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**Abstract**

The Analytical Country Reports analyse and assess in a structured manner the evolution of the national policy research and innovation in the perspective of the wider EU strategy and goals, with a particular focus on the performance of the national research and innovation (R&I) system, their broader policy mix and governance. The 2013 edition of the Country Reports highlight national policy and system developments occurring since late 2012 and assess, through dedicated sections:

- national progress in addressing Research and Innovation system challenges;
- national progress in addressing the 5 ERA priorities;
- the progress at Member State level towards achieving the Innovation Union;
- the status and relevant features of Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3);
- as far relevant, country Specific Research and Innovation (R&I) Recommendations.

Detailed annexes in tabular form provide access to country information in a concise and synthetic manner.

The reports were originally produced in December 2013, focusing on policy developments occurring over the preceding twelve months.

## ACKNOWLEDGMENTS AND FURTHER INFORMATION

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). [ERAWATCH](#) is a joint initiative of the European Commission's [Directorate General for Research and Innovation](#) and [Joint Research Centre](#).

The Country Report 2013 builds on and updates the 2012 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

The first draft of this report was produced in December 2013 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments and suggestions of Ruslan RAKHMATULLIN from JRC-IPTS. The contributions and comments from Pat Kelly, Department of Jobs, Enterprise and Innovation are also gratefully acknowledged.

The report is currently only published in electronic format and is available on the [ERAWATCH website](#). Comments on this report are welcome and should be addressed to [jrc-ipts-erawatch-helpdesk@ec.europa.eu](mailto:jrc-ipts-erawatch-helpdesk@ec.europa.eu).

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## EXECUTIVE SUMMARY

Ireland is one of the smaller EU Member States having a population in 2013 of 4.593m with just under 1% of the total EU28 population.

In December 2013, Ireland exited the €67.5bn Economic Adjustment Programme organised by the EU, the euro area Member States and the International Monetary Fund which had been put in place three years previously as a result of the economic and financial crisis.

Ireland's economy is showing signs of making a slow recovery from the negative Gross Domestic Product (GDP) growth rates experienced during the period 2009–2010; in 2012, the rate of growth in GDP was 0.2% which compares favourably with the EU28 average GDP growth rate of -0.4 per cent.

Gross expenditure on R&D (GERD) rose from €2.735 bn in 2009 to an estimated €2.826 bn in 2012, an increase of €91 m or 3.3%.

Ireland's research intensity (GERD as a percentage of GDP) which had increased strongly during the period 2000–2010 saw its growth rate fall off considerably. The research intensity rate rose fractionally from 1.69% in 2010 to 1.72% in 2012 and compares unfavourably with the estimated EU28 average for 2012 of 2.06%. Ireland's national R&D investment target is to raise combined public and private investment levels to 2.5% of GNP (approximately equivalent to 2.0% of GDP) by 2020.

GERD per capita, on the other hand, rose from €605 in 2009 to €617 in 2012, comfortably exceeding the EU28 estimated average figure of €525.8 in 2012.

The constraints on Exchequer resources has resulted in Government Budget Appropriations or Outlays on R&D (GBAORD) falling from €898m in 2009 to an estimated €760m in 2012. Ireland's GBAORD intensity rate in 2012 was estimated at 0.46% which is below the EU27 average of 0.65% and very significantly below that of other EU Member States of similar size and technological sophistication (Finland: 1.03% and Denmark: 1.01%).

The business enterprise sector is the largest performer of research in Ireland and accounts for just under 70% of GERD in 2012. The second largest group of research performers was the HEI sector at 26% with the Public Research Organisations accounting for the balance of 5 per cent.

Within the business enterprise sector, the multinational companies, predominantly in high tech sectors such as ICT and Life Sciences, are the major research performers accounting for 71% of BERD while indigenous enterprises largely based in low and medium tech sectors account for the balance. The seven universities are responsible for virtually all of research carried out in the HEI sector.

From a political perspective, the R&I policy agenda is set by the Cabinet and in particular, the Cabinet sub-committee on Economic Recovery and Jobs. Reporting to it are two committees which are responsible for overseeing the implementation of R&I policies: the Inter-departmental Committee on Science, Technology and the Prioritisation Action Group (PAG).

R&I policy formation in Ireland is highly centralised with the regions having little or no involvement.

The two main research funding Government ministries are the Department of Jobs, Enterprise and Innovation and the Department of Education and Skills. The main research funding bodies are Science Foundation Ireland, Enterprise Ireland and IDA Ireland which are under the aegis of the Department of Jobs, Enterprise and Innovation and the Higher Education Authority and the Irish Research Council which are under the aegis of the Department of Education and Skills.

The R&I policy advice infrastructure is a state of transition with the planned abolition of Forfás, the national policy advisory board for enterprise, trade, science, technology and innovation, in 2014 and the integration of its policy research functions into a new Strategic Policy Division within the Department of Jobs, Enterprise and Innovation. The Advisory Council for Science, Technology and Innovation was stood down in 2013 as it is a sub-board of Forfás.

From a R&I policy perspective, the main focus is on the implementation of the national research prioritisation strategy which seeks to prioritise competitive State funding in 14 priority areas and in 6 science and technology platform areas, deemed to have the greatest potential for economic development and job creation. The PAG which is headed by the Minister for Research and Innovation and comprises the main research funders and public sector performers is responsible for overseeing the research prioritisation strategy. During 2013, the Government published a framework for monitoring public investment in science, technology and innovation, comprising a series of metrics and targets, as well as Action Plans for each of the 14 Priority Areas.

Ireland joined the Smart Specialisation Strategy (S3) platform in 2013, and work has commenced to identify whether the processes used to formulate the research prioritisation strategy could form the basis of a national S3 strategy.

The main challenges faced by the R&I system include the following: the dual nature of the enterprise sector; low levels of formal collaboration; low absorptive capacity of indigenous SMEs; lack of clarity and inconsistency of the national Intellectual Protection (IP) regime; and insufficient early-stage venture capital funding.

The policy response to these challenges include enhancing the R&D tax credit, the development of research funding supports facilitating the development of industry-led research networks involving higher education institutions, the implementation of the new Intellectual Property Protocol and technology transfer infrastructures, including the newly established central Technology Transfer Office (cTTO) and the creation of a seed and venture capital market.

The *Innovation Union Scoreboard 2013* report classified Ireland as belonging to a group of EU Member States known as Innovation Followers i.e. showing a performance above or close to that of the EU27 average. The report noted that Ireland's growth performance during the period 2008-2012 was higher than average for countries in the Innovation Followers category. It said that Ireland had strengths in two areas, Economic effects and Human resources, and had relative weaknesses in the area of Finance and support.

Ireland is making progress towards the realisation of the European Research Area (ERA) and the research prioritisation strategy is the main focus of policy efforts to develop a more effective national R&I system. Other national policies that impact on ERA include support for an open labour market for researchers and promoting open access to research.

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# 1. BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

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Ireland is a unitary state and is divided into two NUTS II regions for Structural Funds planning purposes: the Southern and Eastern Region (S&E) and the Border, Midlands and Western Region (BMW). Two regional assemblies, the S&E and the BMW Regional Assemblies, are the managing authorities for regional Operational Programmes.

STI policy is highly centralised in Ireland; the regions have no involvement in policy formulation and their implementation role in relation to STI policies is limited.

## **Research and innovation policy**

Ireland is a relatively late-comer to research and innovation policies; the first White Paper on Science, Technology and Innovation was published in 1996. Investment in research and innovation (R&I) grew slowly with the EU Framework Programmes and Structural Funds being an early and important funding source for Irish researchers.

Two major R&I developments took place during the late 1990s:

- The first was a technology foresight exercise which resulted in a government decision to fund research in two broad thematic areas: biotechnology and ICT;
- The second was the launch of the Programme for Research in Third Level Institutions (PRTL) which provided funding for research infrastructures in the higher education institutions.

The net effect of both factors was a substantial increase in research funding provision to the higher education sector from 1999 onwards. The HE sector has been the main vehicle for publicly-funded research in Ireland, and as a corollary, Ireland has a relatively small number of Public Research Organisations compared to other EU Member States.

In 2006, the Government launched the *Strategy for Science, Technology and Innovation 2006-2013* (SSTI) which set out Ireland's ambitions to be a leading knowledge economy and specified targets in relation to the number of PhDs trained. This was followed two years later by the policy framework document, *Building Ireland's Smart Economy: A Framework for Sustainable Economic Renewal* (2008), which highlighted the need to re-prioritise policies to stimulate the economy including an emphasis on investing in research and development and building the innovation or 'ideas' component of the economy through the utilisation of human capital.

Prompted by the economic crisis, in March 2012, the Government launched its Research Prioritisation Action Plan with the aim of focusing the State's expenditure on scientific research

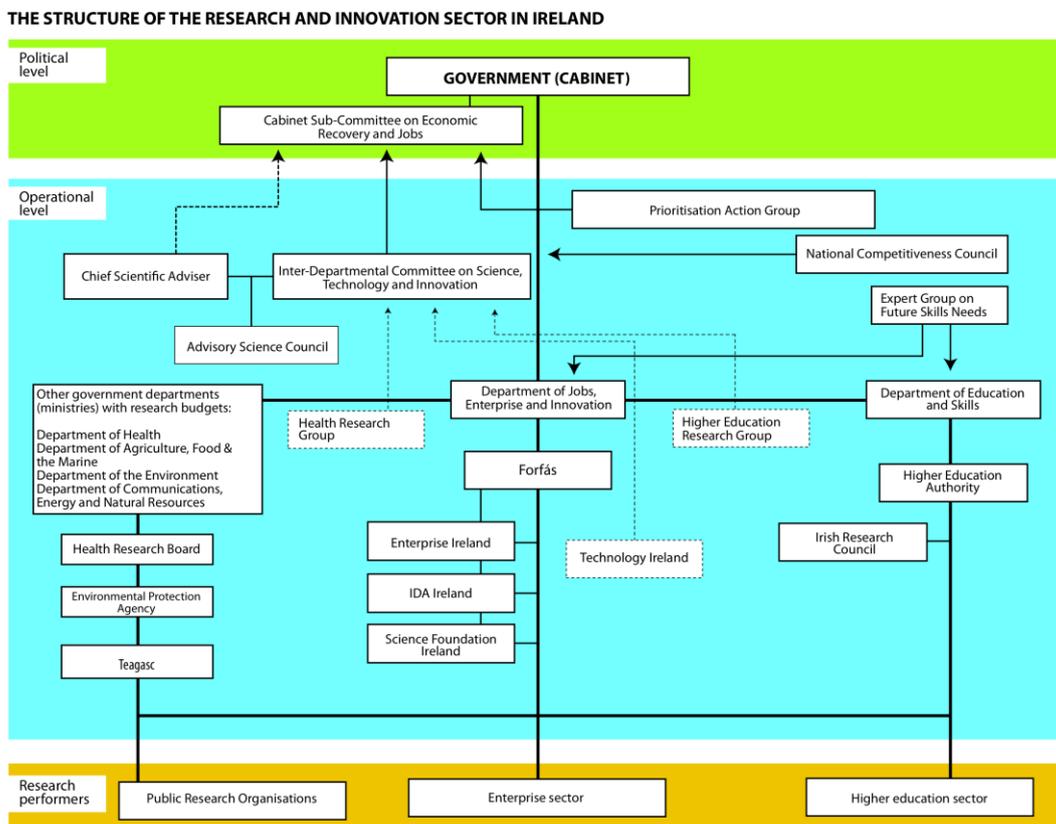
on 14 priority areas and six science and technology platform areas, deemed to have the greatest potential for economic development and job creation.

