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Executive Summary

Ireland has been — and continues to be — a major casualty of the economic downturn; its GDP growth rate declined in 2008 and fell even more sharply in 2009. In November 2010, the Irish Government accepted a €67.5b joint support programme from the EU and IMF.¹

Expenditure on research and development (GERD) in Ireland has risen steadily from €2.4b in 2007 to €2.8b in 2009, an increase of just under 16%. GERD as a percentage of GDP increased from 1.45% in 2008 to 1.77% in 2009 — though it should be noted that this ratio improvement has been assisted by the rapid decline in GDP.

Expenditure on research and development by the business sector also increased during the period 2008-2009. Spending by companies on research amounted to €1.687b in 2008 and advanced to €1.868b in 2009, representing a 9.2% increase. Business expenditure on research accounts for approximately two-thirds of all research expenditures and 70% of BERD is accounted for by foreign owned companies.

The higher education sector accounts for 29% of GERD with the balance of 4.5% being accounted for by the public research sector. The seven universities represent the largest research performers in the higher education sector while Teagasc is the largest research performer in Ireland's comparatively small PRO sector.

Progress in developing Ireland's research infrastructure — particularly within the higher education institutions — has been reflected in a rise in Ireland's research ranking in terms of the impact of its scientific research. In 2003, Ireland ranked 36th in Thomson Reuters Essential Science Indicators but by 2010 it had broken into the top 20.

One of Ireland's strengths is the number of people with science and technology qualifications as a percentage of the workforce: this rose from 41.2% in 2007 to 45.9% in 2010 and was higher than the EU average of 40.5%.

The research and innovation governance structure comprises the Cabinet Committee on Economic Recovery and Jobs at its apex which is supported by a high level governmental co-ordinating body in the form of the Inter-Departmental Committee on Science, Technology and Innovation. Both can draw on the Chief Scientific Adviser, the Advisory Science Council and Forfás for advice and policy input. Four public sector agencies account for the bulk of research and innovation funding: the Higher Education Authority, Science Foundation Ireland, IDA Ireland and Enterprise Ireland.

Recent changes in the governance structure include the transfer of responsibility for the Programme for Research in Third Level Institutions from the Department of Education and Skills to the Department of Jobs, Enterprise and Innovation and the Government's decision in December 2011 to merge the two research councils, the Irish Research Council for Science, Engineering and Technology (IRCSET) and the Irish Research Council for the Humanities and Social Sciences, (IRCHSS) into a single body,.

¹ Comment: €17.5b of own existing financial resources was also used – see parag. 6 of <http://www.merriionstreet.ie/wp-content/uploads/2010/12/EUIMFmemo.pdf>

The main trends in research and innovation funding indicate a decline in funding allocated under the [Strategy for Science, Technology and Innovation 2006-2013](#) for the higher education and agri-food sectors over the period 2009-2011 and an increase in the allocation for the enterprise sector. The new Government, which took office in March 2011, has prioritised funding for commercialisation and innovation.

The Government is considering the report of the National Research Prioritisation Exercise (NRPE) which had been initiated in 2010. The purpose of the review was to identify those areas of opportunity or challenge for Ireland with potential to deliver the greatest return to the economy via jobs and/or the exploitation of tangible or intangible goods. Ireland's [National Reform Programme](#) (NRP) notes that the findings from this project will shape priorities for public R&D investment.

The main structural challenges faced by the national system include the following:

- The dual nature of the enterprise sector: on one hand, large foreign owned high technology companies and, on the other, a large number of indigenous SMEs operating in low and medium technology sectors. The challenge for policy-makers is to get the former to undertake more R&D while seeking to encourage SMEs that do not innovate to become involved in research and innovation;
- Low levels of formal collaboration: recent policy reports have highlighted the low levels of linkages between higher education institutions and enterprises. Recent policy trends in seeking to transfer knowledge from the HEIs to the business sector require better linkages between the two sectors;
- Low absorptive capacity of indigenous SMEs: the new Government is committed to developing a network of Technology Research Centres to work on applied technological research issues;
- Lack of clarity and consistency in the national IP regime: a number of government committees are examining ways in which IP transfer can be enhanced;
- Insufficient early-stage Venture Capital funding: the Government has launched a major new initiative, Innovation Fund Ireland, to address this issue.

The main research and innovation priority as stated in the NRP are 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 main focus of Government research and innovation policies is on a range of measures to facilitate greater RTDI expenditure in the private sector including improvements in fiscal measures to support research and development (R&D tax credit), supports for higher education-industry linkages and supports for in-company R&D and start-up companies.

Ireland has successfully targeted foreign direct investments projects with an RTDI element — in 2009, nearly half of FDI in Ireland were in research, development and innovation. Attracting more mobile R&D related FDI projects is a key policy objective as is encouraging existing foreign owned companies to invest more in research and innovation. The Government has made several changes to the R&D tax credit — the most recent of which were announced in the 2012 Budget — to make it more attractive for companies to undertake research and innovation in Ireland. The 2012

Budget proposals will make it easier for enterprises to outsource their R&D activities to HEIs or organisations.

Policy-makers also wish to capitalise on the substantial investment that Ireland has made in its science infrastructure in order to create employment. The priority here is to develop linkages between knowledge producers (mainly the higher education institutions) and enterprises so that knowledge can be transferred to industry where it potentially can be converted into commercial products and services. The policy actions here focus on providing supports to facilitate higher education-industry collaboration and include measures such as Competence Centres, Industry-led Research Networks and Strategic Research Clusters.

Ireland's policy mix is closely aligned with the ERA pillars and objectives; the Government has indicated that Irish RDI activities can contribute to the collective effort to strengthen the European research and innovation system while EU initiatives such as support for researcher mobility and the funding of frontier research are contributing directly to the achievement of national objectives.

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Introduction

Ireland is a country with a small population (4.58m [2011]) compared to most EU Member States; it accounts for less than 1% of the total EU population.

Ireland is facing significant economic difficulties; GDP declined by 7% in 2009 and 0.4% in 2010. However, signs of growth in the Irish economy in the first two quarters of 2011 were reversed by negative GDP growth in Q3². The economy is expected to show small growth in 2012 on the back of a strong export performance.

The number of people employed in Ireland has been falling and the national statistical agency indicates that the unemployment rate rose to 14.4% in the third quarter of 2011.

GDP per capita fell from €40,500 in 2008 to €34,900 in 2010. GNP, which is a better measure of economic activity in Ireland, decreased by 9.8% in 2009 but increased by 0.3% in 2010.

Total expenditure on R&D (GERD) in Ireland rose from €2.4b in 2007 to €2.8b in 2009, an increase of 15.8%. GERD as a percentage of GDP rose from 1.45% in 2008 to 1.77% in 2009 (it should be noted that this ratio improvement was assisted by the decline in GDP), though was still lower than the EU 2009 average of 2.01%.

