshops, highlighted that despite strong academic research taking place in the region the application and commercialization of this research are slow.
- There is a lack of funding for the proof-of-concept stage.
- There is a need for investment and support in the supply chain and service industries supporting the life sciences industries.
- The apprenticeship portfolio does not at present include healthcare, med-tech, and community engagement skills development.
- With rapid digitalization, the existing workforce needs upskilling to make the most of the new technologies.
- SMEs lack financial support for investing in new technologies and new machinery, and the opportunity to test the technology.
- The sector could be supported with understanding and adoption of cluster-based innovation. The health care sector needs to be brought together to encourage innovation and specialisation in the region. The upcoming cluster policy can be leveraged to enable this.
- There is a need for facilitating dialogue between the MNCs, indigenous companies, government, and academia.
- While the region has strong skills in clinical research, significant efforts are required to encourage innovation and new ways of thinking.

> **Key Areas of Technology Specialisation**
>
> - **Biopharmaceuticals:** The biopharmaceutical industry (Biopharma) is the result of an evolution of the traditional pharmaceutical industry with the incorporation of biotechnology developed on living cells and molecules. The most specific area of biopharmaceutical product development includes vaccines, blood components, hormones, antibodies, cell-based therapies, stem cells, gene therapy or enzymes.
> - **Homecare and telemedicine:** Telemedicine allows healthcare professionals to monitor and treat patients remotely using telecommunication technologies. For example, telemedicine technology is used for follow-up visits, management of chronic conditions (e.g., allergies, asthma), medication management (e.g., post-operation check-ins) and specialist consultation (e.g., in case of infections, conjunctivitis). In addition to the research and industry expertise in the region, the high rural population in the southern region makes it suitable for tele-healthcare.
> - **Direct Retailing:** Pharmaceutical manufacturers have a growing interest in direct delivery to pharmacies, using only a restricted number of wholesalers as sole agents (Direct-To-Pharmacy) or using wholesalers as logistics providers for the same purpose).
> - **Water & Waste Management:** Environmental concerns are influencing biopharmaceutical manufacturing by emphasising the importance of recycling instead of recurring landfill disposal or incineration. The manufacture of medicines and drugs makes use of chemicals, materials and other substances that are potentially toxic if allowed into the environment. Ireland current exports most of its hazardous waste, indicating a gap in service provision.
> - **Eco-conscious production:** This is a crossover of the Medical Device and Energy industries. It focuses on the production of devices designed to use low-voltage DC power supplied by batteries and solar photovoltaic systems. The application of these new technologies would not only have environmental benefits (reduced air pollution emissions) but also generate energy savings for health centres.

3.3.7   International Financial Services (IFS)

Ireland has positioned itself as a globally recognised centre for specialist IFS and is home to leading global financial services institutions and technology-rich Irish enterprises serving every major economy in the world. Ireland's IFS covers many different strands, namely, investment management and fund services, investment banking, investment fund and debt listing, trading platforms, rating agencies, corporate treasury operations, insurance/reinsurance, aviation financing, environmental, social and governance (ESG) fund management, fintech, payments, and global business services.

The sector has now grown to become a truly national industry with a significant presence across the country in several regional locations including Cork, Drogheda, Galway, Letterkenny, Limerick, Waterford, and Wexford (30% of employment is outside Dublin[19]). The fact that the Southern Region hosts most of these locations is evidence that the region offers an attractive alternative to Dublin for multinational IFS firms, but particularly for indigenous technology enterprises.

> **Key Strengths**
>
> - The sector features a strong international dimension which has expanded in the number and mix of investors, with a significant increase in the range and sophistication of activities undertaken. In Ireland, the foreign-owned segment of the industry accounts for approximately three-quarters of the total number of firms and 80% of the headcount.

---

[19] Focus-on-International-Financial-Services-and-Fintech-2020.pdf (enterprise.gov.ie)

- The region has benefited from IDA sponsored international FDI. Recent examples include State Streat in Kilkenny, BNY Mellon in Wexford, Northern Trust in Limerick, and multiple firms in Cork such as Deutsche Borse, Clearstream Global Securities Services, Willis Towers Watson, and Alter Domus.
- Homegrown fintech successes in the region include Fexco and Monex in Kerry, Kilkenny-based TransferMate, and Waterford-based FundRecs. For more indigenous companies, see the recently updated All-Ireland Fintech Map 2021[20].
- The region has a well-educated, highly-skilled, flexible, internationally diverse, and multilin-gual pool of talent, which is underpinned by top-10 business schools in Ireland, such as Cork University Business School (CUBS) within UCC, and the Kemmy Business School at the University of Limerick – one of the largest undergraduate business schools in the country.
- The region has an increasingly strong entrepreneurial support infrastructure in terms of incubators, accelerators, and investors. The NDRC (national startup accelerator pro-gramme), which has a history of supporting early-stage Fintechs, has already expanded its activities to Cork, Kerry, and Waterford (at ArcLabs). VC investments for Fintechs feeds in, for instance, from Kernel Capital and SOSV, two of the country's top ten VC investors -both based in Cork.

South-East
- The region has built a strong cohort of shared services operations, as well as a sizeable portfolio of IFS companies. The South-East Financial Services Cluster (SEFSC) aims at foster-ing the local IFS ecosystem and particularly supporting business growth and start-up inno-vation. The cluster has grown its network from 6 to 36 companies, and if the support struc-ture is included, the number reaches 57 members.
- The Insurtech Network Centre (INC) based in IT Carlow, an accelerator for tech start-ups in the Insurtech and Regtech space, which -together with the Faculty of Lifelong Learning at IT Carlow- recently received €1.7M funding for the creation of the Centre for Insurance, Risk, and Data Analytics Studies (CIRDAS).
- Key regional assets in terms of entrepreneurial support: Waterford's ArcLabs, drawing skills and research expertise from WIT and TSSG, to support start-up creation and scale-up, as evidenced by FundRecs' success story.[21]
- Clune Technology Group is the parent company of some of Ireland's most successful and ground-breaking Fintech brands including TransferMate Global Payments, Immedis, Be-namic, Taxback International and Taxback.com. In an ultra-competitive Fintech sector, Clune Technology Group's companies are all at the cutting edge of financial innovation de-veloped in Ireland South-East and exported to the world's largest multinational clientele.[22]

South-West
- Cork is home to Ireland's second-largest cluster of IFS companies. The Cork Financial Ser-vice Forum (established in 2008) is driving the advancement of the industry.
- R&D+I activities in South-West are concentrated in UCC: The Centre for Investment Re-search, the Financial Service Innovation Centre, the Governance Risk & Compliance Tech-nology Centre, and the Insight SFI Research Centre for Data Analytics (hosted also across other universities in Dublin and Galway).
- Evidence of strong collaboration between private enterprises, higher education, and Gov-ernment to boost the financial technology sector.

---

[20]https://fintechireland.com/uploads/3/5/4/5/35459745/20210315-20210401-indigenous-irish-fintech-companies-fintech-ireland-peter-oakes-peter-ohalloran-v4.1.png
[21] https://www.thinkbusiness.ie/articles/fundrecs-fintech-dublin-waterford-new-york/
[22]https://irelandsoutheast.com/2021/03/15/great-place-to-work-award-and-new-acquisition-for-clune-technology-group/

- o Kerry's new RDI Hub was launched in 2019 with the support of Fexco, IT Tralee, and Kerry County Council. The hub seeks to drive design-led innovation, facilitate technology R&D, and nurture entrepreneurship within the fintech sector.
  - o Launch of FINTECHNEXT, a €3M, a 4-year research collaboration between Fexco, UCC, and SFI aiming at disrupting 3 key fintech verticals: Treasury & FX, Digital Taxation, and Corporate Asset Administration. The collaboration will generate commercially viable fintech prototypes, associated IP, and a dedicated fintech knowledge repository centred at UCC.
- Several companies announced investments in South-West including Deutsche Borse/Clearstream, Alter Domus, Willis Towers Watson, Apex Funds Services and World Nomads Group. These investments endorse the region and Cork as a credible location for financial services.
- The presence of over 60 technologies companies in hardware and software services supported by industry-focused third level institutions and internationally renowned research centres has helped to attract even more technology companies to the South-West region.

Mid-West
- Building on the tradition of aircraft leasing, and with the continued growth of Northern Trust, the region has seen an emerging Fintech sector, particularly in pay tech and e-commerce, with companies such as Digital River, ACI Worldwide, First Data (now owned by Fiserv), and Transact Campus, focused on Ed-tech. Another example is Limerick-based CloudCards, which develops cloud-based aircraft asset management software and raised $2.2m in VC funding.
- First Data established a research centre in Nenagh (Co. Tipperary) to develop amongst other things, their blockchain capabilities.

Challenges & Opportunities

- In the aftermath of the global pandemic, the IFS sector is taking an essential role in supporting all other economic activities by stabilising markets and ensuring the flow of credit and payments. The resilience demonstrated by the sector throughout the pandemic presents a significant opportunity for Ireland to strengthen its competitiveness and, by moving quickly and decisively, the IFS sector will be well-positioned to secure global market share and bolster the national economy[23].
- The situation in the light of Brexit is highly dynamic with many companies reassessing their operations and many UK companies ramping up Irish businesses to retain EU passport rights allowing them to operate across the European Union with freedom. As a result, suitable infrastructure is being put in place within the sub-regions to attract high-level investment, where key provincial cities are moving to ease local commercial property constraints (e.g., Cork, Limerick, and Waterford)
- *"Ireland is already perceived as a top global fintech ecosystem. Our challenge is not about reaching the number one spot globally, which simply will not be the case for a small open economy regardless of how progressive we are. Our challenge is to incrementally raise our profile and position year on year and more importantly remain in the upper echelons vis-à-vis our European Union peers."* – Peter Oakes (Founder of Fintech Ireland)
- The region needs resources, funding, and increased collaboration to keep pace with emerging European Fintech powerhouses. Through benchmarking with the 10 European Fintech Discovery Program hubs, the region could identify opportunities for differentiation, specialisation, and collaboration.

---

[23] Focus-on-International-Financial-Services-and-Fintech-2020.pdf (enterprise.gov.ie)

- To exploit FDI's spillover effects, there is a need to intensify existing collaborative efforts between start-ups, corporations, and academia. Particularly, fostering engagement and collaboration via PoC (de-risking testing and experimentation), tech transfer, work-based research, and better use of existing EI support to leverage new technologies into IFS enterprises, while supporting start-ups in the scale-up phase.
- There is a need to link the fintech start-up and innovation ecosystem across the region in a more coherent way, **to become Europe's Fintech entrepreneurial powerhouse**, attracting start-ups from around Europe in all fintech verticals. (US Case studies: Boulder County, Colorado, and Des Moines, Iowa)
- It is necessary to support regionalisation objectives, as one of the three key horizontal pillars of the IFS2025 Strategy. The **Fintech Foresight Group**, established by the Irish banking federation BPFI to harness new technology opportunities in both the Fintech and the wider IFS sector, could be instrumental to expand the linkages of the regional start-up ecosystem and enhance interaction with IFS companies, tech & research centres, and government, to identify opportunities for synergy. Similarly, the Regional Enterprise Plans process could be a key policy response for supporting the development of regional strengths in the IFS sector and identifying potential clusters of fintech activity.
- Addressing skills needs through substantial actions with new industry-led specialised programmes: tailoring specific fintech short courses in emerging financial sectors like compliance, treasury, regulation, and BDM or developing Fintech apprenticeship programmes. Moreover, the creation of specialist talent in the emerging area of Sustainable Finance will be crucial to bridge the existing skills gap – building on the recommendations of Sustainable Finance Skillnet.
- As crypto assets are becoming mainstream, it is time to integrate fund management training with the evolution of digital ledger technologies, stablecoins, and increased interest in central bank digital currencies. This may start to open huge opportunities in the cross-border payments space.
- As a highly regulated sector, industry and regulation need to be in sync. By creating a platform where start-ups in Fintech, Insurtech, Regtech and related industries have a direct line to central regulators, interactions can be encouraged as they build their solutions. In this way, their innovative products and services are more likely to be effective, with market needs clarified through every stage of communication.