The overarching national R&I goal is to promote excellent research and innovation in priority areas for maximum economic and societal impact by:

- Contributing to sustainable economic growth;
- Protecting and increasing employment;
- Addressing societal challenges.

### R&I policy governance

From a political perspective, the Cabinet and in particular, the Cabinet sub-committee on Economic Recovery and Jobs, sets the R&I policy agenda (see organigram below).



(Source: Official Government documents and interviews with government officials)

The Inter-Departmental Committee on Science, Technology and Innovation is responsible for overseeing the implementation of research policies, primarily the SSTI. It is composed of senior officials from the ministries having a significant research budget. A new body, the Prioritisation Action Group, was established to implement Research Prioritisation. The PAG which is chaired by the Minister for Research and Innovation comprises those Departments that are members of

the Inter-Departmental Committee on Science, Technology and Innovation in addition to the relevant funding agencies under the remit of those Departments. The PAG reports to the Cabinet sub-committee on Economic Recovery and Jobs.

The research and innovation policy-setting system in Ireland is highly centralised; there are no regional R&I policies. The two main Government departments (ministries) responsible for research and innovation are the Department of Jobs, Enterprise and Innovation and the Department of Education and Skills.

There have been changes in the composition of advisory bodies: Forfás, the policy advisory board for enterprise, trade, science, technology and innovation, is being abolished and its strategic policy functions are being integrated into its parent ministry, the Department of Jobs, Enterprise and Innovation. The abolition of Forfás will have implications for the future of the Science Advisory Council which was established in 2005 to provide advice on S&T issues to Government. Its membership was stood down in September 2013 as the Council is a sub-board of Forfás.

### **Research performers**

The two main research performing sectors are the HEI and business enterprise sector which account for over 95% of the research performed in 2012; the Public Research Organisation sector is small by EU28 standards accounts for the balance.

Within the HEI sector, the seven universities are the dominant players accounting for 98% of research expenditures in 2010–2011<sup>1</sup>. Multinational companies account for 71% of the research performed in the business enterprise sector. The attraction of foreign direct investment has been a significant feature of Irish industrial development policy since the 1960s and in recent years there has been a shift in emphasis in Irish FDI policy towards attracting projects with an R&D component. IDA Ireland, the State agency responsible for attracting FDI projects to Ireland, estimates that 40% of new investment projects have an R&D element.

In 2011, there were over 19,000 research personnel in the business enterprise sector, a 21 per cent increase since 2009, and more than 14,000 full time equivalents (FTEs).

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<sup>1</sup> Laffan, B. (2013), Institutes of technology not ready for university status: Research gulf divides higher education, *The Irish Times*, September 11, 2013. Available from: <http://www.irishtimes.com/news/education/institutes-of-technology-not-ready-for-university-status-1.1522709>

## 2. RECENT DEVELOPMENTS IN THE RESEARCH AND INNOVATION POLICY AND SYSTEM

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### 2.1 National economic and political context

Ireland had been participating in a joint economic support programme, *Economic Adjustment Programme for Ireland*, involving the European Commission, the euro area Member States and the International Monetary Fund since December 2010, the purpose of which was to return the Irish economy to sustainable growth and to ensure that Ireland has a properly functioning healthy banking system. Having achieved the targets set by the troika to date, Ireland exited the programme in December 2013. As a consequence of the implementation of the programme, there had been reductions in Government expenditure which impacted on the availability of public funds for research. Government Budget Appropriations or Outlays on R&D (GBAORD) decreased from €898m in 2009 to €760m in 2012.

During the first six months of 2013, Ireland held the EU presidency and helped, inter alia, to secure agreement on a budget of €79bn for research and innovation under the Horizon 2020 initiative. The agreement of funding for Horizon 2020 was a central goal of the Irish presidency's designated theme of jobs and growth.

### 2.2 Funding trends

#### 2.2.1 Funding flows

Ireland's national R&D investment target as set out in the *National Reform Programme — 2013 Update* is to raise combined public and private investment levels to 2.5% of GNP (approximately equivalent to 2.0% of GDP) by 2020.

GERD as a percentage of GDP increased marginally between 2009–2012; in 2009, GERD as a % of GDP stood at 1.69% and it was 1.72% in 2012 (see Table 1 below). The 2012 figure was lower than the EU28 estimated average of 2.06%. GERD per capita rose from €605 in 2009 to €617 in 2012, comfortably exceeding the EU28 estimated average figure of €525.8 in 2012.

The impact on reductions in the Exchequer funding as a result of the economic crisis could be seen in the reduction in GBAORD. The Forfás *State Investment in Research and Development 2012–2013*<sup>2</sup> report noted that Ireland's GBAORD intensity rate for 2012 of 0.57% of GNP and 0.46% of GDP was below the EU27 average of 0.65%. Science Foundation Ireland pointed out in its *Agenda 2020 — 2013 Review* that Ireland's GBAORD intensity rate was very significantly below

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<sup>2</sup> Forfás (2013), *State Investment in Research and Development 2012–2013*. Available from: <http://www.forfas.ie/publications/2013/title,11442,en.php>

that of other EU Member States of similar size and technological sophistication (Finland 1.03%, Denmark 1.01%, Austria 0.8%).

There were no major changes in the R&D performed by the three major research performing sectors (Government, Business enterprise and HEIs) as a percentage of GERD. The Business enterprise sector accounted for just under 70% of the research performed in 2012, followed by the HEI sector at 25.9% and the PRO sector at 4.7%.

Business enterprise funding for R&D declined from €1.4bn in 2009 to an estimated €1.374bn in 2012, a decline of €50m. Government funding provision for R&D, on the other hand, increased during the same period, from €815m in 2009 to an estimated €842m in 2012. Funding from abroad for R&D — mainly from the EU — also increased: from €451m in 2009 to an estimated €577 in 2009.

**Table 1. Basic indicators for R&D investments**

	2009	2010	2011	2012	EU28 (2012)
GDP growth rate	-5.5	-1.0	2.2	0.2	-0.4
GERD (% of GDP)	1.69	1.69	1.66	1.72	2.06(e)
GERD (euro per capita)	605	587	590	617	525.8(e)
GBAORD - Total R&D appropriations (€ million)	898	838	795	760	86309.497
R&D funded by Business Enterprise Sector (% of GDP)	1.15	1.16	1.14	1.2 (e)	1.12 (2011)
R&D performed by HEIs (% of GERD)	26.7	26.6	26.1	25.9	24.0
R&D performed by Government Sector (% of GERD)	5.0	4.8	4.9	4.7	12.0
R&D performed by Business Enterprise Sector (% of GERD)	68.3	68.6	69.0	69.4	63.0
Share of competitive vs. institutional public funding for R&D	n.a.	n.a.	n.a.	n.a	—
Venture Capital as % of GDP	0.135	0.110	0.258	0.118	0.03 (EU15) (2011)
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	33.6	33.7	33.8	—	38.9 (2011)
Employment in knowledge-intensive service sectors as share of total employment	6.0	5.8	5.8	—	5.6 (2011)
Turnover from Innovation as % of total turnover	11.8 (2008)				13.3 (2008) (EU15)

(Source: Eurostat)

The available data for Venture Capital as a percentage of GDP indicate a fluctuating picture for Ireland, ranging from a high of 0.258% in 2011 to 0.118% in 2012; in any case, the Irish figure far exceeds the EU15 average of 0.03% for 2011.

Irish employment in high- and medium-high technology manufacturing sectors and in knowledge-intensive sectors as a share of total employment are broadly similar to EU averages.

## 2.2.2 Funding mechanisms

### 2.2.2.1. Competitive vs. institutional public funding

Though no official data is available to specify the amount of competitive versus institutional public funding for research and development, the available information suggests that the trend is towards increased provision of competitive-based funding. An analysis of data published by Forfás indicates that almost €366.5m of total GBAORD funding of €760m in 2012 was disbursed through competitive project-based funding programmes of which Science Foundation Ireland accounted for €162m.

The Forfás *Survey of Research and Development in the Higher Education Sector 2010/2011*<sup>13</sup> publication notes that indirect government funding for the HEI sector is mainly derived from the proportion of the Higher Education Authority's block grant dedicated to R&D. The Forfás document reported that while indirect government funding for the sector was roughly on a par with, or higher than, direct funding up to 2006, in the two-year period between 2008 and 2010 it decreased by 32.4 per cent to €148m, the lowest it had been since 2002. Eurostat data indicate that the level of General University Funding fell even further since 2010 and the estimated figure for 2012 is €114m.

The block grant provided to HEIs is intended to cover core teaching and research activities within institutions — the internal allocation of funds as between teaching and research is at present a matter for each institution. The allocation of the block grant is determined on a formula basis. The allocation is based on a standard per capita amount in respect of weighted EU student numbers in four broad subject price groups. Student numbers in the four groups are weighted to reflect the relative cost of the subject groups. A further weighting is given for research students. 5% is also top-sliced from the aggregate grant for all higher education institutions.

Funding for PROs is normally determined on the basis of annual negotiations between research organisations and their parent ministry.

### 2.2.2.2. Government direct vs indirect R&D funding

Eurostat data indicate that total direct Government funding for R&D has increased from €631m in 2009 to €728m in 2012.

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<sup>13</sup> Forfás (2013), *Survey of Research and Development in the Higher Education Sector 2010/2011*. Available from: <http://www.forfas.ie/publications/2013/title,11441,en.php>

The use of tax incentives for the business enterprise sector has increased in importance. A review of Ireland's R&D tax credit scheme<sup>4</sup> was published by the Minister for Finance in October 2013, indicated that it had been a significant driver for increasing R&D expenditure over the period 2004–2013. The number of companies benefiting from the credit had increased from less than 75 in 2004 to almost 1,500 in 2011. The annual cost of the scheme is estimated to have risen from €71 million to approximately €261 million over the same period. The review made a number of recommendations which the Minister for Finance said he would be implementing in relation to the outsourcing of R&D, qualifying expenditure in relation to the base year and the key employee provision.

### **2.2.3 Thematic versus generic funding**

The national research prioritisation strategy which was published in March 2012 and is in the process of being implemented recommended that Government funding for R&D should be focused on 14 priority areas and six science and technology platforms that underpin these priority areas.

The new prioritisation strategy does not apply to the block grant provided to higher education institutions which supports research or to funding to in-company performed R&D.