Business expenditure on R&D also rose during the period 2008-2009; it increased from €1,687b in 2008 to €1,868b in 2009, an increase of €156m or 9.2%.

The most recent BERD statistics for 2009-2010 show that in excess of 80% of total research and development expenditure was concentrated in four sectors: Manufacturing, Information and communication services, Real estate activities and Professional, scientific and technical activities³.

There were almost 1,300 enterprises engaged in research and development activities in Ireland in 2009. More than two thirds of all enterprises spent less than €500,000 on research and development activities, over one fifth spent more than €500,000 and less than €2m while over 10% spent €2m or more.

Eurostat data shows that Business R&D accounted for 66.3% of GERD in 2009 with the Government and Higher Education sectors accounting for 4.5% and 29.4% respectively.

Increasing the numbers of PhDs has been a key Government R&D metric: in 2006, the Irish education system produced a total of 979 PhDs but by 2009, this number had risen to 1,211 — an increase of 24% in four years. Total number of R&D researchers as a percentage of the total labour force increased marginally from an estimated 0.92% in 2007 to 1% in 2008⁴. The number of people with science and technology qualifications as a percentage of the labour force rose from 41.2% in 2007 to 45.9% in 2010.

² Central Statistics Office:

http://www.cso.ie/en/media/csoie/releasespublications/documents/latestheadlinefigures/qna_q32011.pdf

³ Central Statistics Office and Forfás:

<http://www.cso.ie/en/media/csoie/releasespublications/documents/informationtech/2010/berd10.pdf>

⁴ Unless otherwise stated, figures are from Eurostat 2011:

http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/database

Eurostat data shows that Ireland's patent performance — as measured by the number of EPO patent applications per million inhabitants — increased from 65.44 in 2006 to an estimated 73.7 in 2008.

In terms of university rankings, the results of the *Times Higher Education World University Rankings 2011-2012*⁵ survey show that the two leading Irish universities, Trinity College Dublin (117) and University College Dublin (159), both dropped out of the top 100 ranking that they attained in 2010-2011. In the *QS World University Rankings 2011-2012*⁶, however, Trinity was ranked 65 while University College Dublin was ranked 134.

Recent data from *Thomson Reuters Essential Science Indicators 2010*⁷, which measures the impact of countries' scientific research, ranks Ireland in 20th position in the world across all research fields — a dramatic rise from its placing of 36th as recently as 2003. Ireland is ranked even higher in areas such as in Immunology (3rd) and Materials Science (8th).

A comprehensive study of publicly-funded research performance published by Forfás and the Higher Education Authority in 2009⁸ shows that Ireland has improved in terms of the volume and impact of its research. Ireland is ranked 8th on the impact of research publications within a group of 20 comparator countries, including; Denmark, Netherlands, US, UK, Finland, Australia, Singapore and China.

National research and innovation system structure and governance

The Cabinet Committee on Economic Recovery and Jobs is situated at the apex of the research and innovation policy governance structure and the main high-level governmental co-ordinating mechanism is the Inter-Departmental Committee on Science, Technology and Innovation. Other important actors include the Office of Science, Technology and Innovation at the Department of Jobs, Enterprise and Innovation, the Chief Scientific Adviser, the Science Advisory Council and Forfás (the enterprise and science policy advisory board). Forfás provides secretariat services to the Chief Scientific Adviser and the Science Advisory Council. The main STI funding agencies include the Higher Education Authority (HEA), Science Foundation Ireland, Enterprise Ireland and IDA Ireland.

The structure and governance of the Irish national research and innovation system is undergoing change. The previous Government put in place a structure to oversee implementation of the Report of the Innovation Taskforce in the form of an Implementation Committee chaired by the Minister for Enterprise, Trade and Innovation. The Committee noted much progress had been made in implementing many of the key recommendations and that some recommendations were more concepts than recommendations that would need further study before they were ready to be implemented. Work on the Innovation Taskforce Report has been somewhat overtaken by events as the focus has now moved to implementation of the Report of the Research Prioritisation Steering Group. A final summary of the state of play on implementation of all of the recommendations of the Innovation Taskforce is due to be finalised by the Department of Jobs, Enterprise and Innovation shortly.

⁵ <http://www.timeshighereducation.co.uk/world-university-rankings/2011-2012/top-400.html>

⁶ <http://www.topuniversities.com/university-rankings/world-university-rankings>

⁷ <http://www.sciencewatch.com/about/met/latestversionesi3/>

⁸ Forfás and the Higher Education Authority (2009): Research strengths in Ireland: a bibliometric study of the public research base. http://www.forfas.ie/media/forfas091209_bibliometric_study.pdf

The Government has already announced that the two research councils, the Irish Research Council for the Humanities and Social Sciences and the Irish Research Council for Science, Engineering and Technology, will be merged into one consolidated body under the HEA and that it is examining the scope to merge Forfás into the Department of Jobs, Enterprise and Innovation.

The Government decided in 2010, *inter alia*, in order to facilitate greater HEI-industry collaboration, to transfer responsibility for the [Programme for Research in Third Level Institutions](#) from the Department of Education and Skills to the Department of Jobs, Enterprise and Innovation (the HEA continues to be responsible for its management).