Key Emerging Areas

- **Fintech** is a dynamic segment at the intersection of the IFS and digital sectors, where tech-focused start-ups and new market entrants are disrupting the traditional value chain with new products, services, and business models. Fintech verticals in Ireland include Credit & Lending, Platforms, Funds & Trading, Crypto & Blockchain, FinOps, Insurtech, Accounting, Payments (Paytech), Regtech, Savings/Investing (Wealthtech), Big data /Analytics (AI). Promising areas for the region are:
  - **Paytech:** Payments has the highest share of companies in the Irish Fintech ecosystem (25%), increasing to 58 All-Ireland indigenous companies in 2019[24]. It is a significant sector with high growth potential because it powers the global e-commerce transactions, forecasted to grow by 15-20% per annum[25] from USD 3 trillion today.

---

[24]https://www.cpaireland.ie/getattachment/Resources/CPA-Publications/Accountancy-Plus/accountingcpd-net-courses-(2)/PCA-Profiles-Personal-Development-(7)/The-Irish-Fintech-Ecosystem-Headwinds-and-Tailwinds-(and-the-Making-of-a-Global-Fintech-Centre)-by-Peter-Oakes.pdf?lang=en-IE

[25]https://www.ubs.com/global/en/wealth-management/chief-investment-office/investment-opportunities/longer-term-investments.html

- o **Regtech, Insurtech, and Wealthtech:** these emerging industries have started to pick up in the region with rising success stories (e.g., Fund Recs, Blink Innovation), that can be further supported with already existing specialised technology and innovation centres. Regtech has the highest share (17%) after Paytech, getting closer with 39 All-Ireland indigenous companies. Insurtech and Wealthtech are yet to be exploited, with 5% and 2.5% share, and 12 and 6 indigenous companies, respectively.
  - o **Crypto & Blockchain**: A nascent and promising industry that is gaining momentum thanks to the support of Blockchain Ireland and direct funding from IDA. There is evidence of expertise in applied blockchain with Sedicii in Waterford and Fiserv (First Data) in Tipperary.
  - o **Cybersecurity:** tapping into the region's emerging strengths and responding to the increasing emphasis on data and information security, as well as mitigation of cyber-threats as digital becomes mainstream.
  - o **AI / Big Data / Analytics:** Fintech companies are strongly looking into these technologies to boost the capabilities of their existing platforms, products, and services.
  - o **CX-tech:** Ireland's emerging CX industry could fulfil the growing need of financial institutions for innovations that improve customer experience with seamless integration and usability, in response to the shift from 'product-driven to 'customer-centric.
- **Sustainable finance** is the capital required to tackle climate change and includes green bonds, ESG and socially responsible investing (SRI) investments, sustainable infrastructural investments, climate finance, and performance bonds. EU Green Deal's ambitions represent a significant opportunity for Ireland to be in the vanguard, as the country aims at becoming a specialised hub in this growing area. By making it a priority, the region can initiate a push to improve the depth and awareness in the area: leveraging key local experts (e.g., Stephen Nolan, SEFSC's member, EC advisor and chair of the FC4S), exploring new opportunities with emerging tech strengths (e.g., Limerick-based Accuvio's software for ESG reporting), and developing the new specialised skills needed in the space.

3.3.8 ICT Sector – Digital Industries

Digital industries cover some of the core sectors in the information age, combining services related to information and communication technologies (ICTs) with the hardware they use. It is related to an increasingly cross-cutting technology and has become an element of most parts of economic activity. There is a growing push in Ireland for the adoption of disruptive technologies in industries, to meet emerging challenges such as the need for increased efficiency, shorter production chains, and increased flexibility. On the other hand, ICT skills are needed to drive productivity and growth in virtually all enterprise activities as digitisation creates new business models, new production methods, new processes, and new ways of working. Therefore, greater ICT development is a priority across sectors for the Southern Region. Enhanced quality and provision of ICT infrastructure are seen as critical for the rejuvenation of the Region's cities, towns, and rural areas. Moreover, it is an objective of the Region to build on Smart City and Smart Region initiatives and support a leadership role for the Southern Region as an innovator in smart technologies.

Key Strengths

- The ICT sector is a large and rapidly growing sector in the Southern Region, made up of both indigenous and multinational companies.
- The ICT ecosystem is populated with a complete support network including research and technology centres, industry-led cluster groups, venture capital, tech incubators and accelerators, business innovation centres, and multiple entrepreneurial and coworking spaces.

Mid-West

- The Mid-West has seen considerable growth in technology, particularly in software development. Companies such as First Data, Jaguar Land Rover, STATS, Becton Dickinson, WP Engine and Dell EMC are all engaging in high-end research and development activities.
- The University of Limerick is home to recognised research centres such as LERO (software), MACSI (applied maths), and CONFIRM (smart manufacturing). In addition, the NEXUS Innovation Centre supports entrepreneurship, and the EPI STEM National Centre supports STEM education.
- LERO seeks to establish a strong Irish software ecosystem with a focus beyond purely software engineering towards industrial applications such as Connected Autonomous Vehicles; Health, Wellbeing & Human; Performance; Smart communities/cities; GovTech; FinTech; AgriTech & food.
- Limerick Institute of Technology's (LIT) research groups are ISRG (interactive systems), ACAD-Emy -incl. Digital Arts Lab and ISRG-proposed Centre for Creative Informatics, ACORN (intelligent systems, smart facilities, and smart electrical networks), and CaIR (computing and informatics).
- LIT has the largest portfolio of enterprise, incubation, and acceleration centres in Ireland, with three centres across Mid-West: Hartnett Enterprise Acceleration Centre, QUESTUM Acceleration Centre, and TCEC. LIT's Centre for Creativity, Enterprise, Innovation, Design, & Engagement Research (CEIDE) is building on these centres to leverage academic resources and research output to support this wider socio-economic remit.
- Additional business and entrepreneurial support in Limerick are taking place at the ENGINE hub (coworking space + high-tech audio-visual equipment) and Fab Lab (digital fabrication laboratory with a focus on creative and cultural industries), and in Shannon at the Gateway Hub (incubation space uniquely located at Shannon Free Zone).
- The Mid-West has a robust power grid infrastructure and dark fibre connectivity (capacity) to effectively serve a Cluster of Data Centres. Nautilus Data Technology in partnership with Shannon Foynes Port is to develop the first set of floating data centres in Europe, employing water cooling technology that increases efficiency, tackling high energy usage and emissions from data centres globally – establishing a new trend: blue-green data centres.
- Dell has also opened its first European IoT Lab in Limerick, which provides resources and expertise to allow companies to discuss, build, and test M2M applications.
- Testbed facilities focused on Connected and Autonomous Vehicles (CAV) with the Future Mobility Campus Ireland (FMCI) at the Shannon Free Zone and in partnership with Red Hat, which focuses on Connected Electric Shared Vehicles (CESV) and Unmanned Aerial Vehicles (UAVs). Lero's Blended Autonomous Vehicles Spokes programme has worked with partners in Valeo Vision Systems, Jaguar Land Rover, Kostal, Liebherr, Dairymaster, Greenval, Pavement Management Systems, Transpoco, McHale and Combilift. In particular, the R&D partnership with Valeo will use the NUI Galway campus also as a CAV Testbed.
- The Smart Limerick roadmap includes several projects, initiatives, and exciting opportunities to accelerate the digital transformation of the region (some in partnership with LERO), such as Limerick Enterprise Architecture, Connected Health, Smart Ageing Volunteers Platform, Insight Limerick – DaaS, The Networks Forge, among others. The Smart Limerick roadmap includes several projects, initiatives, and exciting opportunities to accelerate the digital transformation of the region (some in partnership with LERO), such as Limerick Enterprise Architecture, Connected Health, Smart Ageing Volunteers Platform, Insight Limerick – DaaS, The Networks Forge, among others.
- The Propeller Shannon Accelerator programme is a unique aviation and travel-tech programme that support innovation and start-ups in B2B Traveltech, next-generation Airports for passengers, Big data, Aviation services, drones/UAVs, cybersecurity, satellite tech, and

more. This is supported by the Shannon Group's International Aviation Service Centre (IASC) and cluster.
- There is an emerging screens industry in the Mid-West:
  - *Film in Limerick*, which is the go-to place for all things film, is heavily promoting the screen industries, offering a range of services and facilities, intending to make the mid-west region a major hub of film and TV productions while nurturing homegrown talent. Key initiatives and programmes are the Engine Short Film and Documentary Programme schemes (to support emerging talent in the three Counties); the Writers Factory (new screenwriting course), and Delegations.
  - Troy Studios is Ireland's newest and largest studio facility catering to an increasing number of national and international productions.
  - The ENGINE Hub is partnering with the film and tech sector and has been developing specialised training facilities to meet the needs of a supply of skills, following the opening of Troy Studios.
- The region also has a strong reputation in the Sports tech industry, where the first-ever sports business cluster was established in 2015. After receiving funding from the EPSI, the SportsTech Ireland Cluster is nurturing a local ecosystem for international sports innovation and technology, with the SportsTech Hub and Accelerator initiatives.
  - University of Limerick's PESS advances research in sports, health, biomechanics, and most recently golf performance.
  - Lero recently opened Ireland's first e-Sports research lab at the University of Limerick, designed to boost the performance of international amateur and professional esports players.

South-West
- The South-West region has acknowledged strengths, skills, and capabilities in high-tech manufacturing and ICT-enabled global business services, with the presence of over 60 ICT companies supported by industry-focused third level institutions and internationally renowned research centres.
- UCC has cross-disciplinary and synergistic research capabilities with ICT-focused centres such as CRT-AI, Boole Centre for Research in Informatics, Centre for Unified Computing, IN-SIGHT Centre for Data Analytics, Microelectronic Circuits Centre Ireland, and the Tyndall National Institute. Highlights include:
  - The VR Digital Environment Lounge for experimentation and learning about immersive environments.
- The Tyndall Institute is working with industry to research the latest in ICT, microsystems, and nanotech, and develop solutions and applications for health, communications, energy, agriculture, and the environment, with key centres such as QCEQ (quantum computing), CONNECT (advanced networks), ESA Space Solutions Centre Ireland, IERC (energy technologies), IPIC (photonics), and MCCI (microelectronics).
- MTU's Nimbus Research Centre is leading research efforts in cyber-physical systems and IoT, as well as in embedded systems, as their underpinning technology. Highlights are:
  - The Applied IoT Group, an EI Technology Gateway (incl. regional institutions such as TSSG at Waterford and IMaR at Tralee), provide the industry with technical capabilities across the IoT technology stack, i.e., from devices and sensors to user applications, incl. data analytics, cloud computing, and UX/UI.
  - XRIL – Extended Reality Innovation Lab providing tech capabilities in AR/VR/MR to serve the needs of industry 4.0, incl. competencies in Design Thinking and user-centred research and design.

- MTU's IMaR Technology Gateway at IT Tralee specialises in intelligent mechatronics, RFID, and IoT technologies and applications in a wide range of automation, identification, and manufacturing services.
- Business bodies and support networks for entrepreneurs and innovators in the region are Rubicon Centre, Ludgate Hub, RDI Hub Killorglin (in the Kerry Hub Knowledge Traingle), CBA, CorkBIC, Cork Chamber, and Cork Entrepreneurs, Dingle Creativity and Innovation Hub, and Tom Crean Business Centre (at Kerry Technology Park Tralee). A highlight is MTU's HINCKS Centre for Entrepreneurship Excellence, which is the first-of-its-kind research and training centre in the field of Entrepreneurship. The UCC Innovation Office supports innovation and start-ups in several programmes such as Gateway UCC Academy and IGNITE.
- The Cork Smart Gateway initiative provides further support to organisations for industry-academia partnerships a conduct knowledge and technology promotion activities (e.g., through webinars)
- Digital Kerry is a new function setup in the Kerry Council focused on the development of a digital strategy for the region, as well as the expansion of its connectivity infrastructure.
- Evidence of strong specialised and organised cluster activities:
  - Cyber Ireland brings together industry, academia, and government to represent the needs of the Cyber Security Ecosystem in Ireland, to enhance the innovation, growth and competitiveness of the companies and organisations which are part of the cluster. Cyber Ireland has amassed a membership of over 110 organisations nationwide, made up of almost 60 indigenous start-ups and SMEs and over 30 MNCs from across the cybersecurity sector, as well as other relevant sectors.
  - it@Cork is one of Ireland's most established and connected tech clusters, with more than 220 companies from the tech sector in the South-West, it provides support through training, upskilling, networking, and knowledge-sharing opportunities.
  - The STEM South-West industry-led cluster was funded in 2019 to promote and nurture STEM throughout the region, through training, a cross-regional collaboration between industry, government, and academia, increasing employment and economic opportunities.