There had previously been a strong focus within the Irish STI system on sectoral policies. As an example, Science Foundation Ireland, one of the largest providers of research funding to the HEI sector and which accounted for 20% of the Government's spending on R&D in 2013, focuses on three key areas: ICT, biotechnology and sustainable energy.

An analysis of estimated GBAORD expenditures for 2013 indicates that industrial production and technology accounted for €170m out of a total GBAOARD spend of €773m. Agriculture and Health were the next two largest sectoral areas of expenditure with funding of €98.3m and €46.2m respectively.

### **2.2.4 Innovation funding**

Obtaining data on the amount of innovation funding in Ireland is problematic; there are difficulties in disaggregating funding for innovation from overall RTDI funding provision. Even those support measures that have the word 'innovation' in their title may also fund projects that incorporate a R&D component. An analysis of strategy documents and available data indicates, however, a shift from the provision of funding for basic research to a greater emphasis on the funding of market-focused/innovation-related projects.

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<sup>4</sup> Department of Finance (2013), *Review of Ireland's Research and Development (R&D) Tax Credit 2013*. Available from: <http://budget.gov.ie/Budgets/2014/Documents/Department%20of%20Finance%20Review%20of%20R&D%20Tax%20Credit%202013.pdf>

The 2012 Community Innovation Survey contains questions on expenditures by respondent enterprises on innovation activities. The results of this Survey, when published, may provide a valuable source of information on innovation expenditures by Irish enterprises. Respondents were asked to specify if they had received public financial supports for innovation activities from local/regional authorities, Central Government and/or the EU; they were not asked though to indicate the amount of financial support received.

## **2.3 Research and innovation system changes**

The membership of the Advisory Council on Science Technology and Innovation (ACSTI), which provides policy advice to the Government on science, technology and innovation, was stood down in September 2013. The future of the Council is being considered in the context of the integration of Forfás, of which ACSTI is a sub-board, with the Department of Jobs, Enterprise and Innovation.

Legislation to permit Science Foundation Ireland (SFI) to fund applied research and to extend its sectoral/thematic funding remit to include the 14 areas identified under the research prioritisation strategy was signed into law in October 2013. The law, Industrial Development (Science Foundation Ireland) (Amendment) Act 2013, also includes a new function to enable SFI to promote and support awareness and understanding of science, technology, engineering and mathematics. Additionally, the new law will allow SFI to provide funding to research groups based in Northern Ireland and also to enable participation by SFI in international funding programmes. Previously SFI did not have the power to fund research groups outside the State.

The Prioritisation Action Group which was formed in 2012 to oversee the implementation of the research prioritisation strategy, has appointed champions to six key thematic areas (food, ICT, health, energy, manufacturing, and services/business processes) to ensure communications and consistency among the stakeholders charged with the operational execution of the strategy. The champions are members of PAG and were closely involved in the development of the Action Plans for the 14 priority areas.

National support structures were established to help Irish organisations to access funding under FP7; a review is under way to establish what supports will be needed to help Irish public and private sector organisations to tap into Horizon 2020 programme funding. The Minister for Research and Innovation has stated that Ireland will target up to €1.25bn in research and technology funding under the new €79bn programme.

## **2.4 Recent Policy developments**

The Government in July 2013 approved a series of metrics and targets in order to monitor the impact of state investment in science, technology and innovation, in line with the national research prioritisation strategy. The development of these metrics was a key recommendation of the high-level steering group set up to initiate the research prioritisation strategy. The steering

group had recommended a framework of metrics and targets with a view to firstly, monitoring the impact of public STI investment in broad terms, and secondly, monitoring the impact of the implementation of research prioritisation in the 14 priority areas. The framework comprises three levels of targets – overarching national targets; departmental [ministry]/agency-level targets; and priority area targets. The targets are underpinned by a wide range of 79 monitoring metrics covering the enterprise support environment, including inputs, outputs and outcomes. The metrics will be monitored annually and the Prioritisation Action Group will be responsible for their monitoring.

The Government also approved the publication of individual Action Plans on each of 14 priority areas of research identified by the research prioritisation steering group as showing the greatest opportunity in terms of supporting jobs. The Action Plans represent the detailed blueprint for actions to be taken by funding Ministries and agencies to re-align the majority of competitive public research funding around the priority areas over the next five years. Each Action Plan includes a vision, key objectives and specific actions along with timelines and those responsible for leading and supporting delivery of the action.

One of the key aims of the research prioritisation strategy is to reduce the fragmentation and lack of cohesion of public research funding provision. One outcome of the strategy was the announcement in February 2013 that Science Foundation Ireland and Teagasc, the agriculture and food development authority, had signed a Memorandum of Understanding to jointly fund research in the agri-food sector which employs 150,000 people.

In line with the 2012 report of Advisory Council for Science, Technology and Innovation, Sustainability of Research Centres, which recommended that public funding for research should be concentrated on a smaller number of large-scale research centres, the Government announced in February 2013 that it was allocating €200m to Science Foundation Ireland (SFI) to fund the establishment of seven large research centres under SFI's Research Centres programme. Private sector companies will provide an additional €100m in funding for the research centres which will target major societal challenges including health and energy.

The research centres funded under this initiative are closely aligned with the priority areas included in the research prioritisation strategy and with the thematic areas to be addressed in Horizon 2020.

New Technology Centres were established in 2013 in the areas of Connected Health, Data Analytics and Pharmaceutical Manufacturing. Work is ongoing for initiatives in Medical Devices and Dairy Processing. The Programme for Government highlighted the need for companies to be made aware of the research expertise within the HEI sector with the aim of generating innovative technologies leading to job creation. The Technology Centres though based in higher education institutions and staffed by academic researchers are collaborative entities established and led by industry.

In 2012, the Government approved a new Intellectual Property (IP) protocol which seeks to encourage industry to collaborate with higher education institutions and public research performing organisations to access and commercialise the IP generated. A new Central

Technology Transfer Office (cTTO) was established in Enterprise Ireland, the agency responsible for the development of indigenous industry, to facilitate the access by industry to the resources in the HEI and PRO sectors. A director of the cTTO was appointed in 2013 to oversee the implementation of the new structures to encourage industry-HEI collaboration and IP transfer.

In 2013, the Higher Education Authority, which is responsible for policy development in the higher education sector, published national guidelines for access by research centres to research infrastructures hosted by higher education institutions and other research bodies in Ireland. Previously there had been no nationally accepted set of guidelines in place governing access to items of research infrastructure hosted within publicly funded institutions. The new guidelines set out for the first time a set of agreed rules that would apply, where practical, to all items of research infrastructure within these institutions. The guidelines state, for example, that where practical, all research infrastructure in publically-funded higher education institutions and other research bodies, including existing infrastructure supported wholly or in part by Exchequer resources, should be available for use by other researchers regardless of which HEI or other research body hosts it.

December 2013 marks the end of the period covered by the Strategy for Science, Technology and Innovation 2006-2013 and as of yet there has been no announcement of any overarching research and innovation strategy to succeed it. The main research and innovation policy focus is on the implementation of the research prioritisation strategy with particular emphasis on maximising the economic return of the State's investment in research.

## **2.5 National Reform Programme 2013**

The National Reform Programme for Ireland — 2013 Update under the Europe 2020 Strategy reviewed Irish research and innovation policies and performance.

The National Reform Programme (NRP) document noted that Ireland's headline target is to improve the conditions for research and development, in particular with the aim of raising combined public and private investment levels in this sector to 2.5% of GNP (approximately equivalent to 2.0% of GDP).

The document made observations in relation to following specific aspects of Irish R&D policies:

- **Research prioritisation strategy:** It noted the formation of the Prioritisation Action Group (PAG) as a vehicle for implementing the research prioritisation strategy. The NRP document highlighted that the Group brings together senior officials from the ten state agencies funding research, as well as nine Government Departments. It noted that a key objective of the PAG was to achieve greater coherence and cooperation between these bodies in relation to research investment and the 14 Priority Areas;
- **Tax incentives for R&D investment:** The NRP document outlined that the primary purpose of the R&D tax credit scheme was to encourage additional business expenditure

on research and development (BERD) by foreign owned and indigenous firms. It indicated that since the introduction of the R&D tax credit, there had been a significant increase in BERD and in the use of the R&D tax credit. The document also noted that the decision by the Irish Government in Budget 2013 to review the R&D tax credit scheme, the objective of which was to ensure that the scheme remained 'best-in-class' internationally as well as representing value for money for taxpayers;

- Mathematics and science literacy: The National Reform Programme document reviewed initiatives to encourage greater participation by second level students in science, technology, engineering and mathematics disciplines and noted an initiative by higher education institutions to award higher bonus points for students taking higher level mathematics at second level;
- National Intellectual Property Protocol and associated structures: The NRP reviewed the new national IP protocol announced in 2012 and described the practical arrangement to facilitate the access by industry to publicly-funded research;
- Further measures to support commercialisation of research and cross-border collaboration: The NRP document outlined the proposed legislation to extend the legal remit of Science Foundation Ireland to include applied research and also to fund on a wider geographic basis, including supporting research teams and institutions in Northern Ireland. SFI will also, subject to the consent of the Minister for Jobs, Enterprise and Innovation, look to participate in collaborative funding programmes with countries of the European Economic Area or other countries.

The NRP document also reviewed linkages between actions and policies in key target policy areas and noted that each target area are not mutually exclusive but are applied in a multifunctional context in order to support and reinforce the other targets. It highlighted, for example, the achievement of education targets while simultaneously ensuring a sufficient supply of science, mathematics and technology graduates to meet the skills requirements for the achievement of the R&D target and employment objectives.

## **2.6 Recent evaluations, consultations, foresight exercises**

In 2011, Forfás, the policy advisory board, developed a new framework for evaluating enterprise supports that takes account of best international practice. It has used this framework to evaluate national research and innovation programme supports. These evaluations have now been completed and the results are anticipated to be published by the Department of Jobs, Enterprise and Innovation before the end of 2013.

The Government announced in Budget 2013 that it would review the R&D Tax Credit scheme and the Terms of Reference for the study were published in February 2013. The objectives of the review are to ensure that the R&D tax credit scheme remains 'best-in-class' internationally as well as representing value for money for taxpayers. As noted in Section 2.2.2 above, the results of the review indicated that the annual cost of the scheme is estimated to have risen from €71

million in 2004 to approximately €261 million in 2011. The number of companies benefiting from the credit increased from less than 75 in 2004 to almost 1,500 in 2011.

The Department of Jobs, Enterprise and Innovation has published the results of an evaluation of the Micro-enterprise Loan Fund which provides access to credit for microenterprises and facilitate the growth and expansion of viable businesses with less than 10 employees from all industry sectors across the country, which have been refused access to credit from financial institutions. The results indicate that between October 2012 to 31<sup>st</sup> January 2014, a total of €2.259m value of loans were approved for 137 micro-enterprises.<sup>5</sup>

An extensive consultation exercise was held with key stakeholders following the development of Action Plans for the 14 priority areas under the research prioritisation exercise. The Action Plans were approved by the Government in July 2013.