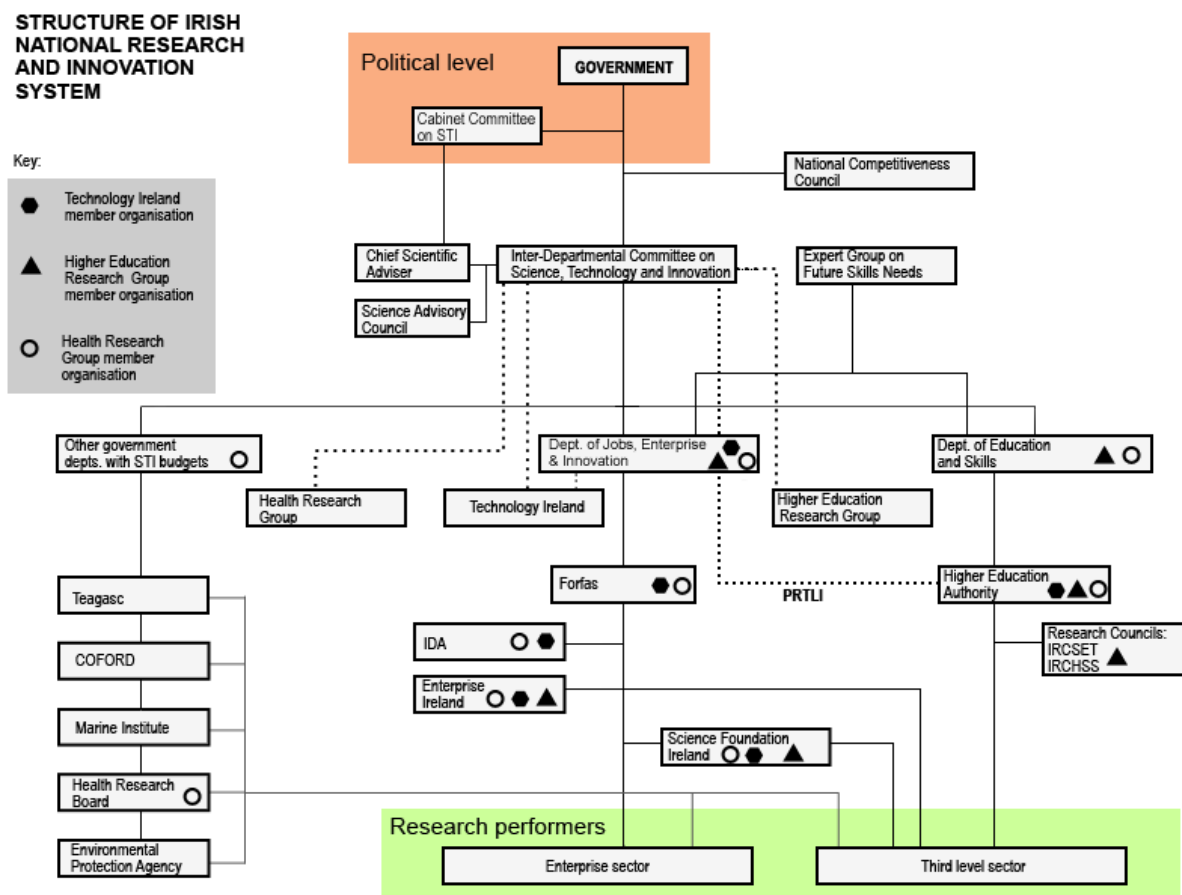
The main research performers are the seven universities and to lesser extent, the network of Institutes of Technology. Ireland's public research organisation sector is small by European standards; Teagasc, the agriculture and food development agency, is the largest PRO performer with an estimated research budget of €48.5m in 2010.

Foreign owned enterprises accounted for almost 70% of all business expenditure on research and development in 2009.

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.

Figure 1: Overview of Ireland's research and innovation system governance structure



Structural challenges faced by the national system

Dual nature of Irish enterprise sector

Recent benchmarking reports indicate that Irish enterprises score well compared to the EU average in terms of innovation activity. The *Community Innovation Survey*⁹ shows that Irish enterprises are more likely to be innovative (45%) compared to the Euro area-15 (40%). Irish enterprises were ranked 4th in the euro area-15 manufacturing innovation ranking and 3rd in the services innovation ranking.

These statistics disguise, however, the dual nature that characterises the Irish enterprise sector: on one side, a small number of large foreign-owned high technology companies and, on the other, a large number of small indigenous-owned enterprises operating in predominantly low and medium technology sectors. Foreign-owned enterprises — largely concentrated in the ICT and pharma sectors — exhibit higher levels of innovation compared with indigenous enterprises. Two-thirds of business expenditure on research and development in 2009 was carried out by foreign companies.

Ireland has been successful in recent years in attracting mobile R&D-related FDI investments; it is estimated that just under 50% of total inward FDI projects to Ireland in 2009 had a research and innovation component¹⁰. The development of a high

⁹ http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/en/inn_esms.htm

¹⁰ IDA Ireland, Annual Report 2009

quality science infrastructure in Ireland and Ireland's low corporation profit tax are cited as among the main reasons why these R&D FDI projects located in Ireland.

Attracting R&D mobile investments is a key government objective and in addition to the marketing efforts of IDA Ireland, the body responsible for promoting inward investment, the Government is also continuing to enhance the R&D tax credit so as to further promote Ireland's attractiveness to multinational companies as a location in which to carry out research and development activities.

The other major challenge for Irish policy-makers is to facilitate higher levels of innovation performance in indigenous companies and to encourage those SMEs that do not innovate to become involved in R&D; a challenge that is exacerbated by the difficult economic and trading environment.

In addition to support measures such as the R&D Grants initiative to assist the R&D capability of SMEs (€39m expenditure on 2010) offered by Enterprise Ireland, the agency responsible for the development of indigenous industry, the new Government (which took office in March 2011) has made a commitment to make the R&D tax credit — subject to a cost-benefit analysis — more attractive and accessible to SMEs. The Government's 2012 Budget contains a number of enhancements to the tax credit.

Low levels of formal collaboration

The Forfás 2011 report on Ireland's innovation performance, *Analysis of Ireland's Innovation Performance (2011)*¹¹, and other high level studies have identified the low level of linkages between SMEs and the HEIs as a weakness in the Irish innovation system. The level of formal inter-firm and HEI-HEI interactions is also low.

A key aim of the [Strategy for Science, Technology and Innovation 2006-2013](#) is to strengthen the National Innovation System among its many dimensions, particularly with regard to the systemic aspect: forging more effective linkages and interactions among the different parts of the system. The challenge for policy-makers is that there is now a renewed focus on transferring knowledge from the higher education sector to industry and implies developing better linkages between the HEIs and enterprises.

A number of new support measures from Enterprise Ireland seek to improve collaboration between industry and the higher education sector; the [Innovation Voucher](#) scheme has been very successful in encouraging small enterprises to interact with knowledge providers. The Competence Centres (now known as Technology Centres) and the Industry Led Research Networks initiatives provide funding for groups of enterprises to engage HEI researchers in pursuing industry-led research projects. The Innovation Partnership programme supports individual companies to undertake collaborative research with higher education research groups. The initiative supports an average of 50 projects a year with a budget of €8m. A number of initiatives developed by Science Foundation Ireland such as the Centres for Science, Engineering and Technology and Strategic Research Clusters also seek to promote collaboration between higher education institutions and industry.

Recent enhancements to the R&D tax credit announced in the Budget 2012 will make it easier for enterprises to outsource their R&D activities to higher education institutions which should also help the development of formal linkages.

¹¹ Forfás (2011), Analysis of Ireland's Innovation Performance, http://www.forfas.ie/media/forfas110323-Analysis_of_Irelands_Innovation_Performance.pdf

The Programme for Research in Third Level Institutions (PRTL) has been instrumental in facilitating HEIs to collaborate with each other. The fifth and current cycle of the PRTL is funding the Innovation Alliance, a collaborative venture between Trinity College Dublin and University College Dublin, which involves the establishment of a new 4th-level Innovation Academy and a Joint Venture in Enterprise Development. The University of Limerick and the National University of Ireland Galway have also formed a strategic alliance. The PRTL has been unique in the emphasis that it has placed on collaboration and the encouragement of institutions to focus on particular areas of research and to collaborate to strengthen national performance. The Programme also aims to facilitate greater collaboration between research activities in higher-education institutions on the whole island of Ireland.