South-East
- The South-East has a dynamic digital innovation ecosystem with a strong research infrastructure, knowledge competencies and skills supply, built around WIT and IT Carlow.
- The business and entrepreneurial base is supported by the ArcLabs incubator, the SEBIC, the LEOs, and Local Chambers, connecting research, skills, and industry, and linking company need with knowledge and support. The Walton Institute has also a track record in start-up support with the creation of over 17 spin-out and spin-in companies.
- WIT's Walton Institute (formerly TSSG) is spearheading the development of next-gen digital technologies with the research groups: Emerging Networks Lab, Programmable Autonomous Systems, Mobile Ecosystem & Pervasive Sensing, Research Infrastructure & Testbeds; incl. the innovation centres SEE Space Network centre (with its Satellite Radio Communication testbed) and the Kilkenny Co-supported PACE centre (agri-tech). Highlights include the tech assets, industry testbeds and living labs:
  - The TSSG Data Centre facility supports over 50 concurrently active ICT research projects and houses other research infrastructure and research groups and centres, such as ICHEC's Supercomputer 'Fionn' and CONNECT's Pervasive Nation Testbed.
  - E-Textiles Lab: intelligent smart wearable garments for the detection and sensing of data can be knitted and woven into the fabric.
  - Mixed Reality Lab, which has VR/AR equipment with Hololens, Oculus Quests and a VR Treadmill to test all types of virtual scenarios.

- IT Carlow's Dargan Centre reinforces and strengthens the institute's commitment to high-quality RDI activities, which are closely aligned to both national research activities and Horizon 2020 and the European Framework for Research & Innovation. Digital RDI activity at the Institute is driven and delivered mainly through the gameCORE, designCORE, and engCORE research centres.
- Grassroots initiatives such as the Tech Meetup communities in Waterford and Kilkenny.
- Examples of indigenous ICT companies competing internationally are Red Hat, Nearform, and ImmerisiveVR.
- South-East is home to several award-winning companies in the broader design sector and is well-positioned to promote and develop Ireland's capabilities in business-related design across all sectors of the economy. The Design sector is supported by the presence of the Design and Crafts Council of Ireland and academic and commercial research centres of excellence.
- 2,400 people in the South-East have qualifications in Audio-visual Techniques and Media Production; Design; or Craft Skills (Source: CSO, Census)
- Cartoon Saloon is a Kilkenny-based five-time Academy Award, Golden Globe, BAFTA and Emmy nominated animation studio, that has carved a special place in the international animation industry through its award-winning films and TV series.
- Nemeton TV, a Waterford-based production company, creates premium content for broadcasters, sports, organisations and commercial brands.
- Centre for Design Innovation and the National Centre for Design and Craft are some of the organisations promoting design and design thinking, as well as creativity in the South-East.

Key Challenges and Opportunities

- There is a continuing concentration of technology-related activities in Ireland which bring about the need for enterprises to build distinctive strengths and ensure a degree of diversity, to prevent crowding out or inflationary effect as enterprises compete for essentially the same skills.
- Lack of cohesion in regional engagement and goals for a common innovation ecosystem across the region. Funding for coordinated regional infrastructure in the identified areas, as well as the adoption of a cohesive roadmap for industries looking to innovate is therefore required.
- Need to internationalise the region, develop value chains, attract talent and investment, facilitate upskilling, and partnership innovation.
- Building an entrepreneurial pipeline is key, alongside an increased focus on creating start-ups.
- Start-up support and de-risking of POC (Proof of Concept) trials to foster engagement with local start-ups rather than the better-known international hubs. Active encouragement for collaboration via POC, tech transfers, work-based research, and awareness of existing EI Supports in this space to leverage these technologies into the FS / INS / REG enterprise
- Linking the ICT research base in the South-East with the traditional industry sectors such as Engineering and Advanced Manufacturing and ensuring that manufacturing firms stay competitive by engaging in the benefits of digitalisation.
- Potential displacement and changes in work practices emerging from the growth in Robotics, Artificial Intelligence, Augmented Reality, Virtual Reality and Machine Learning.
- Another potential future hub of VR activity could also be Ireland. Hosting the European headquarters of many innovative global businesses, including IT giants such as Google and Facebook, and thereby attracting investment from abroad. The cities of Dublin and Cork

tick the boxes for the development of a dynamic VR community. Companies such as Immersive VR Education exemplify this potential.

- The North Quays development proposed for Waterford City could create an opportunity for an innovation district and innovation hub on retail tech.
- Building on the success of Immersive VR and knowledge of VR within the Walton Institute (Waterford) to create more start-ups.
- URDF Funding is an opportunity for this specialisation area.

Key Areas of Technology Specialisation

- Applied IoT: a subset of the larger IoT which focuses on specialised requirements for industrial applications, such as manufacturing, agriculture, health, transport, etc.
- Cybersecurity to provide confidentiality, integrity, privacy, and assurance, using security applications such as security mgmt., access control, authentication, malware protection, encryption, and permitter deference.
- SportsTech: with more than 40 companies in Ireland already selling to international markets, it is an emerging sector with the highest potential in the following verticals: IoT, Sports Performance, Data Analytics, Broadcast, Wearable Tech, Fan Engagement, Sports eCommerce, Digital Media.
- Film-tech & Animation: within the screens industry and creative sectors, film tech emerges with the application of advanced digital technologies throughout the production process. Key technology areas include innovative storytelling, innovative motion picture techniques, real-time rendering, 3D printing, globally distributed workflow, AI developed screenplays, AI sound/light design, autonomous drone cameras, cloud-based technologies, and much more.
- Creative industries: design-based (i.e., industrial design, product design, web design and visual communications, Ui/Ux (User-interface/User-experience) design and software design, service design, and strategic design), digital creative (i.e., games sector, and the post-production/visual effects (VFX) which supports the audio-visual sector, but is also an export service in its own right), and content creation industries (i.e., advertising and brand development, but also including new content for commercial social media uses, online distribution and mobile applications ('apps'), as well as content for new platforms such as AR/VR/XR, Augmented Reality / Virtual Reality / Mixed Reality)
- Advanced mobility technologies relate to the automotive and transport sector as a core and expand it with related technologies from the Production Technology and Aerospace cluster. Topics dealt with by technological innovation in the field of mobility include autonomous driving, connectivity, electrification, and shared mobility (ACES), urban mobility, autonomous drones, aircraft types and aerodynamics, radar, navigation, GPS, GIS, etc.

3.3.9 Tourism

Tourism is undoubtedly among Ireland's most important indigenous sectors. It has experienced annual growth from 2010 to 2019, when it generated approximately €9 billion for the Irish economy and supported 260,000 jobs, before the onset of the Covid-19 pandemic. Unfortunately, the industry has been disproportionately impacted by the pandemic throughout 2020 and into 2021, with an estimated 90% drop in revenue and 160,000 job losses. However, as an urgent response at the national level, the Tourism Recovery Taskforce (TRT) was established in May 2020 to develop

a recovery plan for the tourism industry from 2020-2023, which include immediate priorities for survival as well as recommendations for stabilisation and recovery[26].

Being home to all three of Ireland's Regional Experience brands, namely, the Wild Atlantic Way, Ireland's Ancient East, and Ireland's Hidden Heartlands, the Southern Region is uniquely positioned to exploit the new consumer demand trends in a post-Covid-19 environment and strengthen its image in terms of outdoor activity and open space, as well as green, clean and sustainable destinations. Through the RSES and the Metropolitan Area Strategic Plans (MASP), the Southern Region has already set its ambitions to support visitor experience development and investment into flagship tourism products. The strategic objective of promoting the sustainable development of tourism destinations that enhance diverse tourism roles for key regional locations, while seeking investments in services to cater for the new post-pandemic reality, is more relevant than ever.

Key Strengths

- Before COVID-19's shock, tourism in the region had been booming. The Southern Region welcomed around 4.7m overseas tourists in 2017, who spent over €1.68b during their visit, as well as ca. 4.5m Ireland residents (incl. NI) spending €0.9b (Fáilte Ireland, 2019). Some areas are popular among overseas tourists while others welcome a higher share of residents from the island of Ireland:
    o The **South-West attracted the highest numbers of overseas visitors after Dublin,** in 2017, with nearly 2.4m tourists travelling to Cork and Kerry - and generating €968m in revenue. Domestics trips accounted for 2.2m and €455m in visitor spending.
    o The South-East attracted 1.5 times more domestic visitors (1.45m, €455m) than overseas tourists (0.95m, €271m), while, conversely, Mid-West attracted 1.5 times more overseas tourists (1.4m, €444m) than domestic (0.92m, €175m).
    o In general, the Southern Region's overdependence on overseas tourists was low, with an average overseas-domestic ratio of 1.1. This may have been critical to keeping businesses afloat during the pandemic, as many had to rethink their offerings to attract more domestic visitors - a trend that will continue in the short and medium-term.
- The **assets of each county within the region are complementary to each other.** There are a plethora of additional brands, particularly focused on the tourism market across the region.
    o In the Mid-West, the urban capital of Limerick provides a critical mass value proposition for Clare and Tipperary; while a rich and unique tourism offer in terms of people, land, and natural resources of the Wild Atlantic Way and Ireland's Ancient East, augment the value proposition of the region's capital city.
    o The South-West is particularly well-placed to attract the so-called 'Great Escaper and Culturally Curious' segments of the tourist market who among other things are looking for authentic areas of discovery, cultural insights, good food, history & natural beauty for an inspiring & unusual experience. The South-West also contains the only gold-star dark sky reserve in the Northern Hemisphere, an area uncontaminated by artificial lights, and is full of cultural and heritage sites.
    o The South-East is a popular Irish destination for the summer months, thanks to its more stable and warmer weather. However, the region also has an untapped potential in terms of built and cultural heritage and is exploiting exciting opportunities as part of Ireland's Ancient East.

---

[26] https://www.itic.ie/RECOVERY/#recommendationdetails

- The Kerry Tourism Industry Federation, which was formed to meet the County's need for collaborative destination management, is taking a coordinated approach to sustainable tourism by involving both the private and public sectors.
- Shannon Heritage (from Shannon Group) has developed and ran tourist flagship attractions together with innovative immersive experiences such as the Medieval Banquet Nights at three castles in the region, or the Fairy Trails at two castles.
- The Rosslare Europort located in the South-East is Ireland's best geographically positioned port to the UK and mainland Europe and offers excellent direct connectivity for future business.
- The South-East is moving closer to its ambition of having the entire region interconnected by Blueway/Greenway routes, with work ongoing on the New Ross to Waterford stretch of Greenway which will create a 70km+ stretch of Greenway from Dungarvan to New Ross.
- Across the region, there is **a vibrant and growing technology start-up community, underpinned by a network of entrepreneurial support hubs and spaces** that could be tapped into.
- The Shannon Propeller Accelerator programme is launching start-ups in the Travel Tech space, which is also drawing entrepreneurs from across the world. Success stories: three of its start-ups — Airside Management, OneAire, and Block Aviation — are all finalists for the Rolls Royce Innovation Challenge. Another, Trustabit, was selected by Plug and Play to present to Star Alliance at their Innovation Day.
- Some of the most recent cases of the use of digital technologies in tourism are to be found in Cork, such as the Augmented Reality Tour Guide, in collaboration with UCC; the series of VR documentaries for Cape Clear's Island Ferry Tales project, by the start-up Wombat Media, or the 'quest' app developed by travel-tech start-up Keyquest.
- Key AR/VR competencies in the region include the Extended Reality Innovation Lab (XRIL), at Nimbus Research Centre (Cork), and the Walton Institute Interactive Technologies Division (Waterford), which has a particular focus on the tourism sector with the use of AR/VR for heritage interactive experience and recently launched a Mixed Reality Innovation Lab.