## **2.7 Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)**

Ireland joined the Smart Specialisation Strategy (S3) platform in October 2013 though no Irish NUTS 2 region is associated with the platform. Neither does Ireland have a Smart Specialisation Strategy. However, the Government is positioning its National Research Prioritisation Exercise (NRPE) — which it commenced in 2010 — as the basis for its Smart Specialisation Strategy. The report of the high-level steering group established to oversee the NPPE was published in March 2012 and forms the basis of the Government's research prioritisation strategy.

Forfás has outlined the main stages of the process underpinning the NPPE and notes their similarity with the S3 framework<sup>6</sup>:

- Considerable emphasis placed on defining a set of criteria to help bring objectivity and consistency to the exercise;
- The establishment of four key criteria for assessing and evaluating proposed priority areas;
- The gathering of a substantial body of evidence for each of the criteria concerned by undertaking detailed studies, by consulting with industry and the research community and drawing on relevant expertise for each of the areas being put forward for evaluation;
- Continuously reviewing with Government departments [ministries] and agencies responsible for research and development in the science and technology area, what was currently happening;

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<sup>5</sup> Microfinance Ireland (2014), *Microfinance Ireland Microenterprise Loan Fund Scheme for the period 1st October 2012 to 31st December 2013*, Dublin, Ireland. Available from: <http://microfinanceireland.ie/>

<sup>6</sup> See: Speech by Mr. Martin Shanahan, Chief Executive of Forfás, at EuroScience Open Forum (ESOF) 2012: <http://www.forfas.ie/newsevents/news/title,9486,en.php>

- Finally, consulting and validating proposals with experts in thematic working groups and with a wide a wide group of scientific and business stakeholders before finalising the prioritisation.

In 2012, the Government established a high-level group, the Prioritisation Action Group (PAG), under the chairmanship of the Minister of State for Research and Innovation to oversee the implementation of the research prioritisation strategy. In 2013, the Government approved a framework of metrics and targets with a view to firstly, monitoring the impact of public STI investment in broad terms, and secondly, monitoring the impact of the implementation of research prioritisation in the 14 priority areas

In June 2013, the Minister of State for Research and Innovation indicated his desire to ensure that Ireland would quickly progress its Smart Specialisation Strategy in preparation for the next round of EU Structural Funds, commencing in January 2014. It is anticipated that work will commence late 2013 to map the work undertaken under the NRPE onto the Smart Specialisation Strategy framework in order to determine the additional work required to fulfil the very specific requirements of the latter given that it has a wider focus than just STI.

## **2.8 Policy developments related to Council Country Specific Recommendations**

The main focus of Ireland's EU/ECB/IMF financial assistance programme is on returning the Irish economy to sustainable growth and on ensuring that Ireland has a properly functioning healthy banking system.

There available documents are relatively silent on the implementation of R&I programmes. However, a Commission Staff Working Document (SWD(2013) 357 final, dated May 2013), Assessment of the 2013 national reform programme and stability programme for Ireland, noted that R&D was rising gradually and was equivalent to 1.7% of GDP in 2011, making the 2% target by 2020 within reach. In addition, the document pointed out that Ireland was among the Member States with the highest share of R&D intensive sectors in the economy.

The document also highlighted the adoption of a new national intellectual property protocol in 2012 as a welcome step to enable industry to benefit from R&D in public institutions. It also welcomed the prioritisation of public R&D into 14 areas with high potential in terms of economic and societal impact and job creation effects.

### 3. PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

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*This chapter is aimed to assess the performance of the national Research and innovation system and identify the structural challenges faced by the national innovation system.*

#### 3.1 National Research and Innovation policy

The EU *Research and Innovation Performance in Ireland: Country Profile 2013* publication noted that the recession hit Ireland particularly hard but pointed out that the economy had since made a partial recovery based on the exports from the MNC sector, which is primarily high tech or knowledge-intensive services. The report showed that knowledge-intensive service exports from Ireland as a percentage of total service exports amounted to 73.1% in 2010 and greatly exceeded the EU average of 45.1%.

In 2012, Ireland's R&D intensity stood at 1.72% which though below the average EU intensity rate of 2.03% has over the past decade shown above average growth: it grew by 4.07% during 2000-2011 compared with an average EU27 growth of 0.8% for the same period. Ireland's R&D intensity target is 2.0% of GDP or 2.5% of GNP by 2020.

Business expenditure on R&D as a percentage of GDP grew strongly over the period 2000–2010 and stood at 1.14% in 2011, just below the EU average of 1.26%. The amount of GERD financed from abroad was 15.6% is almost twice the EU average and is the outcome of a FDI policy which has focused on attracting projects with a strong R&D component.

In terms of S&T excellence<sup>7</sup>, Ireland's score has been rated at 38.11 which is lower than the EU average of 47.86; here again however, Ireland's growth record over 2005–2010 of 5.39% exceeded the EU average growth of 3.09%.

The benefits of Ireland's investment in R&D over the decade in the growth in international publications by Irish scientists; in 2011, the percentage of international scientific publications by Irish authors among the 10% most cited publications worldwide as a percentage of total scientific publications stood at 11.4% in 2008 — up from 9.5% in 2000 and superior to the EU average of 10.9%.

The development of human resources was a particular focus of the Strategy for Science, Technology and Innovation 2006-2013, particularly in terms of the training of PhDs. The percentage of new doctoral graduates (ISCED 6) per thousand population aged 25–34 rose from 0.89% to 2000 to 1.58% in 2010, bringing it closer to the EU average of 1.69%.

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<sup>7</sup> This is a new indicator which takes into consideration the quality of scientific production as well as technological development.

According to the Forfás/Central Statistics Office publication, *Business Expenditure on Research and Development (BERD) 2011/2012*, the number of PhD qualified researchers employed in the business enterprise sector has increased more than threefold from 467 in 2003 to 1,551 in 2011.

Table 2

<b>HUMAN RESOURCES</b>	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	1.58 (2010)
Percentage population aged 25-64 having completed tertiary education	49.4 (2011)
<b>Open, excellent and attractive research systems</b>	
International scientific co-publications per million population	1,131 (2011)
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	11.4 (2008)
<b>Finance and support</b>	
R&D expenditure in the public sector as % of GDP	0.56 (2011)
Public Funding for innovation (innovation vouchers, venture/seed capital, access to finance granted by the public sector to innovative companies)	
<b>FIRM ACTIVITIES</b>	
R&D expenditure in the business sector as % of GDP	1.2 (e) (2012)
Venture capital and seed capital as % of GDP	0.03% (2011)
<b>Linkages &amp; entrepreneurship</b>	
Public-private co-publications per million population	34 (2011)
<b>Intellectual assets</b>	
PCT patents applications per billion GDP (in PPSE)	2.8 (2009)
PCT patents applications in societal challenges per billion GDP (in PPSE) (climate change mitigation; health)	0.24 (2008)
<b>OUTPUTS</b>	
<b>Economic effects</b>	
Medium and high-tech product exports as % total product exports	2.57 (2011)
Knowledge-intensive services exports as % total service exports	73.1 (2010)
License and patent revenues from abroad as % of GDP	2.29 (2011)

The *Innovation Union Scoreboard 2013* report indicated that Ireland belongs to a group of Member States categorised as **Innovation Followers** that are showing a performance above or close to that of the EU27 average. The report also showed that Ireland's growth performance during the period 2008-2012 was higher than average for countries in the Innovation Followers category.

The 2013 Scoreboard publication also notes that Ireland has the highest performance for Economic effects due to its high above average performance in Employment in knowledge-intensive activities, Contribution of medium and high-tech product exports to the trade balance, Knowledge-intensive services exports and License and patent revenues from abroad. It said that Ireland only performed below average for Sales of new-to-market and new-to-firm innovations. The 2013 Scoreboard report found that Irish SMEs were more likely to be innovative (45.5% of SME population) than their average EU counterparts (38.4% of SME population).

Ireland also scored highly in terms of Human resources which are described as a relative strength. Relative weaknesses were identified in the area of Finance and support.

The EU *Innovation Union Competitiveness Report 2013*<sup>8</sup> contained this summary of Ireland's performance in relation to research and innovation:

*“Ireland is one of the top performers for the European innovation indicator. It ranks third in the EU after Sweden and Germany. This is a result of good or very good performance for all of the indicator's components with the exception of patent applications. Ireland performs particularly well as regards employment in KLA, the export share of KISs, and employment in high growth enterprises in innovative sectors as a share of employment in all high-growth firms. The relatively low performance in patents is linked to limited research capacity, the economic structure and the division of work within international (American) companies, which have European headquarters in Ireland (contributing to value added but less to patenting). Ireland performs above the EU average in the contribution of medium/high-tech goods to the trade balance, mainly as a result of its exports of medicinal and pharmaceutical products. The strong performance in KLA and the outstanding performance in the export share of KISs is explained by the economic structure of the country, with financial services and computing services being relatively important in the Irish economy. Ireland is the largest software exporter in the world, after India (computer services exports of €32bn in 2011). Ireland performs well as regards employment in fast-growing innovative firms as a percentage of total employment in such firms. This is a result of a high share of computer programming companies among them.”*

The OECD 2013 economic survey of Ireland<sup>9</sup> suggested, however, that Ireland's innovation capacity should be assessed with care. It pointed out that the high value of indicators measuring knowledge-intensive industries or indicators measuring export share of knowledge-intensive services — mainly computer software — might be related to MNCs located in Ireland.

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<sup>8</sup> European Commission (2013), *Innovation Union Competitiveness Report 2013*. Staff Working Paper, Directorate General for Research and Innovation, Luxembourg: Publications Office of the European Union.

<sup>9</sup> Organisation for Economic Co-operation and Development (2013), *2013 Economic Review — Ireland*, OECD Publishing.

## 3.2 Structural challenges of the national R&I system

The main structural challenges facing the Irish R&I system include the following:

### **Dual nature of Irish enterprise sector**

The *Research and Innovation Performance in Ireland: Country Profile 2013* publication noted the impact that MNCs in the high-technology manufacturing and knowledge-intensive services sectors had made to Ireland's enterprise profile. Indigenous enterprises, on the other hand, tend to be concentrated in the low and medium technology sectors though they have a significant presence in the software sector.

The most recent data on Business Expenditure on Research and Development show that the MNCs account for 70% of R&D expenditure in 2012. The *Research and Innovation Performance in Ireland: Country Profile 2013* report indicated that the share of SMEs introducing product or process innovation as a percentage of the total SME population was falling. A similar finding was observed in relation to the number of SMEs introducing marketing or organisational innovation.

### **Low levels of formal cooperation**

The low level of formal cooperation between business enterprises (and especially SMEs) and the Higher Education sector has the focus of a number of recent policy studies. As noted earlier in the report, an early policy decision within the Irish context was to use the higher education system as the main vehicle for publicly-funded research with the consequence that Ireland has fewer Public or Research Technological Organisations compared to other EU Member States.