Low absorptive capacity of indigenous SMEs

Studies have shown that indigenous SMEs have a lower innovation absorptive capacity. A recent report by Forfás, *Analysis of Ireland's Innovation Performance* (2011), indicates that small indigenous enterprises had low levels of co-operation arrangements and thus may not be benefitting fully from positive externalities arising from close proximity to innovative foreign-owned enterprises. The report also found that the contribution to turnover of new-to-firm and new-to-market innovations was below EU average.

A 2005 Forfás report, *Making Technological Knowledge Work*, prepared by Technopolis shows that in relation to innovation activities 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. Consequently, the government places a significant priority on developing the skills and absorptive capacity of enterprises to adapt and exploit technologies, whether developed in Ireland or internationally.

Considerable focus has been placed within the Irish education system on the development of fourth level education i.e. the provision of graduate education, particularly structured PhD courses (programmes that preserve the PhD's traditional strengths and embed activities that support the acquisition of a range of relevant specialist and generic skills). However, there is concern that the difficult economic climate is reducing the capacity of industry, especially SMEs, to employ fourth level graduates which in turn would negatively impact on its capacity to absorb technological knowledge.

Additionally, Ireland, unlike other EU Member States, lacks a network of specialised research institutes along the lines of the German Fraunhofer Institute or Danish GTS Institutes whose mission is to provide technological services, especially to SMEs. There is one such organisation in the agri-food sector, Teagasc, which has close connections with food companies. The report of the Enterprise Strategy Group called for a dedicated support structure for industrial research and development.

Technological services in sectors outside of the food industry are provided in Ireland by higher education institutions (HEIs) which up until now have given a higher priority to their teaching and research roles. The new strategy for the higher education sector highlights the need for HEIs to give equal priority to — alongside their teaching and research roles — an engagement role with key stakeholders, such as industry.

The Programme for Government, *Government for National Recovery 2011-2016*¹², notes that there is a critical gap between basic research promoted and funded by Science Foundation Ireland and third level institutions and its subsequent development into commercial opportunity for investors can only be closed by making new technologies 'investment ready'. The document says that a network of Technology Research Centres will be established focused on applied technological research in specific areas, to be linked to appropriate higher education institutions. The centres will accelerate exploitation of new technologies by providing infrastructure that bridges gap between research and technology commercialisation. The Government plans to initially establish three additional centres focussing on biotechnology, nanotechnology and high value manufacturing. Further centres from a number of other areas will be selected at a later time.

Lack of clarity and consistency in national IP regime

The report of the Innovation Taskforce, *Innovation Ireland* (published in March 2010), indicated that there was confusion amongst both industry and HEIs around national policy in respect of the terms that apply to HEI-industry research and access rights to HEI IP. The report noted that industry needed predictability around these issues and the current system of IP does not facilitate smooth collaboration between MNCs and HEIs.

The report said that Ireland had an opportunity to be one of the few locations in the world for which there was clear, fair and unambiguous operating procedures for State supported IP.

The government in its national plan for reducing the budget deficit, *Government for National Recovery 2011-2016*, commits to the development of a national IP protocol to give predictability about the terms on which the enterprise sector can access IP created in HEIs and the wider digital sector.

The Intellectual Property Implementation Group is in the final stages of drafting a national IP strategy which will provide for a new, simplified Intellectual Property framework to ease the transfer of technology between the higher education sector and enterprise.

Insufficient early-stage Venture Capital funding

The *Innovation Union Scoreboard 2010*¹³ noted weaknesses in relation to venture capital, an issue that had been raised in the Innovation Taskforce's report in 2010. The latter report highlighted that despite recent investments by Enterprise Ireland in seed capital funding there was insufficient early stage funding through both the public and private sectors in Ireland. Additionally, the report stressed the importance of developing business angel funding and also recommended changes to the Business Expansion Scheme and the Seed Capital scheme.

The government has moved to address the weakness in venture capital funding through the establishment of Innovation Fund Ireland initiative and through proposed changes to the Business Expansion Scheme.

¹² Department of the Taoiseach (2011): Government for National Recover 2011-2016, http://www.taoiseach.gov.ie/eng/Publications/Publications_2011/Programme_for_Government_2011.pdf

¹³ <http://www.proinno-europe.eu/inno-metrics/page/innovation-union-scoreboard-2010>

Assessment of the national innovation strategy

National research and innovation priorities

Ireland's first and current multiannual R&D strategy document is the [Strategy for Science, Technology and Innovation 2006-2013](#) (SSTI) published in 2006 and which has a large focus on the continued development of the science base; two of its key metrics relate to doubling the number of PhDs and to the composition of research teams.

The current [National Reform Programme](#) (NRP) document for Ireland acknowledges that recent economic events have caused an interruption to the trajectory of the targets set in the SSTI — such as achieving the research intensity of 2.5% of GNP by 2013. The National Competitiveness Council in its *Ireland's Competitiveness Scorecard 2011*¹⁴ report noted that taking account of the constraints on productive investment to 2014 imposed by the *National Recovery Plan*¹⁵ (and assuming that public funding of R&D would remain constant over this period, and that private funding would increase by an average of 3% per annum), this scenario would give a research intensity level at end-2014 of 1.51% of GDP (1.93% of GNP).

The publication of the medium term economic framework document, *Building Ireland's Smart Economy*, in December 2008 was the Government's first strategic response to the emerging economic, banking and fiscal crisis. The document highlighted the need to re-prioritise policies to stimulate the economy including an emphasis on investing in research and development and on building the innovation or 'ideas' component of the economy through the utilisation of human capital. One of its main policy priorities was to invest heavily in research and development, incentivise multinational companies to locate more R&D capacity in Ireland, and ensure the commercialisation and retention of ideas that flow from that investment.

The *Building Ireland's Smart Economy* document also sought to position Ireland as an international innovation hub, and an Innovation Taskforce was established in 2009 to advise the Government on its strategy for achieving this. In its report published in 2010, *Innovation Ireland*, the Taskforce recommended that the Government should deliver on the investment framework set out in the SSTI and achieve the goal in the renewed Programme for Government of investing 3% of GDP on R&D by committing to an updated SSTI for the 2014-2020 period.

The Government has also identified the potential for Ireland to become a major player in research and innovation in internationally traded services; the Department of Enterprise, Trade and Innovation's *Trading and Investing in a Smart Economy: A Strategy and Action Plan for Irish Trade, Tourism and Investment to 2015* points to the significant growth potential in new services resulting from convergence between different sectors, such as health informatics, financial analytics and digital lifestyle management.

The Strategy and Action Plan also noted that Ireland had an opportunity to become a global centre for the development and commercialisation of technologies, services and products that improve the well-being of older people across the world.