Key Challenges and Opportunities

- The geographical remoteness of some regional locations is a major challenge. It creates specific imbalances that make attracting tourism and increasing overnight stays more challenging.
- High seasonality poses a major challenge to the industry and employment. Initiatives that will motivate and facilitate potential tourists to visit and stay are therefore needed.
- Tourism, leisure, hospitality**,** and retail businesses are in survival mode and are therefore taking whatever measures are necessary to adapt and pivot to thrive. Research and innovation in the sector could become a daunting challenge, given the lack of critical resources and dependence on state aid.
- Lack of clarity and uncertainty continues to drive consumers' behaviour and travel plans. The desire for overseas travel is mitigated by low levels of confidence in being able to do so, despite government messaging. As a result, consumers are going local: 52% of consumers will replace a long break overseas with a domestic trip, and 48% will replace a short trip overseas with a domestic one (Fáilte Ireland, 2021). Therefore, the industry should be examining how to maximise the return from the domestic tourism market and deal with the increasingly stronger competition.
- Possibility of local (digital) entrepreneurs already in search of market opportunities to help tackle the global pandemic crisis. If presented with the right challenge and provided with the right resources, they could support the recovery and revitalisation of the tourism industry.

> Example: Dublin has a similar, but more densified community, which has already spawned highly valued travel-tech start-ups, such as TripAdmit, which raised €300K last year and aims to renew the Irish tourism industry.
> - Considering the new trends of travellers who prefer outdoor activities, there is the opportunity to develop specific tourism offers, taking advantage of the Greenways, Blueways, and other existing or planned trails. Cross-border initiatives, such as the EuroVelo 1 - Atlantic Coast route, which consists of an on/off route from Norway to Portugal via Ireland, could be an invaluable opportunity to attract a niche group of tourists.
> - According to a report from NUI Galway's SEMRU, Ireland's domestic coastal and marine tourism activity could play a significant role in rebooting the sector. The report found that the total expenditure by domestic tourists in coastal areas was 35% of the total domestic tourist expenditures in 2018, with domestic marine tourism accounting for €381m. Given this significant contribution, particularly to those regions outside the capital, the opportunity - again- is examining how to maximise the return from the domestic tourism market.

Key Areas of Technology Specialisation

- **Sustainable Tourism:** A research by Booking.com reveals that 72% of tourists are adopting a more sustainable and environmental mindset when making their travel decisions.[27] Now, the Covid-19 pandemic has heightened the focus on the resiliency, sustainability and interconnectedness of the tourism sector.[28] The region can increase its competitive positioning by a focus on carbon offsetting in tourist transport and destinations, increased emphasis on outdoor activities, more hands-on heritage and cultural experiences, local food production, and slow tourism hubs.
- **Experience Tourism:** This is about creating once-in-a-lifetime experiences or fostering an emotional connection with cultures and nature, by developing a marketable and cohesive array of offerings (experiences) that appeal to niche personal interests. Some of the trends are food tourism, solo travel wellness travel, and increasingly transformative travel, where the tourist is not travelling only for leisure but also aiming to make a difference in both the lives of others (volunteering travel) and oneself (wellness travel).
- **Food Tourism:** Food and beverage consumption accounts for 35% of all international tourism revenues, and Fáilte Ireland is banking on Ireland's food and beverage offering as a key component in the post-pandemic recovery of the tourism industry. The Southern Region has a long tradition in agriculture, as well as a dynamic food and beverage industry. Some of the key trends are sustainable and high-quality foods, food trails (linked to Greenways and Blueways), food clusters, regional brands, local food personality, the use of digital technologies for consumer engagement and value-added experiences.[29]
- **Travel Tech:** Although the global travel tech industry has seen a significant drop in the last year,[30] technology can play a crucial role in supporting recovery and rebuilding traveller confidence, for instance, by addressing concerns around mixing with crowds, social distancing and physical touchpoints, according to Amadeus' Rethink Travel Global Survey.[31] Key technologies include contactless tech (sensors, RFID (Radio Frequency Identification), NFC (Near Field Communication) tags, facial recognition and modern biometrics), Digital ID (blockchain-

[27] https://globalnews.booking.com/bookingcom-reveals-key-findings-from-its-2019-sustainable-travel-report/
[28] https://www.oecd-ilibrary.org/industry-and-services/managing-tourism-development-for-sustainable-and-inclusive-recovery_b062f603-en
[29] https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/2_Develop_Your_Business/Key%20Projects/Taste%20the%20Island/Areas-of-Focus_Destinations.pdf
[30] https://www.globenewswire.com/news-release/2020/12/24/2150411/0/en/Global-Travel-Technologies-Industry.html
[31] https://amadeus.com/documents/en/theme/research-report/global-traveler-survey-us.pdf

based digital / health passes), travel planning and management technologies (incl. auto-mated booking or tour management platforms), robotics (hotels, airports, front desks, etc.), IoT and big data technologies.

3.4 Overview of Potential Priority Areas

The macroeconomic analysis, the sectoral SWOT analysis, and the inputs from the stakeholder consultation informed the identification of the priority areas for the Southern Region. Each of the priority areas builds on existing sectoral strengths indicated in the SWOT and is centred around a direction of transformation identified through the stakeholder interviews and workshops and market analysis. The identified areas were strengthened through analysis of the regional ecosystem potential and global opportunities. The priority areas are cross-sectoral, having an impact on several sectors and markets each of which are identified. Also noted in Table 11 is the rationale for the selection of the priority area and the key regional stakeholders who are required to be involved in the further development of the priority area into a smart specialisation area for the region.

Table 11: Overview of Potential Priority Areas

Priority Area	Target Sectors and Markets	Rationale	Key Stakeholders
1. **Additive Manufacturing**	• Life Sciences (Prosthetics, Orthotics, Implants, Devices, etc.) • High Tech Manufacturing (Embedded Sensors, Aerospace, Automotive, Construction)	• The medical devices industry in Southern Region has invested strongly in the development and commercialisation of additive manufacturing for the health and life sciences sector. • The region has a strong applied R&D focus in the area with several research centres offering facilities for technology development and application. • Additive manufacturing is predicted to be a highly disruptive force within the global manufacturing industry and the market is expected to shift from prototyping to mass production. The field is projected to grow at a rate of 26% over the next years.[32]	**Research Centres** • Rapid Innovation Unit • SEAM • Irish Manufacturing Research centre • CONFIRM • SSPC **Private Sector** • Stryker (Amagine Institute) • Additive • Croom Precision medical **Clusters** • STEM South-West cluster • Emerald Aerospace group
2. **Advanced Transport & Mobility Systems**	• Transport (connected and autonomous vehicles, shared EV modalities) • Aerospace (unmanned aerial vehicles, autonomous drones) • Digital industries (IoT, advanced	• Investments in the relevant technologies across the mobility landscape are continuing to accelerate. The market is expected to reach USD 91b by 2026 (CAGR 18.4% from 2020) • Europe's ambitious climate goals are also pushing the sector forward with increased investments in the	**Research Centres** • Lero **Private Sector** • Red Hat • Shannon Group • Cluster members **Clusters** • Shannon Cluster

---

[32]https://www.statista.com/statistics/284863/additive-manufacturing-projected-global-market-size/

	software, advanced connectivity)	transition towards more sustainable mobility. • Research capabilities and testbed infrastructures are present in the region, with strong industry collaboration and partnerships	
3. Applied IoT	• Digital industries (cloud computing, It, networks, etc.) • High-tech manufacturing (IIoT) • Agrifood (agri-etch, precision agriculture, etc.)	• IoT is being applied across a wide-ranging of industries, driving a market that reached UDS 250b in 2019 and is projected to reach USD 1,463b (CAGR 24%). • This is a crosscutting area of specialisation that taps into the region's research strength in software, ICT, and cyber-physical systems and innovative applications being developed together with the industry.	**Research Centres** • IMaR • Nimbus • TSSG • Dell IoT Lab • ACORN **Clusters** Applied IoT Gateway Cluster
4. Bio-based economy	• Agri-food (biomass resource) • Bioeconomy (biorefining, bioconversion, sustainable materials) • Blue Growth Industries (bioplastics from seaweed)	• Lisheen is a leading area for the development of the Irish bioeconomy. • The Bioeconomy Innovation and Piloting Facility is a critical infrastructure for scaling technologies that convert Ireland's abundant natural resources to high-value products. • Extensive research into the conversion of biomass to food ingredients, feed ingredients, pharmaceuticals, natural chemicals, fertilisers, and biodegradable plastics, is ongoing in the region. • Development of bio-based composite materials for producing carbon fibres for use in end-user sectors such as transportation, renewable energy, and construction is also underway.	**Research Centres** • Teagasc • Higher Education Institutions • Shannon ABC • National Bioeconomy Campus Lisheen • Irish Bioeconomy Foundation • Walton Institute **Private Sector** • Glanbia Ireland • Carbery Group • Dairygold • NutraMara • BioAtlantis Ltd. **Clusters** • Circular Bioeconomy Cluster SW

5. **Biopharma-ceuticals and Pharmaceuticals 4.0**	• Life Sciences (Molecular and cellular communication, Clinical and Translational research) • High Tech Manufacturing (Bio) Process Engineering, Process Analytics, Continuous Processing, Model predictive Control) • Bioeconomy	• All the world's top 10 pharmaceutical companies have substantial operations in Ireland. • Circa €2 billion invested in Biopharma R&D by IDA client companies annually. • Manufacturing excellence in Biopharmaceuticals is a hallmark of Ireland's success in the sector making the country the 3rd largest exporter of pharmaceuticals globally. • The COVID-19 pandemic has put the biopharma industry at the centre of global attention with substantial investments in innovation and digitalisation to improve cost and time effectiveness. • The biopharma industry is expected to grow at a 10.6% CAGR between 2020 and 2027. • The European Cluster Observatory (2015) found the emerging Biopharma industry 'to show the most dynamic cross-sectoral linkages', with many linkages to other industries and technological areas. • The Southern Region has a strong presence of pharmaceuticals companies and research centres conduction state-of-the-art research which can be leveraged to be leaders in the biopharma industry and manufacturing of pharmaceuticals.	**Research Centres** • SSPC • PMTC • CONFIRM • Rapid Innovation Unit • SEAM • Synbiocentre • PMBRC • Cork University Hospital • HRB Clinical Research Facility Cork • Mercy University Hospital **Private Sector** • AbbVie • Abbott • Astellas • Regeneron • Eli Lilly • Stryker • Additive • Croom Precision medical • Novartis • BD • Rowa Pharmaceuticals, etc. **Clusters** • STEM South-West cluster
6. **Blue Bio-economy**	• Blue Growth Industries (bioplastics from seaweed/fish waste) • Bioeconomy (Sea vegetable aquaculture, microalgal biofuels)	• The objective to create commercially viable alternatives to existing fuels, cosmetics, plastics, livestock feed etc. from marine plants and animals has not been fully realised but is an area of high research interest, globally and to the region. (Emerging Sector)	**Research Centres** • MaREI • AFDC • Bantry Marine Research Station • Teagasc **Private Sector** • Wild Irish Seaweeds Ltd • Brandon Bioscience • Green Biofuels Ireland Ltd • ESB