A 2011 Forfás report, *Analysis of Ireland's Innovation Performance*<sup>10</sup>, revealed that small indigenous enterprises had low levels of co-operation arrangements and thus might not be benefitting fully from positive externalities arising from close proximity to innovative foreign-owned enterprises.

The *Innovation Union Competitiveness Report 2011* indicated that the intensity of contractual R&D collaboration was low in Ireland (under 0.002% of GDP, well below the EU average of 0.05% in 2008). The *Innovation Union Scoreboard 2011* report revealed a strong decline among Irish SMEs collaborating with others. The report said that the share of SMEs in Ireland collaborating with others had decreased with more than 10% annually.

### **Low absorptive capacity of indigenous SMEs**

A number of reports by Forfás<sup>11</sup> and other have highlighted the low levels of absorptive capacity of indigenous SMEs which is considered as a barrier to improving their technological and commercial capacity.

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<sup>10</sup> Forfás (2011): *Analysis of Ireland's Innovation Performance*, Dublin, Ireland. Available from: <http://www.forfas.ie/publication/search.jsp?ft=/publications/2011/Title,7615,en.php>

The 2005 Forfás report, *Making Technological Knowledge Work*, found that SMEs rely extensively on human capital — especially in the form of graduates — as a mechanism for acquiring external know-how and they also tend not to develop or systemise routines for identifying innovation opportunities or realising the value of external knowledge.

A 2013 study on manufacturing in Ireland<sup>12</sup> by Forfás questioned whether the absorptive capacity of Irish-based enterprises was sufficiently developed for the Research Technology Organisation model to be viable or sustainable in Ireland along the lines of VTT in Finland or NTO in the Netherlands. RTOs are focused on applied research directed at medium term industry needs as well as shorter term technology development and technical services (problem solving) for industry clients. RTOs rely to a greater extent on private revenues and the question arises as to whether the absorptive capacity of Irish based firms is sufficiently developed for an RTO model to be viable or sustainable in Ireland. The Forfás report called for a feasibility study to be carried out to assess the potential for establishing a Research Technology Organisation in Ireland.

### **Lack of clarity and consistency of national IP regime**

The report of the Innovation Taskforce (2010) found that many SMEs find the high costs of proper legal and IP advice prohibitive, and appear not to take a proactive strategic position in respect of IP issues. The report noted the importance of SMEs obtaining proper legal and IP advice, including IP audits, has been recognised internationally.

One of the report's key recommendations, however, was that the development of a national Intellectual Property (IP) protocol should be a priority, in order that entrepreneurs and companies have predictability about the terms on which they can access IP created at Higher Education Institutions (HEIs) in order to turn it into products and services that meet customer needs. It said this recommendation was necessary to achieve a more efficient and effective approach to identifying and accessing IP arising from public research investment if Ireland was to strengthen its commercialisation focus and gain a competitive advantage within the EU. The Innovation Taskforce also pointed out that the process of finding, accessing and bundling IP from the HEIs needed to be rationalised.

### **Insufficient early-stage Venture Capital Funding**

The *Research and innovation performance in Ireland: Country Profile 2013* publication pointed out that following the financial crisis, ease of access to capital in Ireland was the lowest of all OECD countries in 2010, whereas previously Ireland had been ranked in 11th place. In contrast, in 2009 Ireland was still in 5th place in the OECD and 2nd in the EU (behind Sweden) in terms of venture capital investment as a percentage of GDP. Regarding the number of business angel networks and groups, Ireland is 3rd in a group of smaller and medium-sized countries.

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<sup>11</sup> Forfás (2005), *Making Technological Knowledge Work — A Study of the Absorptive Capacity of Irish SMEs*, Dublin, Ireland. Available from: <http://www.forfas.ie/publications/2005/title,796,en.php>

<sup>12</sup> Forfás (2013), *Making It In Ireland: manufacturing 2020*, Dublin, Ireland. Available from: [http://www.forfas.ie/media/220413-Making\\_It\\_In\\_Ireland-Publication.pdf](http://www.forfas.ie/media/220413-Making_It_In_Ireland-Publication.pdf)

The Innovation Taskforce report which was published in 2010 made a number of observations in relation to seed and venture capital. It said that a key goal should be a transformation in the scale and nature of the Irish Venture Capital environment by attracting top tier venture financing to Ireland so as to successfully scale innovative companies. The report also recommended that Ireland should seize the opportunity to redirect capital investment into innovative companies, including through “business angels” who also transfer knowledge and experience.

A review of the equity investment landscape<sup>13</sup> published by Forfás in 2013 identified a number of weaknesses in relation to the provision of seed and venture capital and suggested a number of recommended actions. The report also highlighted that more action was needed to stimulate the pipeline of entrepreneurs.

### 3.3 Meeting structural challenges

The joint EU/IMF bail-out programme which Ireland exited in December 2013 sought to tackle the collapse in the Government finances and the large-scale problems in the banking sector. Additionally, the Government has a key focus on addressing the twin challenges of unemployment which in November 2013 stood at 406,000 or 12.5% of the workforce and emigration.

The shortfall in Exchequer resources and the need to respond to the unemployment crisis has impacted on research and innovation policies. The implementation of the national research prioritisation strategy stemmed from the need to achieve a more effective and efficient return from the State’s investment in research and innovation. There is increased emphasis within the R&I system on funding applied research and on improving the transfer of Intellectual Property within the HEI sector to the business enterprise sector in order to generate jobs.

Other initiatives have been undertaken to enhance the availability of seed and venture capital and to incentivise both MNCs and indigenous enterprises to undertake research and innovation through enhancements to the R&D tax credit.

Challenges	Policy measures/actions addressing the challenge <sup>14</sup>	Assessment in terms of appropriateness, efficiency and effectiveness
1. Dual nature of Irish enterprise sector	Enhancements to R&D tax credit  Range of support measures aimed at increasing SME	The application process for the R&D tax credit needs to be made more SME friendly  New support measures are needed to reverse the downward trend in product, process, marketing and organisational

<sup>13</sup> Forfás (2013), *A Review of the Equity Investment Landscape in Ireland*, Dublin, Ireland. Available from: <http://www.forfas.ie/publications/2013/title,10258,en.php>

<sup>14</sup> Changes in the legislation and other initiatives not necessarily related with funding are also included.

	involvement in R&D and innovation	innovation in SMEs  More emphasis should be placed on innovative public procurement measures to assist the development of innovative SMEs
2. Low levels of formal cooperation	Additional funding for industry-led HEI collaborative research programmes	Need for scheme similar in nature to Innovation Voucher scheme to facilitate networks of SMEs to collaborate
3. Low absorptive capacity of indigenous SMEs	Increase in funding for Innovation Vouchers scheme	Increased focus on initiatives for enterprises to develop/recruit people with requisite skills
4. Lack of clarity and consistency of national IP regime	New IP Protocol and transfer structures (cTTO) being put in place	Review of Technology Transfer Strengthening Initiative (TTSI I) is underway and will be used to inform future direction. TTSI II, for 2013-2016 was rolled out in 2012.
5. Insufficient early-stage Venture Capital Funding	€850m fund for Irish SMEs jointly funded by the National Pension Reserve Fund (€500m) and private investors (€250m) announced in 2013  Development of New €175m Seed and Venture Capital Scheme 2013-2018	Business angel funding sector in Ireland is underdeveloped and requires support  Further policy action required to address lack of banking credit for SMEs  There is also a need to support the banking sector to develop knowledge around new economy sectors

**Table 3**

## 4. NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

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### 4.1 Strengthening the knowledge base and reducing fragmentation

#### Promoting excellence in education and skills development

The National Strategy for Higher Education to 2030 (published in 2011) sets out a strategy for the sector that would provide for a more flexible system, with a greater choice of provision and modes of learning for an increasingly diverse cohort of students; improvements in the quality of the student experience, the quality of teaching and learning and the relevance of learning outcomes; and ensuring that higher education connects more effectively with wider social, economic and enterprise needs through its staff, the quality of its graduates, the relevance of its programmes, the quality of its research and its ability to translate that into high value jobs and real benefits for society.

A 2013 report by Forfás, Business Expenditure on Research and Development (BERD) 2011/2012, noted that that over 19,000 employees or 14,000 on a full time equivalent (FTE) basis were engaged in R&D in the business sector in 2011. Personnel engaged in R&D increased by 3,295 (a 21 per cent increase) since 2009 and by 7,034 employees over the decade.

The number of researchers employed in businesses in Ireland increased from 8,960 in 2009 to 10,618 in 2011. Since 2003 an extra 4,011 researchers were employed in the business sector. There were 8,996 FTEs employed in the business sector in 2011, an increase of 50 per cent since 2003.

There has been a significant increase in the quality of researchers employed in the business sector: the number of PhD qualified researchers increased more than threefold between 2003-2011.

Over three-quarters of all R&D staff in the business sector were male in 2011. Female R&D personnel accounted for 22 per cent of the total in 2003 and the proportion had slightly increased to 24 per cent in 2011. In absolute terms, there was an increase of 1,934 female R&D personnel since 2003 compared with an increase of 5,101 male personnel over the period.

Another 2013 Forfás publication, State Investment in Research and Development 2011-2012, indicates that there will be a decrease of 13 per cent in 2012 in the overall number of research personnel employed in the Government sector. The total number of research personnel was 1,196 in 2011 and are expected to total 1,039 in 2012. The overall trend is also down 9 per cent on the total research personnel 2010 number of 1,133.

Recent Eurostat data confirms the growth in the number of STI human resources in Ireland. The table below shows how Ireland compares with EU28 data on a range of HR issues. The data shows that Ireland's human resources in science and technology have increased from 1,082 in 2009 to 1,219 in 2012, an increase of 13%.

**Table: Ireland's human resources in science and technology, 2009-2012**

Factor	Geographic scope	Factor	2009	2010	2011	2012
Human Resources in Science and Technology	EU28	Number	105,520	107,297	112,395	115,091
	Ireland	Number	1,082	1,114	1,175	1,219
Human resources in science and technology as a share of labour force	EU28	Percentage	40	40.4	42.3	42.9
	Ireland	Percentage	44.5	46	49	50.5
Human resources in science and technology (HRST) by NUTS 2 regions (% of economically active population)	Border, Midland and Western Region	Percentage	37.1	39.5	41	40.9
	Southern and Eastern Region	Percentage	43.1	44.6	48	49.9
Share of women researchers, by sectors of performance	EU28	Percentage	32.9	32.4	n.a.	n.a.
	Ireland	Percentage	33.2	33.0	n.a.	n.a.

(Source: Eurostat)

Human resources in science and technology as a share of the labour force has traditionally been higher than the EU average; during the period, the percentage grew from 44.5% in 2009 to 50.5% in 2012. Ireland continues, however, to be close to the EU28 average in terms of the share of women researchers by sector of performance.

As noted in the ERA Communication fiche for Ireland (2013), there are no specific policy measures supporting the implementation of the HR Strategy for Researchers, incorporating the Charter and Code.