¹⁴ National Competitiveness Council (2011), Ireland's Competitiveness Scorecard 2011, http://www.competitiveness.ie/media/Forfas060911_Irelands_Competitiveness_Scorecard_Report.pdf

¹⁵ Department of Finance (2010), National Recovery Plan 2011-2014, <http://budget.gov.ie/The%20National%20Recovery%20Plan%202011-2014.pdf>

In light of the deepening economic downturn, documents such as the Strategy and Action Plan and the report of the Innovation Taskforce signalled the Government's intention to give priority to innovation and commercialisation strategies. This focus was also found in more recent documents such as the Programme for Government agreed by the two coalition parties elected into office in February 2011.

In relation to innovation and commercialisation, the document stated the Government would implement innovation and commercialisation policies, including the following (subject to a cost-benefit analysis):

- Implementation of the recommendations of the Trading and Investing in the Smart Economy report;
- Supporting the development of the indigenous digital gaming industry;
- Develop Ireland as a leader in the cloud computing sector;
- Develop a National Intellectual Property (IP) protocol to give predictability about the terms on which business can access IP created in Higher Education Institutions and the wider digital sector;
- Promote and support investment in technology research, development and commercialisation beyond basic research supported by Science Foundation Ireland, as well as removing barriers to innovation and accelerate exploitation of new technologies;
- Target key technology areas and sectors where innovation can be applied;
- Address the critical gap between basic research promoted and funded by Science Foundation Ireland and third level institutions and its subsequent development into commercial opportunity for investors. This can only be closed by making new technologies 'investment ready' through the establishment of a network of Technology Research Centres;
- Amend the R&D tax credit regime to make it more attractive and accessible to smaller businesses.

Under the heading of supports for SMEs, the Programme for Government said it would use public procurement to become a tool to support innovative Irish firms and to allow greater access to Irish small and medium sized businesses.

Underpinning these policy initiatives is the recognition that Ireland has made a substantial investment in its research infrastructure and researcher population — particularly within the higher education sector — and given the severe economic environment there was a need to ensure that the knowledge generated can be used to create commercial products and services leading to wealth and employment creation. The focus, therefore, in terms of research and innovation policy direction is to ensure that linkages are developed between the HEIs and industry in order to facilitate the knowledge flow and that supports are provided to assist companies to utilise that knowledge to create marketable products and services.

The Government has pointed out while the areas around which public R&D budgets have been oriented to date (ICT, biotechnology, aspects of energy policy) were appropriate for building a broad base of national expertise in fundamental, underpinning science and technology there was now a need to leverage the strengths that have emerged from the investment that has taken place. It also stated that it needed to target investment so that Ireland would have a critical mass in areas that link more precisely to sustaining or growing jobs.

The recommendations of the independently constituted Research Prioritisation Steering Group (established in 2010) will be important in implementing efficiency and effectiveness in the Irish system of public investment in R&D.

The report of the Advisory Group for Small Business, *The Voice of Small Business — A Plan for Action*, includes a recommendation to develop and implement a new model for procuring innovation within the public sector that facilitates effective engagement with small firms.

There has been no recent published large-scale evaluation of the Irish R&D/innovation system. The Department of Finance carried out a review of major research and innovation support measures as part of a capital expenditure review and there have been evaluations of Ireland's memberships of international organisations such as the European Molecular Biology Laboratory. (However, there was a full Value For Money study done on SFI. Furthermore, reviews of specific programmes are on-going.)

Trends in R&D funding

The Irish economy has been severely affected by the recession and in 2009 recorded one of the steepest declines in the EU with the GDP growth rate falling by 7%. GDP growth recovered somewhat in 2010 (-0.4%) but fell back again in 2011 (-1.9% in the third quarter of 2011). The outlook is for low levels of growth largely on the back of a strong export performance. However, the domestic market remains weak.

Gross expenditure on research and development as a percentage of GDP increased from 1.45% in 2008 to 1.77% in 2009 but was below the 2009 EU average rate of 2.01%. The *Innovation Union Scoreboard 2010* categorised Ireland as an innovation follower — along with Austria, Belgium, Cyprus, Estonia, France, Luxembourg, Netherlands, Slovenia and the UK — as showing a performance close to that of the EU-27.

GERD per capita in Ireland increased from €594.5 in 2008 to €633.5 in 2009, in both cases, significantly above the 2009 EU average of €473.9.

GERD financed by abroad as percentage of total GERD remained largely unchanged between 2008 and 2009 at 15.6%. The European Regional Development Fund under the National Strategic Reference Framework 2007-2013 partly funds the Border, Midlands and Western and Southern and Eastern Regional Operational Programmes which include measures to improve their competitiveness and innovation capacity.

Government expenditure on R&D (GBAORD) in Ireland decreased marginally from €945.8m in 2008 to €941m in 2009. However, Irish GBAORD as a percentage of GDP increased from 0.53% in 2008 to 0.59% in 2009; despite this increase (caused by declining GDP), Ireland was still below the estimated 2009 EU average of 0.71%.

The *Innovation Union Competitiveness Report 2011*¹⁶ notes that Ireland was among a small group of countries whose real growth in R&D expenditure over the period 2000-2009 exceeded 100%. The Report also said that Ireland's average annual growth in R&D intensity was 1.85% over the period 2000-2006 and 12.20% in 2006-2009, compared with the EU average of -0.10% and 2.78% respectively for the same periods.

¹⁶ http://ec.europa.eu/research/innovation-union/index_en.cfm?section=competitiveness-report&year=2011

Business expenditure on research and development (BERD) in Ireland increased from €1.7b in 2008 to €1.9b in 2009; BERD as a percentage of GDP rose from 0.94% in 2008 to 1.17% in 2009. Ireland lies slightly below the 2009 EU average of 1.25%.

Foreign owned companies accounted for 70% of business expenditure on research and development in 2009. The Central Statistics Office/Forfás publication¹⁷ on business expenditure on research and development covering 2009-2010 indicates that foreign owned companies estimated that their R&D expenditures for 2010 would be lower than their actual 2009 spend while, somewhat surprisingly, indigenous companies estimated that their 2010 expenditures would be slightly higher than their actual 2009 spend.

Eurostat data indicates that the business enterprise sector accounted for over half (50.8%) of general expenditure on R&D in Ireland; this compares with the 2009 EU average of 62%.

The [National Reform Programme for Ireland under the Europe 2020 Strategy](#) (NRP) document notes that Higher Education R&D (HERD) increased over the period 2005 to 2009 from €550m to €829m (+ 42% in real terms). As a result of this investment, Ireland has built a strong science base, and has joined countries such as Finland, Germany and the USA in the world's top twenty countries for scientific output.

The NRP also says that the government has set a headline target of improving the conditions for research and development, in particular with the aim of increasing combined public and private investment levels to 2.5% of GNP (approximately equivalent to 2.0% of GDP).