		• Ireland is one of the three largest producers of algae biomass in Europe. • The European Economic and Social Committee has requested that the blue bio-economy become one of the flagship areas of EU policy.	
7. Blue Energy	• Energy (energy storage and transmission) • Blue Growth Industries (Wind turbines, tidal/wave energy technologies)	• The region has strong renewable energy resources, including wave, tidal and offshore wind. The planned Celtic Interconnector will further foster the development of the region's renewable resources. • The region is the only one in Ireland with a coal-fired power plant. • Growth in intermittent renewables will require investment in energy storage (batteries) and grid solutions. • Sustainable energy will be a crucial component of reaching Ireland's commitment towards carbon neutrality by 2050.	**Research Centres** • IERC • MaREI • CEEDD **Private Sector** • Resolute Marine • Ocean Energy Ltd. • Suir Engineering • Fastnet Shipping Ltd • Shannon Foynes Port Company • ESB **Clusters** • Shannon Energy Valley • Energy Cork
8. Creative Industries	• Digital industries • General industries (industrial/product design, UX-tech, service design, etc.) • Digital content (advertising and brand, social media, online distribution, mobile applications, AR/VR/XR platforms)	• Creative industries are increasingly seen as a source of structural economic transformation. • Therefore, under Future Jobs Ireland, a roadmap for the Creative Industries is underway to push for the creative economy in Ireland. • There is a need to diversify the region's enterprise base from high-tech manufacturing to more (high-tech) knowledge-intensive services. • There is an opportunity to leverage the region's existing research capabilities in design and creative services (incl. digital technologies such as AR/VR) and pockets of design-based industries.	**Research Centres** • Digital Arts Lab at ACADEmy • ISRG's Centre for Creative informatics • CEIDE • XRIL Nimbus Research Centre • gameCORE • designCORE • Design+ Gateway **Clusters** • Creative Ireland

| 9. Cyber-security | • Digital Industries
• Public administration & services
• Critical infrastructure sectors
• General industries | • Increased regulations on data privacy, more sophisticated scamming and phishing, and growth in identity theft are major trends that will demand sophisticated solutions that will lead to significant job creation within the cybersecurity sector.
• While many cybersecurity clusters are emerging around the world, they all face the same fundamental challenge: a shortage of skilled talent. As such, the industry landscape is at a tipping point where those clusters that succeed in generating, attracting, and retaining sufficient talent will be the ones that establish themselves as the world's most prominent.
• Cyber Ireland is boosting the industry forward by tackling the urgent skills shortage challenges, but also the need for research and innovation infrastructure, the promotion and education about cyber, as well as internationalisation.
• Cork is the centre of Ireland's cybersecurity cluster and has proven to be a successful location for both FDI and indigenous companies. | **Research Centres**
• Lero
• Insight
• CONNECT
• MTU
• Walton Institute
Private Sector
• AT&T Cybersecurity, Blackberry Cylance, eSentire, FireEye, Forcepoint, IBM, VMware, John-son Controls, Keeper Security, McAfee, McKesson, Nuix, Qualcomm, So-lar-winds, Sonicwall, So-phos, TransUnion, Trend Micro, UTRC, Red Hat, CipherTechs, Security Risk Advisors
Clusters
• Cyber Ireland |
| 10. Digital service sectors for smart regions | • Life Sciences (E-health, Telemedicine)
• Energy (Smart Homes and Smart Grids)
• Digital & ICT (E-governance)
• Mobility (Autonomous Mobility, MaaS) | • The Southern Region has the ambition to be a Smart Region and is working with the local authorities across the region to realise this ambition.
• The Smart Specialisation and the Smart Region ambitions of the Southern Region hold the opportunity to be the foundation for an emerging specialisation in digital services for smart regions.
• Regions are at the core of the EU Green Deal with a | **Public Sector**
• SRA
• Local Authorities
• City Councils
Private Sector
• IoT and Smart services providers [33]
Research Centres
• Future Mobility Campus Ireland
Clusters
• All Ireland Smart Cities Forum |

---

[33] https://www.enterprise-ireland.com/en/Events/OurEvents/Smart-Cities-and-IoT/Smart_Cities_IOT_Brochure2019.pdf

		great focus on leveraging digitalisation to improve the quality of life in regions.	
11. Efficient and Sustainable Manufacturing	• High tech manufacturing (Eco-conscious production) • Life Sciences (Waste and water management, Resource Recovery, Recycling) • Energy (Waste incineration, Energy Efficiency) • Bioeconomy (active carbon filtration, biological degradation, membrane filtration technology)	• The manufacture of medicines and drugs makes use of chemicals, materials and other substances that are potentially toxic if allowed into the environment. Ireland currently exports half of this hazardous waste to foreign countries. • As the Southern Region has a huge critical mass of pharmaceutical and med-tech manufacturing companies, there is a strong opportunity to invest in waste and wastewater management which complements the manufacturing growth. (Emerging Sector) • With the ambitious carbon neutrality goal set by the Irish government, the pharma and MedTech manufacturing industry there is a huge opportunity for energy-efficient production and development of healthcare solutions that use low energy during operations.	**Research Centres** • PMTC • CONFIRM • Cork University Hospital **Private Sector** • Pharma and biotech companies in the region • Waste Management companies (e.g., Veolia, Invader) **Clusters** • STEM South-West cluster
12. FilmTech	• Screen Industries (audio-visual post-production/visual effects) • Digital industries (software development, AI-based design, cloud computing)	• There is an emerging screens industry in the Mid-West, which is gaining momentum thanks to the promotion efforts of Film in Limerick and the recent establishment of Troy Studios – Ireland's newest and largest studio facility. • Many of the region's strengths in software and ICT, can also be redirected to meet the growing demands for advanced digital technologies within the screens industries.	**Research Centres** • Troy Studios • ENGINE Hub **Clusters** • Film in Limerick
13. Fintech	• International Financial Services - IFS (In-vestments, funds, & trading, Ratings agencies, Corp. treasury operations, Payments &	• Ireland is home to leading global financial services institutions and the IFS sector makes a significant contribution to the economy, creating spill-over effects (30% of employment is outside	**Research Centres** • GRCTC (Cork) • UCC's Centre for Investment Research (Cork) • UCC's FSIC (Cork) • RDI Hub (Kerry) • WIT's RIKON (Waterford)

	banking, Insurance, Reinsurance, Lending & SMB finance) • Digital Industries (FinTech, Insurtech, Regtech, WealthTech, Infosecurity/ Cybersecurity, Blockchain/ Cryptocurrency, Paytech, CX-Tech) • Aerospace (Aviation financing) • Global business services -GBS (Analytics & BI, LegalTech, HR & prof. services)	Dublin) across the Southern Region in key locations (Cork, Limerick, Waterford, and Wexford). • The Southern Region offers an attractive alternative to Dublin for IFS firms and boasts emerging high-tech indigenous enterprises, skills and talent from renowned Business Schools, and key clusters pushing the advancement of the industry. • There is a terrific opportunity to make the Southern Region a European Hub for tech start-ups serving the IFS and leverage the priority set for the sector at the national level.	• TSSG (Waterford) • IT Carlow's InsurTech Network Centre Accelerator (Carlow) **Private Sector** • Fexco • SE Financial Services Cluster members **Clusters** • Cork Financial Service Forum • South-East Financial Services Cluster
14. Future Sustainability & Food Tourism	• Tourism (Hospitality, Leisure, Food & Beverage) • Agri-food	• New post-COVID-19 behavioural trends are pointing at the increasing relevance of sustainable tourism. • The Southern Region is best positioned to exploit this consumer demand trends by focusing on carbon off-setting in tourist transport and destinations, increased emphasis on outdoor activities, more hands-on heritage and cultural experiences, local food production, and slow tourism hubs. • Food Tourism is a strategic priority for Fáilte Ireland in for the post-pandemic recovery of the tourism industry. • The region's long tradition in agriculture and food products could be used as a brand for high-quality sustainable and affordable food experiences that can attract both domestic and international visitors.	**Private Sector** • Shannon Heritage • Cluster members **Clusters** • Kerry Tourism Industry Federation

15. Marine Technology	• Blue Growth Industries (Marine sensors, Subsea power cables, Subsea remotely operated vehicles) • Digital Technologies (Smart Ports, Blue data management)	• This area combines the Southern Region's natural marine resources and expertise in ICT. In addition, the region hosts multiple testing sites and research centres focused on the area. • The region is home to 4 of Ireland's 5 ports of national significance, all of which stand to benefit from smart and sustainable digitalisation strategies. • Blue growth is a focus of Ireland's goals and extending Industry 4.0 to the marine sector is a logical play towards the region's strengths.	**Research Centres** • HMRC • CRIS • CONFIRM • MMRRC **Private Sector** • 8 West Consulting • Central Solutions • DARE Technology • Luxcel Biosciences Ltd • Transas • EpiSensor • MAC • MeteoGroup Ireland • Ocean Survivor • SonarSim • UAV Evolution Ltd **Clusters** • SmartOcean Innovation Cluster
16. Nutritional food & high-value ingredients	• Agri-food (enhanced nutrition, novel product development) • Bioeconomy (biotechnology)	• There is increased exploitation of the abundant seaweed resource in the Southern region. The development of marine ingredients and extracts from seaweed is opening new value chains for the region. • Due to a greater understanding of human nutrition, research into nutritional solutions and higher value-added dairy products for infants, athletes, and the ageing population has increased. • The global functional food market size is estimated to reach approximately $268 billion, registering a CAGR of 6.7% from 2021 to 2027. • Product development, ingredient interactions, sensory and product analysis, and the development of new components and bioactive compounds from environmental and natural sources are some of the research focuses of companies and top research institutes in the region.	**Research Centres** • Teagasc • Higher Education Institutions • Shannon ABC • DAFM **Private Sector** • Glanbia Ireland • Kerrygold • Carbery • Arrabawn • North Cork Creameries • Tipperary Coop • Dairygold • DairyMaster • Dansko • CP Ingredients • Glenstal Foods • BioAtlantis Ltd. • NutraMara • NutriScience **Clusters** • Irish Food Tech

17. Precision Agriculture and Smart Farming	• Agri-food (Agri-tech, Precision Farming) • Digital Industries (ICT, Advanced data analytics, Blockchain)	• There is a unique collaboration between the agri-food sector and information technology companies and research institutes in Ireland, through the VistaMilk SFI research centre in Cork. • Ongoing cutting-edge research on developing new algorithms to optimise soil, weather, animal, and grass growth data from satellite imagery for making precise decisions related to inputs, technologies, and management practices. • Numerous blockchain projects on food traceability, genetic trait performance, animal health and welfare, and end-to-end supply chain assurance for beef and dairy farmers are underway. (Emerging Sector)	**Research Centres** • Teagasc • SFI • DAFM • TSSG • ICBF • Tyndall National Institute • UCC • IDA Ireland • Smart Agri Hubs **Private Sector** • Glanbia • Dairygold • Cork Grassland Services • ICT Companies in Blockchain (IBM, ConsenSys, Fidelity, Deloitte) **Clusters** • Irish Food Tech
18. SportsTech	• Sports & Leisure • Digital media (fan engagement, broadcast) • Digital industries (IoT, data analytics, sports eCommerce, wearable tech) • Footwear & apparel industries	• Sport technologies and innovations have gained popularity both in outdoor and indoor activities, with an expected market growth of over USD 41b by 2026 (CARG 21.4% from 2020). • In the Mid-West, there is a growing cluster of international SportsTech companies concentrated in the region, which are leveraging data and technology for better insights. • By building on its research strength and innovation ecosystem, the region could become a springboard for a unique new area of specialisation, which intersects with software, ICT, media, health, nutrition, wearables, etc.	**Research Centres** • PESS • University of Limerick • eSports Lab • SportsTech Accelerator • Lero **Private Sector** • STATS • Cluster members **Clusters** • SportsTech Cluster
19. Sustainable Finance	• International Financial Services – IFS (Investments, funds, & trading, Banking, ESG investments and management) • Digital industries (fintech, insurtech, regtech)	• The growth of ESG investment is steadily increasing and Ireland already has a cluster of renewable energy infrastructure fund managers with €7 billion of assets under management. • EU developments on sustainable finance represent a significant opportunity for	**Clusters** • South-East Financial Services Cluster • Cork Financial Service Forum