All seven Irish universities along with one funding organisation and the representative body for contract researchers have endorsed the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers. Two Irish higher education institutions have received EU Commission acknowledgement for their progress in relation to the HR Strategy incorporating the Charter and Code: University College Dublin (UCD) and the University of Limerick.

In 2008, the Advisory Council for Science, Technology and Innovation proposed a comprehensive framework for researchers careers; this framework was never implemented as a consequence of reductions in Government expenditures.

Funding has, however, been provided for new innovative PhD training programmes, including the industrial PhD model. The fifth and current cycle of the Programme for Research in Third

Level Institutions is funding the Innovation Alliance, a collaborative venture between Trinity College Dublin and UCD, which involves the establishment of a new 4th-level Innovation Academy.

## **Research Infrastructures**

National policy focus has been on developing policies on the access to research infrastructures on behalf of researchers in the HEI, PRO and business sectors. In 2013, the statutory planning and policy development authority for the higher education sector, the Higher Education Authority (HEA), published national guidelines for access by researchers to research infrastructures hosted by higher education institutions and other research bodies in Ireland.

The HEA document, National Guidelines For Access By Researchers To Research Infrastructure Hosted By Higher Education Institutions Or Other Research Bodies In Ireland, notes that there has been significant investment in research infrastructure throughout the higher education sector over the last 10–12 years. It said it was essential to facilitate the widest possible access to this research infrastructure in order to achieve the greatest return on investment and value for money for the state and for the research community in general. The document outlined that previously there had been no nationally accepted set of guidelines in place governing access to items of research infrastructure hosted within publicly funded institutions. The document sets out for the first time a set of agreed national guidelines that should apply, in so far as is practicable, to all items of research infrastructure within these institutions. It also recognised that opening up access to research infrastructures in Ireland to Irish and international researchers would have cost implications. The HEA guidelines also highlighted that providing access to research infrastructures would require a professional and customer-oriented support service to be put in place.

In addition to the National Guidelines, the HEA has created a database of large-scale research infrastructures (i.e. all research equipment costing over €100,000) arising from surveys it undertook in 2010 and 2012 of research equipment in the Irish higher education sector. The new database, Large Items of Research Equipment (LIRE, [www.heai.ie/lire](http://www.heai.ie/lire)), has now been published online in beta form and is closely connected to the FP7-funded MERIL project which aims to map research infrastructures of EU relevance.

The results of the HEA research infrastructure survey also influenced the call for proposals issued by Science Foundation Ireland under its Research Infrastructure Call 2012 Programme. The overall goal of this support measure is to support the research community in building and sustaining the required infrastructural capacity to accomplish high quality research.

## **4.2 Getting good ideas to market**

### **Improving access to finance**

A number of high-level policy documents including the Action Plan for Jobs 2013 have emphasised the importance of providing seed and venture capital for SMEs, particularly in the

context where lending by domestic financial institutions is constrained by lack of capital. The Action Plan notes that making access to finance a central feature of the Government's recovery and growth plans for the economy in general and the SME sector in particular.

The State Bodies Group (SBG), set up in 2012 and chaired by the Department of Finance, comprises senior officials from the Department of Finance, the Department of Jobs, Enterprise and Innovation, Department of Education and Skills, Forfás, Enterprise Ireland, the National Pension Reserve Fund and Fáilte Ireland. The SBG has a number of functions including scrutiny of the credit environment, oversight of agency efforts to drive businesses towards optimal utilisation of funds and ensuring cohesion in policy making on access to finance issues for SMEs across Government. The Group will have responsibility for both developing key policy initiatives to support SME access to credit and other forms of finance, and ensuring their implementation. The SBG will also monitor and review policies and initiatives that are designed to ensure there is an appropriate flow of finance to support Irish SMEs capacity for growth, including monitoring the level of investment in the venture capital sector.

SME funding initiatives announced in the Action Plan for Jobs 2013 include three new funds to which the National Pension Reserve Fund will contribute funding: the SME Equity Fund, the SME Turnaround Fund and the SME Credit Fund.

In May 2013, Enterprise Ireland launched its Seed & Venture Capital Scheme (2013–2018) which seeks to stimulate job creation and support the funding requirements of young innovative Irish companies. Public sector funding of €175m is being made available to the Scheme which aims to attract and leverage private sector funding to create an overall fund of €700m. The first call for expressions of interest under the Scheme will focus on the provision of up to €100m to venture capital funds targeting investment in the wider ICT and life sciences sectors.

The Department of Jobs, Enterprise and Innovation has been evaluating supports to improve access to finance; the most recent review examined the Microenterprise Loan Fund which improves access to credit for microenterprises and facilitate the growth and expansion of viable businesses with less than 10 employees from all industry sectors.

### **Protect and enhance the value of intellectual property and boosting creativity**

In 2012, the Department of Jobs, Enterprise and Innovation published a new national IP policy document, Putting Public Research to Work for Ireland. The document was the culmination of inputs from two groups previously established by the Department: the IP Implementation Group and the IP Policy Group which worked on the implementation of the review recommendations, in combination with the IP relevant recommendations contained within the report of the Innovation Task Force, Innovation Ireland.

The Putting Public Research to Work for Ireland policy document outlines Ireland's IP Protocol and sets out a new framework for encouraging industry to collaborate with institutions in the HEI and PRO sectors and to access and commercialise the IP generated within these institutions.

New structures to facilitate the transfer of IP from the HEI/PRO sectors to industry were announced by the Government in 2012; these included the establishment of a Central Technology Transfer Office (cTTO), the objective of which is to be the identifiable access route to technology opportunities and academic expertise in the HEI/PRO sectors.

The cTTO is being positioned to be a 'one stop shop' for entrepreneurs and industry, signposting them to the relevant sources of knowledge and capability within Ireland's HEIs and PROs. The stated aim of the cTTO is to encourage the commercialisation of IP arising from State-funded research, with a view to achieving more job creation from public sector investment in this area.

The process of establishing the cTTO is ongoing; a new director of the organisation was recruited in September 2013.

### **Public procurement**

There have been a number of policy initiatives in the past decade aimed at improving public procurement of innovative goods and services but these have gained little traction in practice.

The Action Plan for Jobs 2013 published by the Department of Jobs, Enterprise and Innovation notes that the Government is establishing a National Procurement Office as an independent body under the aegis of the Department of Public Expenditure and Reform to drive a new consolidated and integrated approach to public procurement.

The Office will work closely with Enterprise Ireland, the indigenous SME development agency, to assist small and medium sized enterprises to improve their capacity to tender for public sector contracts.

The Action Plan for Jobs 2013 document notes that innovative companies can offer new solutions to the needs of public sector bodies, often providing improved products and services with lower whole-of-life costs than more conventional purchases. It says that the Procuring Innovation initiative which was introduced by the Government in 2012 seeks to encourage procuring authorities to adopt a more open approach to procuring goods and services by seeking solutions in the market-place that might meet their needs, rather than prescribing a specific product or service to be supplied. The Action Plan points out that the initial batch of projects involved in the initiative in 2012 will act as exemplars for the expansion of the Procuring Innovation initiative in 2013.

## **4.3 Working in partnership to address societal challenges**

A group of Irish organisations focusing on ageing have come together to form a new alliance, COLLAGE (Collaboration on Ageing), and which has become Ireland's 3 Star Reference Site for the European Innovation Partnership on Active and Healthy Ageing (EIP AHA).

The COLLAGE alliance includes research groups, academic institutions, healthcare providers, the Irish Longitudinal Study on Ageing (TILDA), public sector authorities and community

groups. The new alliance has over 30 discrete initiatives and has 9 established action group projects and an additional 8 initiatives registered on Marketplace, providing presence in all three pillars of EIP-AHA.

From a policy perspective, the European Innovation Partnership programme is perceived as an EU Commission-national stakeholders initiative which at present does not involve the inputs of national governments. Ireland is already a committed member of a number of trans-national projects aimed at tackling grand societal challenges as evidenced its participation in eight Joint Programming Initiatives and its observer/associate membership of another two.

#### **4.4 Maximising social and territorial cohesion**

Ireland does not have a specific Smart Specialisation Strategy and while Ireland is registered with the S3 platform neither of the two Irish NUTS 2 regions are registered — unlike Northern Ireland, a NUTS 2 region, which has been subject to a S3 peer review. Irish policy-makers have made the case the Ireland's research prioritisation strategy equates to a Smart Specialisation Strategy; however, the Minister for Research and Innovation has said that work to prepare an Irish Smart Specialisation Strategy would begin in the context of negotiations for Structural Funds in 2014. A review is under way to identify the additional processes and inputs will be needed to produce a Smart Specialisation Strategy using the process and governance structures developed under the research prioritisation strategy.

The development of a Smart Specialisation Strategy will require a greater regional input and focus than has been the case to date with the implementation of the national research prioritisation strategy.

#### **4.5 International Scientific Cooperation**

Ireland has positioned its R&D tax credit as a means of targeting mobile foreign direct investment in research and innovation; recent data indicates that just under half of all FDI projects attracted into Ireland have an R&D component.

Science Foundation Ireland (SFI), the national foundation for research, operates a number of support measures aimed at encouraging international researchers to undertake research work in Ireland. As an example, the SFI Research Professorship Programme seeks to support national strategic priorities by assisting research bodies in their recruitment of world-leading researchers for professorial chairs, or similar research leadership positions in targeted scientific areas within the Biotechnology, Information and Communication Technology (ICT) & Sustainable Energy and Energy Efficiency (Energy) sectors.

In addition, SFI is a co-founder of the US-Ireland Research and Development Partnership, launched in 2006, is an initiative involving funding agencies across three jurisdictions: United States of America (USA), the Republic of Ireland (RoI) and Northern Ireland (NI). Under this support initiative, a 'single-proposal, single-review' mechanism is facilitated by the National Science Foundation and National Institutes of Health in the USA who accept submissions from tri-jurisdictional (USA, NI and RoI) teams to a number of their existing funding programmes.



All proposals submitted under the auspices of the Partnership must have significant research involvement from researchers in all three jurisdictions.

More recently, SFI has launched a new support measure, the International Strategic Cooperation Award (ISCA) 2013, to facilitate Irish HEIs to form partnerships with research centres in Brazil, India, China and Japan. The Award will support activities such as joint workshops, short-term visits, academic placements, training activities and exploratory work in order to obtain further collaborative funding.

In 2013, legislation was passed that enables SFI to fund research groups based in Northern Ireland and also to enable participation by SFI in international funding programmes. SFI did not have a mandate under its previous legal remit to fund research groups outside the jurisdiction.

## 5. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

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### 5.1 More effective national research systems

A key area of focus for STI policy-makers is the implementation of the national research prioritisation strategy which is a crucial element of the Government's overall strategy to accelerate the economic and societal return on Ireland's science, technology and innovation investment, to further strengthen enterprise engagement and take-up of public research and to drive commercialisation. As noted above, the research prioritisation strategy specifies that the bulk of competitive State funding for research will be concentrated in 14 priority areas and in six platform areas for science and technology.