Ireland's *National Recovery Plan 2011-2014*, as endorsed by the EU Commission and the IMF, takes account of the fact that strategic R&D investment is one of the Government's infrastructure investment priorities and to that end includes a range of actions to support innovation in the economy, drawing in particular on the recommendations of the Innovation Taskforce, *Innovation Ireland* (2010), with a strong emphasis on commercialisation of research and supporting start-up enterprises.

The NRP documents note that the assumptions underpinning the National Recovery Plan are that the public investment in R&D will, at a minimum, be maintained at the existing level to 2014. This is reinforced by the new Programme for Government which outlines a significant set of Innovation and Commercialisation strategies and goals which confirms that this productive investment is seen as one of the key drivers of Ireland's economic recovery. The NRP document also states that research has a significant role to play across a range of sectors including developments in the agri-food area, and in meeting environmental and social objectives.

The most recent report of the National Competitiveness Council, *Competitiveness Challenge 2010*¹⁸, recommended that public R&D funding should prioritise programmes which have strong business relevance and participation.

The Forfás review of R&D funding and performance in the State Sector 2009-2010 indicates that the largest agency funding R&D in 2010 is the HEA with an estimated budget of €288.7m (or 33% of total State spending on R&D). The HEA research

¹⁷ Central Statistics Office and Forfás:

<http://www.cso.ie/en/media/csoie/releasespublications/documents/informationtech/2010/berd10.pdf>

¹⁸ National Competitiveness Council (2010), *Competitiveness Challenge 2010*,

<http://www.competitiveness.ie/publications/featuredpublications/title,7075,en.php>

budget includes direct funding such as the PRTL and indirect funding (the block grant). The next largest funder of R&D activities was SFI allocating an estimated €150m to R&D in 2010 via research grants and other research supporting programmes. IDA Ireland and Enterprise Ireland had an estimated combined R&D expenditure budget of €151.6m in 2010. Recent data indicates that industry's take-up of the R&D tax credit increased significantly from €97.3m in 2008 to €153.1m in 2010.

The available indications from policy-makers are that there has been a de facto re-allocation of funding resources away from basic research to closer-to-market research/innovation support measures. This is supported by expenditure data for the Strategy for Science, Technology and Innovation 2006-2013 which reveals that there has been a large decrease in funding for research carried out in the higher education sector between 2009-2011 while funding for enterprise science, technology and innovation support measures has increased slightly during the same period.

Table 1: Basic indicators for R&D investments in Ireland

	2008	2009	2010	EU average 2010
GDP growth rate	-3.0	-7.0	-0.4	2.0
GERD as % of GDP	1.45	1.77	N/A	2.0
GERD per capita	594.5	633.5	N/A	490.2
GBAORD (€ million)	945.8	929.0	N/A	92,729.05
GBAORD as % of GDP	0.53	0.58	N/A	0.76
BERD (€ million)	1,686.7	1,868.2	N/A	151,125.56
BERD as % of GDP	0.94	1.17	N/A	1.23
GERD financed by abroad as % of total GERD	15.5	15.6	N/A	N/A ¹⁹
R&D performed by HEIs (% of GERD)	28.7	29.4	N/A	24.2
R&D performed by PROs (% of GERD)	6.9	4.3	N/A	13.2
R&D performed by Business Enterprise sector (as % of GERD)	48.6	50.8	N/A	61.5

Evolution and analysis of the policy mixes

The economic crisis has impacted Irish research and innovation policies in a number of ways. Firstly, the pressure to reduce Ireland's fiscal deficits has resulted in reduced government research funding for the higher education and public research sectors. Secondly, there is a greater emphasis on developing closer linkages between the HEIs and industry in order to bring about the transfer of knowledge from the higher sector to enterprises so as to assist in the creation of wealth and employment. Thirdly, while the attraction of FDI has been a majority priority, there

¹⁹ 8.4 (2009), 9.04 (2005)

has been a renewed emphasis on incentivising FDI investment with a research and innovation component to locate in Ireland.

The trend in the evolution and analysis of policy mixes are shown below:

Table 2: Trend in the evolution and analysis of policy mixes

<p>Route 1: Efforts to promote the establishment of new, domestic R&D performing firms</p>	<p>The Programme for Government issued by the new Government in March 2011 points to a renewed focus on encouraging new R&D performing start-up companies. One such priority action is to support the indigenous digital game industry by setting aside funding from Innovation Fund Ireland for a seed capital scheme for Irish digital gaming start-ups and promoting Ireland as digital gaming hub.</p> <p>The Innovation Fund Ireland is a major Government initiative to further develop the provision of seed/venture capital funds to Irish firms and involves a partnership with a number of private sector venture capital funds in creating a funding pool for investing in new start-ups.</p> <p>Despite calls from stakeholders including Forfás, the Government has yet to publish a statement on entrepreneurship strategy. The findings of the Global Entrepreneurship Monitor study of Irish entrepreneurship indicated that in 2010 there had been a reduction in the overall rate of early stage entrepreneurial activity, a significant reduction in the population of entrepreneurs, a significant increase in necessity entrepreneurship, and a lowering of entrepreneurial ambition.</p>
<p>Route 2: Efforts to stimulate greater R&D investment by R&D performing firms</p>	<p>Stimulating existing R&D performing firms to increase their research and innovation expenditure is a major priority for Enterprise Ireland, the national agency responsible for the development of indigenous firms, and IDA Ireland, the national agency responsible for foreign direct investment.</p> <p>Enterprise Ireland has a suite of support measures to encourage existing firms to do more research and development including the R&D Fund (budget for 2010 estimated at €39m).</p> <p>The new Government's 2012 Budget contains measures to make the R&D tax credit more attractive and accessible to small and medium sized enterprises.</p>
<p>Route 3: Efforts to stimulate R&D investment by non-performing firms</p>	<p>The main focus here has been support measures offered by Enterprise Ireland and IDA to target non R&D performing companies to undertake research and innovation activities along with the promotion of awareness of the R&D tax credit facility. Enterprise Ireland runs awareness and training programmes to promote the necessity for firms to undertake research and innovation.</p> <p>The high cost of innovation to small firms in Ireland has been identified by Forfás in a March 2011 report, <i>Analysis of Ireland's Innovation Performance</i>, as a weakness in the Irish system and this needs to be addressed by policy-makers.</p> <p>The Forfás report posited the innovation potential and growth opportunities of encouraging firms to engage in non-technological innovation such as marketing or organisational innovation.</p>