		Ireland and the Southern Region to be in the vanguard of this growing area. • Synergies with the local digital industries to explore new opportunities with emerging tech strengths to develop unique tech solutions for this space.	
20. Sustainable livestock management	• Agri-food (sustainability, efficiency, optimisation) • Life Sciences (Plant and animal genomics, breeding strategies)	• Ireland's ruminant production systems have one of the lowest carbon footprints in the EU due to the predominantly grass-based dietary plan for Irish cows. • The South-East and South-West have the highest proportion of specialist dairy farms and since the abolition of quotas in 2015, the Irish dairy sector is striving to be a global leader in the development of high value, environmentally sustainable products. • There is ongoing research at top-level institutions on how to sustainably grow a greater quantity of consistently higher quality herbage for animal consumption, as well as optimized management and breeding strategies. • The Origin Green sustainability programmes under Board Bia, including the Sustainable Dairy Assurance Scheme (SDAS), provide a strong regulatory environment that promotes improved sustainability practices amongst farmers.	**Research Centres** • Teagasc • DAFM • Bord Bia **Private Sector** • Farmers • Primary producers • Processors **Clusters** • Irish Food Tech
21. Tech for Tourism Regeneration	• Tourism (hospitality, leisure) • Passenger transport sector • Digital Industries • Creative industries	• The industry has been disproportionately affected by the pandemic over the past year, and major national efforts are underway not only to ensure that businesses survive but to ensure that they thrive. • Technology is increasingly seen as pivotal in supporting recovery and rebuilding traveller confidence.	**Research Centres** • Shannon Propeller Accelerator • XRIL at Nimbus Research Centre • Lero **Private Sector** • Shannon Heritage • Cluster members **Clusters** • Kerry Tourism Industry Federation

		• There is a vibrant and growing tech start-up community in the region, underpinned by strong innovation infrastructure, which could be. • Local (digital) entrepreneurs may be already looking for market opportunities to help tackle the global pandemic crisis. If presented with the right challenge and provided with the right resources, they could support the recovery and revitalisation of the tourism industry.	

3.5 Sectoral Strength Prioritisation

The prioritisation of the specialisation areas is determined according to the existing technological strengths and capacities of the region, as well as the external opportunities for each area. The first prioritisation iteration presented in this report has been drafted according to the evidence provided for each specialisation area. Therefore, a set of indicators are selected to identify quantitatively and qualitatively the (1) capacity and (2) opportunity of each specialisation area. The following tables give an overview of the indicators used for prioritization along with the data used for ranking the areas.

Each Capacity and Opportunity indicator, C1.-3. and O1.-4., received a numeric evaluation from 0 to 1, where 0 represents the lowest score compared to the other areas, and 1 the strongest score. Furthermore, each indicator has a different weightage in the Capacity and Opportunity due to its relevance. The final evaluation can be found in Table 20: Capacity and Opportunity indicators, in the Annex.

The capacity of the different specialisation areas represents the current regional strengths in terms of technological and research capability, level of readiness and existence of key assets to support the prioritised area. Table 12 gives an overview of the 3 capacity indicators.

Table 12: Overview of Capacity Indicators

Capacity Indicator (Weight in %)	Definition	Context
C1. Technological Resources (40 %)	The specialisation areas are matched according to the Relative Technological Advantage (RTA) values for the 35 WIPO Patent categories in Ireland (see section 3.1.4). Each specialisation area has several relevant WIPO categories linked to it. (Figure 6)	National
C2. Advanced Technology (20 %)	A combination of both parameters C2.and C2.b resulting in an indicator that explores the advanced technology capacity in Ireland.	National
C2.an Advanced Technology - Generation	The specialisation areas are matched and evaluated according to the national level of technology generation country composite scores for each Advanced Technologies for Industry (ATI). Each specialisation area has several advanced technologies linked to it. (Figure 9)	National

C2.b Advanced Technology - Up-take	The specialisation areas are matched and evaluated according to the national level of technology uptake country composite scores for each Advanced Technologies for Industry (ATI). Each specialisation area has several advanced technologies linked to it. (Figure 10)	National
C3. Research and Development (R&D) (40 %)	The capacity of R&D is defined qualitatively according to the research efforts from institutes and the private sector in the Southern region.	Local

The opportunity of a specialisation area indicates the possibilities for future growth reflecting the market growth potential, and alignment with high-level strategies that can drive the areas of specialisation. They are used to find how policies, funding and trends can impact each of the specialisation areas. Table 13 gives an overview of the 4 opportunity indicators.

Table 13: Overview of Opportunity Indicators

Opportunity Indicator (Weight in %)	Definition	Level
O1.a European Union Policies and Strategy (20 %)	The European Union has several programmes and strategies supporting research and innovation. For this evaluation, Horizon Europe as the forefront of European Research and Innovation strategy and the New Green Deal as the driver of the European Policies has been considered.	European
O1.b Horizon Europe	Horizon Europe dictates the main agenda for the Research and development of the European Union. The priority areas have been mapped against the following 6 clusters of Pillar 2 "Global Challenges and European Industrial Competitiveness": 1. Health 2. Culture, Creativity, and Inclusive Societies 3. Civil Security for Society 4. Digital, Industry & Space 5. Climate, Energy & Mobility 6. Food, Bioeconomy, Natural Resources, Agriculture & Environment	European
O2.b European Green Deal	The European Green Deal is one of the key priorities of the European Union concerning policy and funding. Hence, the priority areas have been mapped against its eight main pillars. 1. Increasing the EU's climate ambition for 2030 and 2050 2. Supplying clean, affordable, and secure energy 3. Mobilising industry for a clean and circular economy 4. Building and renovating in an energy and resource-efficient way 5. A zero-pollution ambition for a toxic-free environment	European

	6. Preserving and restoring ecosystems and biodiversity 7. From 'Farm to Fork': a fair, healthy and environmentally friendly food system 8. Accelerating the shift to sustainable and smart mobility	
O3. Local Industry Units according to NACE Codes (20 %)	Evaluation of the specialisations areas considering the number of local industry units in the Southern Assembly Region according to the Statistical Classification of Economic Activities in the European Community usually referred to as NACE.	Local
O4. Global Market Growth (60 %)	Evaluation of each specialisation areas' global market growth in the current and upcoming years, identifying global growth opportunities in all the areas.	Global

Each of the 21 priority areas was graded based on the above-mentioned capacity and opportunity indicators. These have been plotted on the opportunity and capacity matrix in Figure 15. Each bubble represents a priority area and the size of the bubble the degree of linkage of the area with other identified priority areas. A bigger bubble such as **Applied IoT has an impact on most of the other priority areas considering its cross-sectoral nature** where a sector such as Sports tech with limited influence on the other areas is smaller in size.

Figure 15 - Capacity and Opportunity Prioritisation Graph

The priority areas higher up in the graph, indicate areas where the region presents strong technological capacity. For example, the significantly high scores for **Biopharmaceuticals and Pharmaceuticals 4.0 reflect the industry's strong R&D activities and the region's technological competitive advantage** evidenced in the analysis. Conversely, the areas at the bottom of the graph indicate the need to build such research and technological capabilities within the target industries. In this case, areas such as **Sustainable Finance and Creative Industries occupy a low position, given the lower research activity evidenced** compared to the other areas.

On the other hand, the areas on the far right indicate the greatest opportunities, where there is considerable potential for future growth. For example, **Efficient and Sustainable Industries represent the area that is most aligned with the EU's strategic objectives and can therefore benefit from the largest share of allocated funding**, as a consequence **Applied IoT has one of the highest projected market growth rates**. Conversely, areas on the far left indicate the need to create growth opportunities to compensate for low market growth rates or the lack of alignment with EU policies and strategies specifically targeted to these areas. This is the case with FilmTech. Despite representing a significant opportunity for specialisation - especially in the Midwest - **the FilmTech industry (like many other creative industries) has been hard hit by the COVID pandemic**, resulting in the lowest market growth rates compared to other areas.

The capacity and opportunity matrix give a good overview of the key priority areas in the region. However, owing to limited stakeholder consultation with the private sector and unavailability of data, the prioritisation is based on certain assumptions and indicative data. While some of the data was unavailable due to confidentiality reasons, there was a lack of consistency in some data sets (e.g., employment per specialisation area). As such, in the next stages of the EDP process, it is recommended to test the priority areas with the local innovation ecosystem, especially the private sector. The further definition and review of these priority areas should be driven by the private sector as part of the next steps of the EDP process.

The specialisation areas and their prioritisation give an indicative direction for concentrating resources and reaching out to the right stakeholders in the next steps of the EDP process. Table 20: Capacity and Opportunity indicators in the Annex gives the detailed results.

4 Methodology Framework

Adapted from the Guide to Research and Innovation Strategies for Smart Specialisations (2012), Implementing Smart Specialisation Strategies Handbook (2016) and EC's Smart Specialisation platform.

The smart specialisation policy focuses on the identification and further development of activities that are likely to effectively transform the existing economic structures through R&D and Innovation. The goal is to leverage the strengths and capabilities of the regional ecosystem by concentrating resources on the further development of these high potential activities to drive economic growth.

Active stakeholder interaction from strategy development to execution is what sets Smart Specialisation apart from other policymaking. The strategy builds on the belief that the knowledge and insights to pursue a Smart Specialisation is fragmented and distributed across the local innovation ecosystem (small and big companies across the value chain, research centres, universities, etc.). The **Entrepreneurial Discovery Process** is the defining element of the Smart Specialisation Strategy. The European Commission defines the EDP as *an inclusive and interactive bottom-up process in which participants from different environments (policy, business, academia, etc) are discovering and producing information about potential new activities, identifying potential opportunities that emerge through this interaction, while policymakers assess outcomes and ways to facilitate the realisation of this potential*.[34]

The EDP is cyclical in nature and should not be done only as an administrative exercise. The process kick starts with co-identification of priorities, followed by co-development of the transformation roadmaps for the priority areas and their implementation. Regular monitoring of the activities and programmes followed by an evaluation of the impact is an essential feedback loop. The process should be iterative, highlighting the need to reflect on the priority areas after an interval of time and update them to align with the changing market dynamics and regional ecosystem conditions.

Figure 16: The cycle of EDP Source: Implementing Smart Specialisation Strategies a Handbook

The Smart Specialisation work carried out under this project had a focus on identifying priority areas that have the potential to transform economic structures for the Southern Region based on a two-fold approach: a data-driven evidence-based approach through macro analysis of the regional economic and innovation data, complemented with local knowledge and experience through stakeholder interviews and workshops. As such the first step in the EDP journey was undertaken during the priority selection phase. However, the EDP goes beyond the prioritisation phase. The engagement of the stakeholders is essential across different stages of the strategy development and implementation to have a successful Smart Specialisation Approach.

---

[34]https://s3platform.jrc.ec.europa.eu/entrepreneurial-discovery-edp#:~:text=The%20EDP%20is%20an%20inclusive,this%20interaction%2C%20while%20policymakers%20assess

The following section highlights the major steps that need to be undertaken in the S3 development and the potential tools and practices that would inform the regional stakeholders in advancing the regional approach to Smart Specialisation Strategy (S3).

4.1   Priority Areas Identification

Smart Specialisation is a place-based approach, meaning that it builds on the assets and resources available to regions and on their specific socio-economic challenges to identify unique opportunities for development and growth. The strategy needs to be based on a sound analysis of the regional economy, society, and innovation structure, aiming at assessing both existing assets and prospects for future development. The common principle that is central to such analyses is the adoption of a wide view of innovation that spans across economic activities and involves many sectors of the civic society. The priority setting for regional smart specialisation should consist of the identification of a limited number of innovation and knowledge-based development priorities in line with existing or potential sectors for smart specialisation.