One of the major recommendations of the steering group responsible for the development of the research prioritisation strategy was that the Government should develop a framework for monitoring public investment in science, technology and innovation (STI). In July 2013, the Government published a framework document, *Research Prioritisation: A Framework for Monitoring Public Investment in Science, Technology and Innovation*<sup>15</sup>, in which it set out a series of metrics and targets in relation to STI investments.

The Framework seeks to:

1. Monitor the impact of public STI investment in broad terms;
2. Monitor the impact of the implementation of research prioritisation in the 14 Priority Areas identified in the Research Prioritisation Strategy document.

The Framework envisages three levels of targets: Overarching National Targets; Departmental/Agency-level Targets; Priority Area Targets. The targets will be underpinned by a wide range of 79 monitoring metrics covering the enterprise support environment, including inputs, outputs and outcomes.

### 5.2 Optimal transnational co-operation and competition

In 2013, legislation to extend the remit of Science Foundation Ireland was enacted. The changes provide SFI with the capability to:

- Provide funding on an all-Island basis, subject to excellence and strategic criteria being met. This will enable SFI to provide funding for the first time to researchers, based in Northern Ireland, where links with institutions or industry in the State exist;
- Enter into collaborative arrangements with international partners and contribute to the funding of international collaborative projects relating to strategic areas of opportunity for

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<sup>15</sup> Department of Jobs, Enterprise and Innovation and Forfás (2013), *Research Prioritisation: A Framework for Monitoring Public Investment in Science, Technology and Innovation*, Dublin, Ireland. Available from: [http://www.djei.ie/science/technology/rpmaps/A\\_Framework\\_for\\_Monitoring\\_Public\\_Investment\\_in\\_STI.pdf](http://www.djei.ie/science/technology/rpmaps/A_Framework_for_Monitoring_Public_Investment_in_STI.pdf)

the State. This will assist Ireland leverage significant non-exchequer research funding into the State.

Ireland has been very successful in securing funding from the Seventh Framework Programme (FP7). Irish organisations have achieved a total draw-down of €571 million as of September 2013<sup>16</sup> giving an application success rate of 22%. The Government indicated at the launch of the Horizon 2020 programme in Ireland in December 2013 that Ireland is targeting €1.25bn in funding draw-down over the seven years of the programme.

### **5.3 An open labour market for researchers**

Though there has been no new major policy initiative in the area of an open market for researchers, Ireland has traditionally been very supportive of facilitating access by foreign researchers to positions in Ireland and of encouraging Irish researchers to broaden their career paths by gaining international experience.

Ireland was one of the first EU Member States to implement Council Directive 2005/71/EC (the Admission of Third Country researchers directive). The Euraxess Office in Ireland which is hosted by the Irish Universities Association processes Hosting Agreements on behalf of the Department of Jobs, Enterprise and Innovation which enables non-EEA researchers to work in Ireland without recourse to work permits or Green Cards.

The openness and transparency of the Irish system can be gauged from the Researchers' Report 2012<sup>17</sup> which indicates that the share of research posts advertised on the Euraxess Jobs portal (per thousand researchers in the public sector) was relatively high in Ireland.

Ireland with a score of 50% heads the European scoreboard for the percentage of the population aged 30–34 having completed tertiary education. However, the proportion of STEM graduates per thousand population in Ireland over the period 2000–2009 has been decreasing in contrast to the rest of the EU27. Considerable focus is being placed within the Irish STI system on implementing the recommendations of the report of the national research prioritisation strategy which advised that a proportion of PhD funding should be earmarked to support (a) the development and rollout of the industrial PhD model in Ireland and (b) the development of industry-driven Masters programmes. With regard to (a), Science Foundation Ireland and the Irish Research Council are co-funding an industrial PhD programme.

### **5.4 Gender equality and gender mainstreaming in research**

The Researchers' Report 2012 report found that the probability of women of reaching a top-level (Grade A) position in research in Ireland was among the lowest in the EU. Similarly, the report's Glass Ceiling Index score for Ireland was particularly high signifying that women in Ireland have a low probability of being promoted to a higher academic position. Similar findings have also

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<sup>16</sup> Tenth Interim Report of Irish Involvement in the Seventh European Union Framework Programme for Research and Technological Development (FP7) — Enterprise Ireland, September 2013.

<sup>17</sup> European Commission (2013), *Researchers' Report 2012*, prepared by Deloitte for Directorate General for Research and Innovation.

been reported by Science Foundation Ireland in relation to the position of female researchers in SFI-funded projects. SFI's Annual Census 2011 notes that females only accounted for 19% of all award holders in 2011.

One of Science Foundation Ireland's new Key Performance Indicators is to increase the representation of women in SET. Two targets have been identified:

1. Increased employment of women in Irish based SET industries — 10% increase from 2013 baseline;
2. 25% of SFI award holders by 2020.

Exchequer funding constraints have limited the dedicated initiatives for female researchers within the research sector. However, in addition to mainstreaming gender/family friendly support measures within larger research funding programmes, in 2013 Science Foundation Ireland announced the launch of the Advance Fellowship programme which seeks to provide female researchers with the opportunity to remain in or return to high-quality research, to undertake further training and to increase their employability in academic, industrial or policy roles in the SET sector in Ireland.

## **5.5 Optimal circulation, access to and transfer of scientific knowledge including via digital ERA**

A national steering committee on open access policy in Ireland was formed in 2012 by a number of research funders, higher education institutions and other interested stakeholders with an interest in advocating for open access publications. The Committee issued recommendations for a position statement, National Principles for Open Access Policy Statement, which was subsequently adopted by the Irish Government in October 2012. The Committee and its member organisations advocated for the Green route to open access publication and recognise that the output of publicly funded research in Ireland be made freely and openly available. Member organisations committed themselves to advocating for the implementation of the Open Access statement locally within their institutions.

Seven member organisations have published Open Access statements: Health Research Board, Irish Research Council, Higher Education Authority, Dublin Institute of Technology, Health Service Executive, Science Foundation Ireland and Trinity College Dublin.

In May 2013, the Government announced that Ireland would become a member of two European Research Infrastructure Consortia, the European Social Survey (ESS) and the Digital Research Infrastructure for the Arts and Humanities (DARIAH). The Irish Research Council will represent Ireland in the two consortia; it had been involved with both these initiatives, in their pre-European Research Infrastructure Consortia form, for some time, and this had resulted in considerable benefits to the Irish research community. The ESS was established in 2001 to monitor long-term changes in social values while the mission of DARIAH is to enhance and support digitally-enabled research across the humanities and arts.



As noted above, the establishment of the central Technology Transfer Office (the cTTO), a key element of the Government's knowledge transfer strategy, is being implemented (a Director for the new service was appointed in July 2013). The primary role of the cTTO is to provide the identifiable access route to technology opportunities and academic talent that exists in Research Performing Organisations (RPOs). The cTTO aims to provide a 'one-stop-shop' for entrepreneurs and industry, signposting them to the relevant sources of knowledge and capability within Ireland's RPOs.

## ANNEX 1. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS

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Feature	Assessment	Latest developments
<b>1. Importance of the research and innovation policy</b>	(+) R&I policy is key component of national strategies in relation to economic development and employment creation  (+) Grand challenges have influenced development of national research prioritisation strategy  (-) New national R&I policy with wider innovation focus needed to replace Strategy for Science, Technology and Innovation 2006-2013 – Research Prioritisation is currently the main pillar of STI policy.	(+) New strategies for job creation and entrepreneurship will be published in early 2014
<b>2. Design and implementation of research and innovation policies</b>	(+) National research prioritisation strategy seeks to focus State competitive research funding on 14 priority areas and 6 science and technology platform areas  (+) Ireland’s research prioritisation strategy is closely aligned with EU priorities and grand challenges  (-) While Ireland has signed up to the S3 platform, it does not have a Smart Specialisation Strategy	(+) New governance structures established to oversee research prioritisation strategy include public sector research funders and performers  (+) Performance metrics have been published in relation to implementation of research prioritisation strategy  (+) Ireland joined the S3 platform in October 2013
<b>3. Innovation policy</b>	(+) Role and contribution of innovation to economic development is widely recognised in national economic development strategies  (-) Increased emphasis needs to be placed on demand side innovation policies	(+) Action Plan for Jobs 2013 stresses role of innovation in building national competitive advantage
<b>4. Intensity and predictability of the public investment in research and innovation</b>	(+) Public R&I funding seeks to leverage both private sector investments and EU research funding drawn-downs  (+) National R&I policies make significant use of R&D tax credit and research initiatives involving public-private partnerships	(+) Target for FP7 funding draw-down by Irish organisations have nearly been achieved  (+) Enhancements have been made to R&D tax credit
<b>5. Excellence as a key criterion for</b>	(+) Excellence in research and education has long been a	(+) National research prioritisation strategy

<p>research and education policy</p>	<p>corner-stone of national policies</p> <p>(+) Wide-spread use of international peer review in project-based research funding programmes</p>	<p>emphasises importance of excellence as selection criteria for priority areas</p>
<p>6. Education and training systems</p>	<p>(+) Increased recognition of need to align supply of trained researchers from the HEI sector with the needs of industry, particularly in relation to industry-driven Masters programmes</p> <p>(-) Entrepreneurship education needs to be complemented by a national entrepreneurship policy</p>	<p>(+) New further education and vocational delivery structures are being rolled out</p>
<p>7. Partnerships between higher education institutes, research centres and businesses, at regional, national and international level</p>	<p>(+) National policies give a high priority to the commercialisation of research results and are underpinned by research funding support measures which emphasise the establishment of industry-led research networks</p> <p>(+) National structures to encourage the transfer of intellectual property from the HEI sector to business enterprises are being rolled out</p>	<p>(+) Significant funding has been provided for the creation of seven large-scale SFI Research Centres involving HEIs and industry</p>
<p>8. Framework conditions promote business investment in R&amp;D, entrepreneurship and innovation</p>	<p>(+) Ireland scores highly in terms of framework conditions for starting a new business</p> <p>(+) Policies and support measures to foster a seed and venture capital market are bearing fruit</p> <p>(+) New national structures to facilitate the transfer of IP are being put in place</p> <p>(-) Ireland lacks an entrepreneurship strategy</p>	<p>(+) New national entrepreneurship policy to be launched in 2014</p> <p>(-) No new over-arching STI strategy has been announced to replace the Strategy for Science, Technology and Innovation 2006-2013</p>
<p>9. Public support to research and innovation in businesses is simple, easy to access, and high quality</p>	<p>(+) There is a comprehensive R&amp;I funding infrastructure for SMEs which is complemented by an extensive support network to facilitate enterprises to access FP7/Horizon 2020 funding</p> <p>(+) Specific supports are available to high potential start-up companies</p>	<p>(+) New national support infrastructures have been announced to assist Irish researchers to access Horizon 2020 funding</p>
<p>10. The public sector itself is a driver of innovation</p>	<p>(+) The public sector reform strategy highlights the central role of innovation, flexibility and the delivery of streamlined services in a reformed Public Service</p>	<p>(-) Actions in relation to innovative public procurement have focused on governance/organisational issues rather than tangible outcomes for SMEs</p>