<p>Route 4: Efforts to attract R&D performing firms from abroad</p>	<p>Ireland has been very successful in attracting R&D performing firms from abroad to locate in Ireland. Just under half of the FDI projects attracted into Ireland in 2009 were in the research and innovation category. Ireland's low corporation profits tax is a major attraction as are its R&D tax credit and growing science base in the areas of ICT, biotechnology and sustainable energy.</p> <p>The Government has made a number of changes to the R&D tax credit (this allows companies to claim a 25% tax credit for qualifying incremental R&D expenditure on the cost of in-house qualifying research and development activities undertaken within the European Economic Area) to make it more attractive for companies. The increase in the amount of R&D tax credit claimed by companies in the last three years can be used as a proxy indicator of its effectiveness.</p> <p>IDA, the government body responsible for attracting FDI, also has a significant budget (estimated at €80m in 2010) to contribute towards the costs incurred by new firms from abroad in setting up R&D facilities in Ireland as well as the costs incurred by existing foreign owned companies in Ireland.</p>
<p>Route 5: Efforts to increase R&D by stimulating public-private collaboration</p>	<p>The Government in seeking to create exports and employment growth has identified increasing R&D by stimulating public-private collaboration as a key priority. Its priority is to facilitate the transfer of knowledge from the higher education sector to the enterprise sector in order to foster its development into commercial products and services. This has manifested itself in the development of initiatives that encourage HEI-industry linkages such as the Competence Centres and the Industry-Led Research Networks support programmes from Enterprise Ireland and the Strategic Research Clusters support programme from Science Foundation Ireland. An initiative which has proved very successful in linking SMEs with knowledge providers in the HEI/PRO sectors is the Innovation Voucher scheme offered by Enterprise Ireland. The number of firms using the scheme increased from 428 vouchers redeemed in 2007 to 856 in 2010 to a value of €4.2m.</p> <p>Measures to facilitate the transfer of knowledge from the Higher Education Institutions to industry include the development of a new National Intellectual Property (IP) protocol to give predictability about the terms on which business can access IP created in HEIs and the wider digital sector.</p> <p>The involvement of public-private partnerships can also be seen in the provision of seed/venture capital. The Innovation Fund Ireland initiative is a collaborative partnership involving the Irish Government and private sector venture capital providers.</p>
<p>Route 6: Efforts to increase R&D levels in public sector organisations</p>	<p>Investing in the development of a science capacity, particularly in higher education sector, has been a key priority of the Strategy for Science, Technology and Innovation 2006-2013 and has been an important selling point for attracting R&D performing firms from abroad as well as stimulating existing firms in Ireland to engage in research. The main concern is that the pressure to reduce the fiscal deficit is restricting — and will continue to restrict — the provision of funding for research in the higher education and public research organisation sectors. Unless compensated for by increased R&D expenditure in the private sector, this may have a negative impact on Ireland's ambition of achieving its 2.5% GNP (2.0%) target.</p>

The severe fiscal situation and the urgency to increase economic growth has put pressure on the Government to focus on research and innovation measures that will result in increased export sales and employment, and this is reflected in the current policy emphasis on routes 1, 2, 4 and 5.

Assessment of the policy mix

Current policy focus seeks to facilitate the commercialisation of publicly-funded research that has primarily taken place within the higher education sector as a result of significant Government funding for basic research allocated through the Programme for Research in Third Level Institutions and through the programmes offered by Science Foundation Ireland. The economic difficulties have resulted in a pressure on policy-makers to seek an economic return from the investment in basic research made during the last decade through the transfer of knowledge from the higher education institutions to industry which if successfully converted into commercially marketable products and services would lead to increased employment and export sales.

Business R&D expenditure projections for 2010 appear to suggest that indigenous enterprises will increase their level of expenditure over 2009 though the multinational firms — which account for 70% of BERD — estimate that their expenditure on R&D will decline slightly from 2009 levels. This suggests that current supports have largely been effective in encouraging industry to maintain R&D expenditure levels.

IDA Ireland, which is responsible for attracting foreign investment, has been successful in recent years in attracting mobile investment having an R&D component. It is estimated that 45% of all new projects attracted into Ireland in 2009 included an R&D dimension.

There is also recognition that the policy mix should acknowledge the importance of facilitating demand-led innovation. This has been reflected in the development of support measures that are industry-led and include Enterprise Ireland's Competence Centres and Industry-Led Research Networks initiatives.

Enhancing the research and innovation performance of the industry sector — both foreign-owned and indigenous — has resulted in enhancements to key support measures such as the R&D tax credit. Recent changes to this tax credit announced in the Finance Act 2010 have sought to increase its scope and make it more attractive to multinationals; the 2012 Budget announced further changes to the tax credit to make it easier for SMEs to access it. Recent data indicates that industry's take-up of the R&D tax credit increased significantly from €97.3m in 2008 to €153.1m in 2010 which would suggest that changes to the tax credit have been effective.

One of the challenges underpinning an assessment of the Irish policy mix is that there has been no recent published system-wide evaluation of the Irish national innovation system though there have been reviews of key aspects of it. There is a concern that much of the evaluation expertise that had been built up in Forfás, the enterprise and science policy advisory board, has been dissipated — largely as a result of natural wastage — at a time when there is increasing pressure on policy-makers to justify resource allocations to RTDI support programmes.

A related issue is the multiplicity of organisations within the RTDI governance system though the Government is moving to rationalise their numbers; it has already announced that the two research councils, the Irish Research Council for Science, Engineering and Technology and the Irish Research Council for the Humanities and Social Sciences, will be merged into a single body. The previous Government put in place a structure to oversee implementation of the Report of the Innovation Taskforce in the form of an Implementation Committee chaired by the Minister for Enterprise, Trade and Innovation. The Committee noted much progress had been made in implementing many of the key recommendations and that some

recommendations were more concepts than recommendations that would need further study before they were ready to be implemented. Work on the Innovation Taskforce Report has been somewhat overtaken by events as the focus has now moved to implementation of the Report of the Research Prioritisation Steering Group. The economic crisis and associated fiscal pressures have resulted in the establishment of a new Cabinet Committee on Economic Recovery and Jobs which has replaced the t cabinet sub-committee on science, technology and innovation.

There has been on-going debate on the transparency of the national intellectual protection framework policy. Two Intellectual Property Groups, comprising industry, technology transfer and public sector representatives, are working to finalise proposals for a clear and industry-friendly IP Commercialisation Protocol. The Protocol, which is expected to be published shortly, aims to ensure that enterprises can access the IP which arises from research in the public sector in a fair, predictable and consistent way.

Policy areas that might be addressed in the future include initiatives to boost non-technological innovation such as marketing and organisational innovation, particularly among indigenous enterprises. Additionally, there is scope for using public procurement to increase the innovation capacity of SMEs: this was a recommendation of the Innovation Taskforce. Support measures to facilitate the development of inter-firm networks could also help address a structural weakness in the Irish innovation system.

The high cost of innovation has been cited by Forfás as a barrier for SMEs and this should also be addressed in future policy responses.