The following figure from the S3 platform gives an overview of the key aspects to be considered while defining regional priorities.
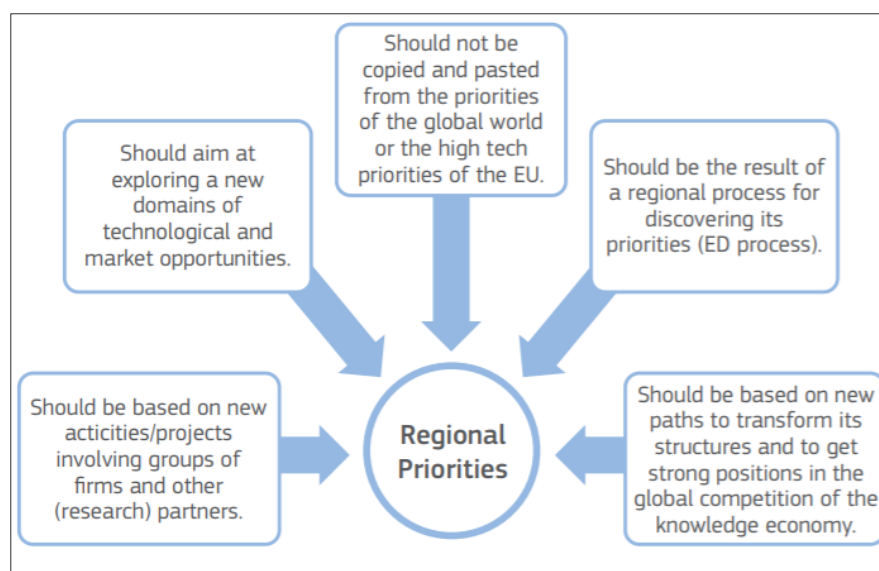
Figure 17: Regional Priorities Identification Source: S3 platform

The analysis should cover three main dimensions:

1. **Regional assets and capabilities:**
   The first step is to focus on the regional specific context:
   - assessing the existing assets (such as research infrastructure, skillset.)
   - evaluating major regional strengths and weaknesses
   - identifying any bottlenecks of the innovation system and
   - key challenges both for the economy and the society.

   Key technology competencies, R&D focus of the regional entities, the position of the companies in the sectoral value chain, research centres and facilities, workforce assets, etc. are useful indicatory for identifying regional strengths with local stakeholders.

   In addition, quantitative data such as the technology uptake potential and technology generation potential of enabling technologies, the critical mass and or potential within each sector need to be evaluated.

Suitable Tools & Methodologies: regional profiling studies, SWOT analysis, comprising key statistical analysis and qualitative assessment, expert assessments, stakeholder interviews and brainstorming workshops and targeted surveys.

2. **Dynamics of the entrepreneurial environment**

   An important step in defining the priority areas is to have a systematic understanding of the areas in the economy and society that have the greatest potential for future development, and that are ready to be tapped (or need to be encouraged and extracted). This includes analysis of the regional entrepreneurial environment, assessing whether it is lively and can generate a significant flow of entrepreneurial discoveries and what areas does the region need support in, and evaluating the diversification potential of these sectors.

   In addition, it also includes an analysis of the major trends globally in the sectoral strengths, potential market growth rates of new areas, complemented with the opportunities within the region.

   In addition, the analysis of the following quantitative data is especially useful to gather evidence on the economic differentiation of the region, highlighting regional strengths and competitive advantage.
   - No. of people employed in different industries within the region (based on NACE codes)
   - No. of entities (companies) focused on different NACE codes.
   - No. of patents in different sectors published by the regional innovators.

   Suitable Tools & Methodologies: Consultation with entrepreneurial actors such as innovation and cluster managers, entrepreneurs, workshops, and data analysis.

3. **Regional Benchmarking:**

   A major novelty of the smart specialisation approach is that a region must make its strategic decisions considering its position relative to other regions of Europe, which implies that the S3 approach requires looking beyond the regional administrative boundaries. This includes evaluating linkages with the rest of the world and the position of the region within the European and global economy.

   Figure 3 Error! Reference source not found. indicates the key regions within Europe structurally like the Southern Region and the relative performance of the region in comparison to these regions across different indicators. During the strategy development phase, the strategies and policies of the regions' leading in specific indicators could be evaluated in detail to learn from their experiences and best practices.

   Suitable Tools & Methodologies: Regional Benchmarking Tool on the S3 platform[35], comparative studies, engagement with other regions and interregional groups (the Thematic Platforms[36] on S3 platform could be used for this)

The three-step quantitative and qualitative analysis of the region helps in the identification of the right priority areas for the region based on an evidence-based approach. These areas are then prioritised as highlighted in section 3.3 and plotted in a capacity opportunity matrix to identify the areas that can be further developed in a particular iteration of the S3 Approach. This was done in its first iteration for the Southern Region as part of this work.

As highlighted in the methodology section earlier, the priority area identification was based on macro analysis of economic and innovation data from the region followed by consultation with

---

[35] https://s3platform.jrc.ec.europa.eu/regional-benchmarking
[36] https://s3platform.jrc.ec.europa.eu/thematic-platforms

key regional stakeholders to complement the quantitative analysis with regional expertise and insights.

4.2   Co-developing Transformation Roadmap

Setting the priority areas for the region is the first step towards developing the regional S3. Table 11 gives an overview of the identified priority areas for the region, the rationale for their selection and the key stakeholders to be involved. The next critical step for the Southern Region is to further define these areas with the local innovation ecosystem and develop individual transformation roadmaps, outlining activities and programmes to enable the transformation of priority areas that garner the most traction into economic strengths.

The EDP initiated between March – April 2021, will come into full force during the roadmap development process. A transformation roadmap details all the rules and tools that the Southern Region will need to reach the prioritized goals, and it should provide comprehensive and consistent information about strategic objectives, timeframes for implementation, identification of funding sources, and tentative budget allocation.

The transformation roadmaps build on the detailed SWOT Analysis conducted for the key sectors (Section 3.1) and the priority areas (Section 3.4). It is recommended to set up a working group for each of the priority areas that would co-develop the transformation roadmap. Based on experiences from other regions, it is useful to appoint coordinators for each priority area (when possible, from both the economic and academic worlds).

The following section highlights some of the main elements to be considered while developing the transformation roadmaps.

4.2.1   Governance

The EDP requires a 'collaborative leadership' dynamic to be in place for regional stakeholders to find their way to work together. One of the important roles of the public sector is to facilitate this collaboration by providing platforms and guiding structures that foster participation, transparency, independence, and integrated implementation. The role of these platforms is essential to ensure balance across competing interests and keep the dominance of particular sectors and lobbying in check.

The S3 governance model should encourage co-ownership and sharing of the strategy enabling collaborative leadership. The S3 platform recommends multi-level governance (MLG) models further supported by the findings of the work on the COHES3ION project which is focused on the improvement of S3 governance through the integration of a regional element. MLG encourages a move from the traditional top-down governance model to more network-like structures where-in hierarchies in decision-making are kept flexible enough to let each actor have a role and eventually take the lead in specific phases of the strategy, according to actors' characteristics, background, and capacities.

The COHES3Ion project results and the RSES governance model draws on collaboration with the sub-regional structures such as the Regional Enterprise Plans (REP's) and stakeholders such as the Local Authorities, enterprise agencies etc. The S3 governance model should encourage co-ownership and sharing of the strategy enabling collaborative leadership.

4.2.2   Shared Future Vision for the Region

A clear and shared regional vision for regional development plays a critical role in ensuring long term stakeholder engagement in the S3 Process. The Regional Spatial and Economic Strategy developed by the Southern Regional Assembly sets out the strategic regional development framework for the Region. The Smart Specialisation Strategy strongly aligns with the vision set out in the

RSES to achieve e economic prosperity, accommodate expanded growth, and make the Southern Region one of Europe's most creative, innovative, greenest, and liveable regions. The vision for the Southern Region's smart specialisation approach in the context of the RSES and concerning the national smart specialisation strategy should be defined with the regional innovation ecosystem.

4.2.3   Stakeholders

One of the initial steps in the roadmap development process is to build on the mapping done during the first stage to develop an inclusive and detailed map of all stakeholders concerning the priority areas shortlisted for the first iteration and bring them onboard the S3 Approach. It is important to note that EDPs are not exclusive and closed processes. There are inclusive and interactive processes and encourage active participation from a wide range of stakeholders.

The following list recommends stakeholders to be considered for each priority area. This is not an exhaustive list of stakeholders and additional stakeholders should be considered depending on the local context.

- **Entrepreneurial agents:** These are the key stakeholders in an ED Process. They include entrepreneurs, company representatives (indigenous SMEs and MNCs), public research institutes, higher education institutions, independent innovators).
- **Ecosystem managers:** These are stakeholders who are either from public or private sector organisations working as boundary spanners, in close collaboration with companies in the region, understanding their needs and supporting cross-sector collaboration, networking, and growth. These include cluster and hub managers, industry associations, regional skills fora, regional enterprise managers, incubation centres, etc. A successful S3 works with ecosystem managers to maximize knowledge spillover and cross-sector fertilisation and innovation.
- **Policy Makers and Leaders:** The policymakers are responsible for integrating the knowledge from the entrepreneurial agents and synthesize it into a coherent and tangible strategy.
- **Society:** The active involvement from broader society encourages an inclusive process to develop a more comprehensive knowledge base and creates a sense of local ownership of the process and strategy. This includes innovation users or demand-side and consumer groups, relevant non-profit organisations, etc.

Suitable Tools & Methodologies: There are several approaches in which stakeholders can be engaged and this would vary depending on the stage of the process, the type of stakeholder, and the resources available.

The following participatory models are recommended:

- setting up working groups or focus groups,
- the establishment of websites tailored for citizen participation and consultation
- stakeholder interviews
- co-creation workshops
- public-private committees survey
- innovation camps.

As mentioned in the introduction, the setting up of the working groups for each priority area is an important first step towards the transformation roadmap development.

4.2.4   Policy Instruments

The policy instruments are the key elements of the Smart Specialisation strategy that translate the vision into action. The policy instruments could fill gaps to promote emerging strengths or fine-tune existing policies to strengthen existing strengths.

- **Launching new strategic initiatives** which are bold actions that involve quadruple helix around an S3 priority domain.

- **Re-orienting existing programmes** by adding a new criterion dedicated to the 'contribution to the smart specialisation areas' in competitive programmes.
- **Updating stakeholders' strategic agendas** from existing operators through aligning actors to respond to S3 priorities.
- **Aligning infrastructure** to relate them with the S3 agenda.
- **Setting up S3 fora** by establishing platforms or for a gathering for the key actors of the S3 domains.

Figure 18: Categories of action for implementing S3 Source: S3 Handbook

Table 14: Examples of Policy Instruments

Examples of Policy Instruments for Smart Specialisation Approach
- Providing support for research equipment and infrastructure in public and private organisations.   - Supporting research and innovation in private sector organisations (e.g., innovation vouchers, prizes for inventions and discoveries, government-funded research grants, offering soft loans or low-interest rate loans, etc.)   - Support technology transfer by facilitating commercialisation of innovation (by removing existing roadblocks, supporting incubation programmes, removing red tape, Internationalisation support services)   - Creating platforms and mechanisms to facilitate intra- and inter-regional interactions (cluster, networks, and association formation)   - Providing key information about emerging technological and commercial opportunities   - Adopting innovation-oriented procurement from the public sector   - Providing Fiscal incentives (e.g.**,** tax benefits, tax rates reduction)   - Supporting Branding and marketing

The policy tools required by a region need to be identified through the ED process based on the inputs from the stakeholders in the region. They should be tailored measures focussed on tackling the main challenges faced by the entrepreneurial actors and incentivize them to grow in the specialisation areas.

Suitable tools & Methodologies: Pilot projects are one of the most useful tools for policy experimentation and allow testing unprecedented mixes of policy measures at a small scale, before deciding on implementation at a larger scale. They reduce risk and improve the effectiveness of the policy when evaluation mechanisms are integrated into the process. This enables tailoring of the policy mix to fit the regional requirements. The **Innovation Camp** is an excellent methodology that supports agile development and implementation through a quadruple helix collaborative co-creation process. These camps bring together key stakeholders from diverse backgrounds to conceive new projects, solutions, or interventions in an iterative process. A 2–3-day face to face camping event where ideation happens, is followed by a 6-week early prototyping phase to realise the ideas. The ideas that are suitable for further implementation are supported for full prototyping in the next 6 months while continuously testing and improving it. Successful ideas are upscaled for realisation across the region.