## ANNEX 2. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS

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		Main changes	Brief assessment of progress/achievements
1	<b>Member State Strategies for Researchers' Training and Employment Conditions</b>	(-) Reduced funding for research in HEIs  (-) Post-doc researchers face contract extension restrictions	(+) Charter and Code implemented at institutional level  (+) Four universities are accredited for HRS4R  (-) HEIs treat early-stage researchers as students — so Code does not apply
4	<b>ERA Framework</b>		
5	<b>Priority European Research Infrastructures</b>	(-) No new calls for SFI Research Infrastructures funding	(+) Ireland fully committed to ESFRI road-map
7	<b>SME Involvement</b>	(+) Use of Irish EU presidency to support greater SME participation in Horizon 2020	(+) Ireland is supportive of efforts to ensure greater participation by SMEs in EU research programmes
11	<b>Venture Capital Funds</b>	(+) Launch of new Seed and Venture Capital 2013–2018 programme by Enterprise Ireland  (+) New €850m fund for SMEs	(+) Good coverage of SME life-cycle funding needs  (-) Some seed and venture capital weaknesses still remain according to Forfás report  (-) Lack of bank credit is problematic
13	<b>Review of the State Aid Framework</b>	(+) Review of R&D tax Credit	(-) No systematic review of State Aid Framework
14	<b>EU Patent</b>	(+) Support for Unified Patent Court	(-) Implementation of UPC in Ireland may require referendum
15	<b>Screening of Regulatory Framework</b>	(+) Screening of regulatory environment of some key priority area as part of research prioritisation strategy	(-) No systematic screening of regulatory framework
17	<b>Public Procurement</b>	(+) Commitment in Action Plan for Jobs 2013 on innovative public	(-) Actions have focused on national public procurement institutional arrangements

		procurement	
20	<b>Open Access</b>	(+) Draft Open Access policy document published	(+) Extensive stakeholder (funders, researchers, data repositories) support for open access
21	<b>Knowledge Transfer</b>	(+) Appointment of director for new national cTTO technology transfer infrastructure	(+) National commitment to knowledge transfer as evidenced by new IP protocol and national technology transfer infrastructures
22	<b>European Knowledge Market for Patents and Licensing</b>	(+) Publication of report of the Copyright Review Group	(+) Support for establishment of Copyright Council of Ireland  (+) New Copyright legislation will allow exemptions for innovation
23	<b>Safeguarding Intellectual Property Rights</b>	(+) Implementation of new national IP protocol	(+) National recognition of the need to develop predictable and consistent IP policies
24	<b>Structural Funds and Smart Specialisation</b>	(+) Ireland joined Smart Specialisation Strategy platform in 2013	(+) Government commitment to developing Smart Specialisation Strategy — which is necessary to draw down Structural Funds
25	<b>Post 2013 Structural Fund Programmes</b>	(+) Initiation of mapping of research prioritisation strategy framework onto S3 framework	(+) Government commitment to develop S3
26	<b>European Social Innovation pilot</b>	(+) Role of social enterprises recognised in Forfás study  (+) Inter Departmental group on Social Enterprise chaired by Minister for Research and Innovation established in 2013.	(+) Support taking place at local level
27	<b>Public Sector Innovation</b>	(+) National annual competition for public sector innovation	(-) National policy on public sector innovation has yet to gain traction
29	<b>European Innovation Partnerships</b>	(+) Irish organisations are participating in an European Innovation Partnership on Active and Healthy Ageing	(-) Perceived as an EU initiative not requiring national government involvement or inputs

30	<b>Integrated Policies to Attract the Best Researchers</b>	(+) SFI funding to attract international researchers are complemented by co-ordinated support and advice infrastructures for researchers moving to Ireland	(+) Irish policies and support structures have consistently supported the movement of researchers into Ireland
31	<b>Scientific Cooperation with Third Countries</b>	(+) New SFI funding programme to support HEI research collaboration with BRIC countries	(+) National policy recognition of the need to develop research linkages with third countries  (-) Exchequer funding resource constraints limit activities in this area
32	<b>Global Research Infrastructures</b>	(-) No new developments	(-) Focus is on national RI priorities
33	<b>National Reform Programmes</b>	(+) Headline R&D intensity target is set at 2% of GDP by 2020	(+) National Reform Programme covers main R&I issues  (-) NRP does not address need to develop successor STI strategy to the Strategy for Science, Technology and Innovation 2006-2013

## ANNEX 3. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

ERA Priority	ERA code	Action	ERA Action	Recent changes	Assessment of progress in delivering ERA
<b>ERA priority 1: More effective national research systems</b>	<b>MS01</b>		Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	(+) Implementation of national research prioritisation strategy	(+) Competitive funding approach widely used by research funders  (-) Competitive funding does not apply to institutional funding e.g. university block or core funds
	<b>MS02</b>		Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	(+) Implementation of national research prioritisation strategy	(+) Wide-spread use of international peer review in programmes using competitive funding approach
<b>ERA priority 2: Optimal transnational co-operation and competition</b>	<b>MS06</b>		Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas	(+) Implementation of national research prioritisation strategy which is aligned with grand challenges	(+) Policy focus is on implementation of research prioritisation strategy which prioritises Government funding in 14 priority areas and in 6 science and technology platform areas
	<b>MS07</b>		Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national	(+) SFI has initiated a number of new funding programmes involving international	(-) Limited number of research funding programmes involve mutual recognition of evaluations conforming to international peer review standards

		funding decisions	collaboration	
<b>MS08</b>	Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant	(+) Enactment of new legislation permitting SFI to fund overseas projects	(-) Exchequer constraints means that cross-border interoperability of Irish funding programmes will be limited	
<b>MS15</b>	Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next SF programmes	(-) No new recent actions in this area	(+) Ireland supports ESFI road-map which influenced SFI Research Infrastructure 2012 funding initiative  (+) Ireland seeking to exploit RI funding opportunities in Horizon 2020	
<b>MS16</b>	Action 5: Remove legal and other barriers to cross-border access to RIs	(+) Publication by Higher Education Authority of National Guidelines For Access By Researchers To Research Infrastructure Hosted By Higher Education Institutions Or Other Research Bodies In Ireland	(+) Recognition of importance of researchers gaining access to research infrastructures that have been financed with public funds	

ERA priority 3: An open labour market for researchers	MS24	Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers	(-) No new actions in this area	(+) Ireland is recognised as having a very open and transparent system for recruiting researchers  (+) Extensive employment equality legislation in force
	MS25	Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national grants	(+) New SFI legislation will allow some cross-border access to research funding	(+) Irish research funding is very open to access by non-national researchers but the research generally must be carried out in Ireland  (-) Opportunities for non-national portability of grants is limited
	MS26	Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network	(-) Now new actions in this area	(+) The Euraxess office in Ireland is heavily involved in organising Hosting Agreements for third country researchers
	MS27	Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.	(+) A number of structured PhD programmes are currently in operation	(+) Report of the National Research Prioritisation Strategy steering group endorses the provision of Structured and Industrial PhD training programmes
	MS28	Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers incorporating the Charter & Code	(-) No new actions	(-) Charter and Code operate at institutional level only  (-) Charter and Code does not apply to early-stage researchers who in the Irish HEI system are classified as students
ERA priority 4: Gender equality and	MS39	Action 1: Create a legal and policy environment and	(+) New SFI Advance Fellowship	(+) Ireland has a comprehensive employment equality legislation framework

gender mainstreaming in research		provide incentives	funding initiative to assist female researchers to return to research	(-) Lack of policy initiatives focusing on gender equality in research
	MS40	Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender	(+) SFI has set performance targets for increasing women in research	(-) Lack of dedicated funding programmes aimed at fostering cultural change in research institutions on gender
	MS41	Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment /career progression and in establishing and evaluating	(-) No new action in this area in 2013	(+) Most universities have gender balanced recruitment committees  (-) There are national guidelines on gender composition of State boards but enforcement is an issue
ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including via digital ERA	MS45	Action 1: Define and coordinate their policies on access to and preservation of scientific information	(+) National Principles for Open Access Policy Statement have been published	(+) Wide-spread support among funders, researchers and data repositories to allow open access to data  (-) No indication yet when the National Principles on open access will be converted into a national policy statement
	MS46	Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies	(+) Appointment of a director to the new national technology transfer service, cTTO	(+) High-level policy support for the transfer of knowledge from the HEI and PRO sectors to the business enterprise sector to create employment opportunities  (+) Research funders promote open access to research data
	MS47	Action 3: Harmonise access and usage policies for research and education-related public e-	(+) Publication of national guidelines for access by	(+) Policy-makers recognise the need for policies to allow researchers to access publicly-funded large-scale research infrastructures

		infrastructures and for associated digital research services enabling consortia of different types of public and private partners	researchers to research infrastructure s	
	<b>MS48</b>	Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	(-) New no actions in this area	(+) e-IDs for researchers organised at a research institution level

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## LIST OF ABBREVIATIONS

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ACSTI	Advisory Council for Science, Technology and Innovation
BERD	Business Expenditure on Research and Development
BMW	Border, Midland and Western Region
CSET	Centres for Science, Engineering and Technology
CSO	Central Statistics Office
cTTO	Centralised Technology Transfer Office
DES	Department (Ministry) of Education and Skills
DJEI	Department (Ministry) of Jobs, Enterprise and Innovation
DSE	Discover Science and Engineering
EEA	European Economic Area
EI	Enterprise Ireland
ERA	European Research Area
FTE	Full time equivalent
GBAORD	Government Budget Appropriations or Outlays for R&D
GDP	Gross Domestic Product
GERD	Gross Expenditure on Research and Development
GNP	Gross National Product
HEA	Higher Education Authority
HEI	Higher education institutions
HERG	Higher Education Research Group
HRB	Health Research Board
IDA	IDA Ireland
IMF	International Monetary Fund
IP	Intellectual Property

IRC	Irish Research Council
IRCHSS	Irish Research Council for the Humanities and Social Sciences
IRCSET	Irish Research Council for Science, Engineering and Technology
MNC	Multinational Company
NDP	National Development Plan
NRP	National Reform Programme
NRPE	National Research Prioritisation Exercise
OECD	Organisation for Economic Co-operation and Development
PAG	Prioritisation Action Group
PRTLII	Programme For Research In Third Level Institutions
R&D	Research and Development
RI	Research Infrastructure
RIS <sup>3</sup>	Research and Innovation Strategies for Smart Specialisation
RTO	Research and Technology Organisation
S <sup>3</sup> Platform	Smart Specialisation Platform
S&E	Southern and Eastern Region
SFI	Science Foundation Ireland
SSTI	Strategy for Science, Technology and Innovation 2006-2013
STI	Science, Technology and Innovation
VC	Venture capital

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