4.2.5   Monitoring and Evaluation Mechanism

The monitoring and evaluation mechanisms need to be integrated into the development of the transformation roadmap. The European Commission's *Implementing Smart Specialisation Strategies Handbook* lays out the importance of having an effective monitoring system in place to assess the following:

   i.   Whether expected changes are taking place, in what direction and with what intensity.
   ii.   How policy measures are contributing to those changes. Specific objectives and expected changes should be explicitly defined for each and all S3 priority areas.

The Handbook recommends therefore that the Key Performance Indicators (KPIs) used for monitoring and evaluation cover the following categories:

   i.   Output indicators (direct products of the policy interventions)
   ii.   Result indicators (socio-economic effects in the target groups)
   iii. Implementation indicators (actual state of policy implementation)
   iv. Structural Change & Specialisation indicators (absolute and relative changes taking place in the production systems comprised in each of the S3 areas)
   v.   Context indicators (competitiveness of regional economy)

Choosing indicators for monitoring such complex phenomena like innovation and specialisation can result in difficult to implement monitoring systems. Implementing a monitoring system that is easy to follow requires creating a system that is clear from the beginning on the S3 objectives, the policies created and the expected outcomes of these policies. Ideally, the indicators chosen are compatible with the strategic objectives of the Regional Spatial and Economic Strategy, whenever possible. The following tables recommend several indicators to choose from in each of the suggested KPI categories and connects them with the Regional Strategic Objectives. The indicators suggested skew quantitative but more qualitative indicators that should also be considered and can be measured with surveys include enhanced quality of life, ability to implement joint research and business projects and ability to participate in a global value chain with high added value.

Output indicators measure the type and level of direct output produced by funded projects. These are likely identifiable in the programmes contributing to the S3 actions and should be linked to specific policy measures.

Table 15 Output Indicators

Output Indicator	Regional Strategic Objectives
Companies financed	1. Compact Growth; 5. A Strong Economy
Companies involved	5. A Strong Economy
New companies	1. Compact Growth; 5. A Strong Economy
Patents filed	5. A Strong Economy
Total investment	1. Compact Growth; 5. A Strong Economy
Researchers employed	5. A Strong Economy
New jobs in R&D	5. A Strong Economy
Research laboratories financed	5. A Strong Economy
Research laboratories involved	5. A Strong Economy

Result indicators measure the degree of achievement of the socio-economic objectives of the S3 strategies. These may be identifiable in the contributing programmes or may need to be tailored to the specific objectives of each S3 priority by the strategy designer.

Table 16 Result Indicators

Result Indicator	Regional Strategic Objectives
Private R&D expenditure	5. A Strong Economy
Gross R&D expenditure	5. A Strong Economy
Labour market statistics	5. A Strong Economy
Number of new applicants/ beneficiaries in innovation projects	5. A Strong Economy
EU Regional Innovation Scoreboard	5. A Strong Economy
Sector-specific change of employment	5. A Strong Economy
Students in higher education in S3 domains	10. A Healthy and Learning Region; 11. Inclusive International Region
Export performance	5. A Strong Economy
Energy consumption	1. Compact Growth; 8. Low Carbon, Climate Resilient and Sustainable Society
GHG emissions from electricity	1. Compact Growth; 8. Low Carbon, Climate Resilient and Sustainable Society
Digitalisation of economy	2. Enhanced Regional Accessibility; 5. A Strong Economy; 6. High-Quality International Connectivity

Implementation indicators measure the actual state of implementation of the policies and related actions. These are likely identified already in the contributing programmes and should be defined for each policy measure.

Table 17 Implementation Indicators

Implementation Indicator	Regional Strategic Objective
Value of funds allocated (regional, national, EU)	5. A Strong Economy; 9. Sustainable Planned and Infrastructure-led Development
Type and amount of contributions paid by public entities into policy implementation and related actions	5. A Strong Economy
Value of accepted investments from outside investors into policy implementation and related actions	5. A Strong Economy
Projects approved	1. Compact Growth
Number and type of beneficiaries funded	5. A Strong Economy

Structural Change & Specialisation indicators measure the absolute and relative changes taking place in the production systems comprised in each of the S3 areas according to the trajectories and transitions foreseen in the strategy for each S3 priority and the whole economy. These likely need to be tailored by the strategy designer to each specific objective.

Table 18 Structural Change & Specialisation Indicators

Structural Change Indicator	Regional Strategic Objective
Patents per Specialisation Area (SA)	5. A Strong Economy
Change in number of inter-firm collaborations	5. A Strong Economy; 9. Sustainable, Planned and Infrastructure-led Development
Research grants in SA's	5. A Strong Economy
Number/value of research-business contracts per SA	5. A Strong Economy; 9. Sustainable, Planned and Infrastructure-led Development
Number/value of research-business contracts per SA as percentage of total	5. A Strong Economy; 9. Sustainable, Planned and Infrastructure-led Development
Number of innovative start-ups per SA	1. Compact Growth; 5. A Strong Economy
Number of innovative SMEs per SA	1. Compact Growth; 5. A Strong Economy
Degree of sectoral growth (companies, employees, turnover, investments, exports)	1. Compact Growth; 5. A Strong Economy

Context indicators provide a picture of the competitiveness of the regional economy, particularly in the areas of research and innovation and the production systems at large. These can likely be found in official statistical sources.

Table 19 Context Indicators

Context Indicator	Regional Strategic Objective
Labour force participation rate	5. A Strong Economy
Export growth rate	5. A Strong Economy
R&D activity	5. A Strong Economy
EU Regional innovation scoreboard	5. A Strong Economy

5 Conclusions & Next Steps

Developed through a stakeholder co-creation process and informed by an in-depth analysis of the macro-economic data for the region, this work has identified the economic strengths of the Southern Region and the potential priority areas for regional specialisation through an evidence-based approach. The identified priority areas build on the regional strengths and capabilities highlighted for each sector in the SWOT analysis and are aligned with the technological trends identified by the EU and emerging market needs. With a significant concentration of resources and support in these areas to the local ecosystem players, they have the potential to transform economic structures in the region.

Agri-food, Bioeconomy, High-Tech Manufacturing, Life Sciences, and International Financial Services have been identified as the key existing strengths of the region, whereas Digital Industries, Blue-Growth, Energy and Tourism show great growth potential. 21 cross-sectoral priority areas have been identified based on these sectoral strengths with potential for smart prioritization to be further explored through the national S3 consultation process being conducted by DETE. To exploit the full potential of these priority areas, the EDP kickstarted as part of this work needs to be extended further to engage a wider variety of stakeholders (entrepreneurial agents, ecosystem managers, policymakers and leaders, and society) from different disciplines across the region. The next critical step for the Southern Region is to further define the identified priority areas with the local innovation ecosystem and develop individual transformation roadmaps, outlining activities and programmes to enable the transformation of priority areas, which garner the most traction, into economic strengths.

To support effective development and implementation of the S3 strategy, the Southern Region needs to undertake the following crucial steps:

- Set a clear vision for the regional smart specialisation approach together with the local innovation ecosystem to align with the implementation of the Regional Spatial and Economic Strategy and the Smart Region work being carried out.
- A collaborative governance model needs to be set up to ensure continuous stakeholder engagement throughout strategy development and implementation.
- The regular monitoring of the activities and programmes followed by an evaluation of the impact needs to be set up as an essential feedback loop to monitor the effectiveness of the strategy.
- Smart Specialisation is an iterative process, wherein the priority areas need to be reviewed and updated regularly to align with the changing market dynamics and regional ecosystem conditions. This cyclical nature of Smart Specialisation needs to be built into the strategy during the development phase.

Additionally, the stakeholder consultation also indicated some common challenges across the different sectors in the region such as skills gap, difficulty in accessing funding for innovation, the collaboration between MNCs and SMEs, clustering, digitalisation know-how, etc. In combination with the development of the S3 strategy, the Southern Region needs to develop horizontal strategies that can address such common challenges to strengthen the local innovation ecosystem.

4.Annex

Table 20: Capacity and Opportunity indicators

| Priority Areas | Capacity | | | | | | Oportunity | | | | | | Total Ranking | Interrelation with other areas |
	C1. Technological Resources	C2. Advanced Technology	C2a. Advanced Tecnology - Generation	C2b. Advanced Tecnology - Adoption/Uptake	C3. Research & Innovation	Total Capacity	O1. European Union Policies and Strategy	O1a. Horizon Europe	O2a. European Green Deal	O3. Local Industry Units according to NACE Codes	O4. Global Market Growth	Total Opportunity		
Additive Manufacturing	0,59	0,12	0,20	0,16	1,00	0,67	0,34	0,53	0,14	0,33	1,00	0,73	0,70	4,00
Advanced transport & mobility systems	0,12	0,82	0,85	0,84	0,33	0,35	0,64	0,70	0,57	0,33	0,64	0,58	0,46	10,00
Applied IoT	0,23	0,76	0,90	0,83	0,67	0,52	0,77	0,96	0,57	0,66	0,95	0,85	0,69	14,00
Bio-based economy	0,35	0,04	0,19	0,12	1,00	0,56	0,96	0,92	1,00	1,00	0,52	0,70	0,63	5,00
Biopharmaceuticals and Pharmaceuticals 4.0	1,00	0,66	0,71	0,69	1,00	0,94	0,45	0,75	0,14	0,33	0,67	0,56	0,75	7,00
Blue Bioeconomy	0,60	0,09	0,19	0,14	0,66	0,53	0,56	0,55	0,57	0,66	0,06	0,28	0,41	6,00
Blue Energy	0,71	0,56	0,75	0,65	0,67	0,68	0,48	0,54	0,43	0,33	0,40	0,41	0,54	8,00
Creative Industries	0,15	0,34	0,41	0,38	0,33	0,27	0,19	0,38	0,00	1,00	0,00	0,24	0,25	6,00
Cybersecurity	0,52	0,45	0,41	0,43	0,33	0,43	0,50	0,36	0,14	1,00	0,62	0,67	0,55	8,00
Digital service sectors for smart regions	0,21	0,44	0,72	0,58	0,33	0,33	0,71	1,00	0,43	0,66	0,62	0,65	0,49	9,00
Efficient and Sustainable Manufacturing	0,74	0,03	0,13	0,08	0,33	0,44	0,75	0,92	0,57	1,00	0,92	0,90	0,67	6,00
Film-tech	0,15	0,76	0,90	0,83	0,33	0,36	0,00	0,00	0,00	0,33	0,00	0,07	0,21	6,00
Fin-Tech	0,60	0,61	0,58	0,60	0,33	0,49	0,15	0,32	0,14	0,33	0,88	0,63	0,56	5,00
Future sustainability & food tourism	0,42	0,00	0,00	0,00	0,33	0,30	0,54	0,22	0,86	1,00	0,24	0,45	0,37	11,00
Marine Technologies	0,69	0,37	0,42	0,39	0,67	0,62	0,75	0,92	0,57	1,00	0,56	0,69	0,65	8,00
Nutritional food & high-value ingredients	0,27	0,03	0,13	0,08	1,00	0,52	0,34	0,55	0,14	0,66	0,24	0,34	0,43	5,00
Precision Agriculture and Smart Farming	0,59	0,90	1,00	0,95	0,67	0,69	0,49	0,55	0,43	0,33	0,37	0,38	0,54	5,00
Sportstech	0,40	0,84	0,90	0,87	0,33	0,47	0,10	0,20	0,00	0,66	0,56	0,49	0,48	4,00
Sustainable Finance	0,00	0,61	0,58	0,60	0,33	0,25	0,23	0,32	0,14	0,33	0,52	0,43	0,34	10,00
Sustainable livestock management	0,21	0,42	0,56	0,49	0,67	0,45	0,44	0,17	0,71	0,33	0,61	0,52	0,48	6,00
Tech for tourism regeneration	0,19	0,58	0,85	0,71	0,33	0,35	0,09	0,04	0,14	1,00	0,09	0,27	0,31	9,00