Table 3: Assessment of the policy mix

Challenges	Policy measures/actions ²⁰	Assessment in terms of appropriateness, efficiency and effectiveness
Dual nature of the enterprise sector	R&D tax credit R&D Grants	<p>The take-up of the R&D tax credit by the business sector has increased but its usage by SMEs has been muted. The Government has committed to making the R&D tax credit more attractive and accessible for smaller companies but as of yet no details have been published. Exchequer funding restrictions notwithstanding, the Government has maintained research and innovation funding for indigenous SMEs to facilitate them to compete in export markets.</p> <p>There is a need to develop non-technological innovation supports e.g. organisational and market innovation, to address weaknesses in these areas among SMEs.</p> <p>The lack of a national entrepreneurship strategy is an omission that needs to be rectified.</p>
Low levels of formal collaboration	Competence (Technology) Centres Industry-Led Research Networks Strategic Research Clusters Centres for Science, Engineering and Technology Innovation Vouchers InterTradelreland Innova Innovation Partnerships	<p>There has been considerable focus on developing support measures to increase linkages between the HEIs and industry in order to assist the transfer of knowledge that can be commercialised by the private sector. These support measures are appropriate given the low levels of formal linkages within the Irish system but it is too early to judge their effectiveness.</p> <p>The Innovation Voucher support measure has been successful in encouraging small enterprises to develop linkages with knowledge providers.</p> <p>There is potential for new policy initiatives to target inter-firm networks.</p>
Low absorptive capacity of indigenous SMEs	There is a commitment in Programme for Government (March 2011) to develop a network of Technology Research Centres Fourth level education InterTradelreland Fusion	<p>The Technology Research Centres network support measure — which incorporates the Competence Centres programme — is currently being developed in the technology areas outlined in the Programme for Government such as biotechnology, nanotechnology and high value manufacturing. Further centres are being planned in learning technologies, cloud computing and financial services.</p> <p>A number of Fourth level initiatives have been launched i.e. the new Marine Institute-IRCSET Industrial PhD scheme, but it is too early to adjudge their effectiveness.</p>

²⁰ Changes in the legislation and other initiatives not necessarily related with funding are also included.

Challenges	Policy measures/actions ²⁰	Assessment in terms of appropriateness, efficiency and effectiveness
Lack of clarity and consistency of national IP regime	Two national IP policy committees are finalising proposals for a national IP protocol and appropriate supporting structures	One of the recommendations of the report of the Innovation Taskforce was the development of a national IP protocol as a matter of priority. The Protocol, which is expected to be published shortly, aims to ensure that enterprises can access the IP which arises from research in the public sector in a fair, predictable and consistent way.
Insufficient early-stage Venture Capital funding	Enterprise Ireland Seed and Venture Capital programme Innovation Fund Ireland	The new Innovation Fund Ireland potentially represents a major source of venture capital funds but it is too early to determine whether it will be effective. The lack of general credit availability for businesses is a concern.

National policy and the European perspective

The Government views activities at European level such as trans-national collaborative research, funding of frontier research, support for researcher mobility (trans-national and inter-sectoral) and careers, measures to enhance knowledge transfer and initiatives to facilitate the tackling of important societal challenges, as contributing directly to the achievement of national objectives as set out in Irish national strategy documents such as:

- The Strategy for Science, Technology and Innovation 2006-2013;
- Building Ireland's Smart Economy — A Framework for Economic Renewal;
- Innovation Ireland (the report of the Innovation Taskforce);
- The Programme for Government, Government for National Recovery 2011-2016.

The Government has indicated that the activity stimulated in Ireland through national initiatives in science, technology and innovation and its continued commitment to investment in this area, as well as the investment of €359m through the 5th cycle of the Programme for Research in Third Level Institutions to 2016, can contribute to the collective effort to strengthen the European research and innovation system, which will be further focused following the outcomes of the National Research Prioritisation Exercise. National activities are supporting and underpinning European objectives whilst also leveraging international funds and alliances thereby enabling the Framework Programmes to complement the national research framework.

Though it acknowledges that there is more to the European Research Area than the Framework Programme, the Government believes FP7 offers Irish SMEs, multinational enterprises and research institutions valuable opportunities to participate in high-calibre research collaborations with their European counterparts. Based on the latest data, Ireland is participating in the Framework Programme from a far stronger position than ever before. The Government has set a target FP7 draw-down of €600m (original target was €400m) in research funding to Irish researchers and enterprises.

The NCC *Ireland's Competitiveness Scorecard 2011*²¹ report indicated that Irish researchers, businesses and educational institutions have received a total of €300m between 2007 and April 2011 under the FP7, and are on target to draw down at least the same figure again before fund ends in 2013. It says that as of 2009 — the latest date for which internationally comparable data is available — Irish researchers were more likely to be successful (27%) than the euro area average (23%) in their applications for competitive funding. However, the NCC points out that Irish researchers attracted significantly less funding per applicant than leading countries such as Finland, Germany and Denmark.

As indicated in the Programme for Government, *Government for National Recovery 2011-2016*, the Government intends to promote Ireland's full engagement with the 'Innovative Union' proposals issued by the European Commission in October 2010 as one of the seven flagship initiatives under EU2020 Strategy, with the specific aim of refocusing R&D and innovation policy on major challenges and at turning inventions into products.

Key elements of Ireland's policy mix reflect the ERA agenda such as the development of human resources and research infrastructures. In the case of the latter, the fifth and current cycle of the Programme for Research in Third Level Institutions which primarily funds the development of research facilities has been influenced by the ESFRI road-map. The facilitation of researcher career paths and mobility is an essential policy ambition and Ireland has been to the forefront in implementing the "Scientific Visa" arrangement.

Table 4: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

	ERA dimension	Main challenges at national level	Recent policy changes
1	Labour Market for Researchers	Developing career structures for researchers	Work is continuing on the development of researcher career paths
2	Cross-border cooperation	Government has set a target of securing €600m in funding draw-down by Irish FP7 participants	Planned legislative changes in the remit of SFI to enable it to fund research projects in Northern Ireland and, where appropriate, in the EEA countries
3	World class research infrastructures	Ensuring access by industry to research infrastructures	Implementation of 5 th cycle of PRTL I
4	Research institutions	HEIs are primarily focused on traditional roles of teaching and research	New higher education strategy seeks to ensure that HEIs give an equal prominence to engagement with stakeholders as to teaching and research
5	Public-private partnerships	Weak linkages between HEIs and industry	Enhanced focus on initiatives which facilitate HEI-industry collaboration

²¹ Op. cit.

	ERA dimension	Main challenges at national level	Recent policy changes
6	Knowledge circulation across Europe	Transfer of knowledge to industry is a key government ambition	Development of new national IP protocol
7	International Cooperation	Limited resources to initiate and manage RDI bilateral agreements	Proposals to develop RDI bilateral relations with China

Annex: Alignment of national policies with ERA pillars / objectives

1. Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers

1.1 Supply of human resources for research

Increasing the numbers of PhDs is a key Government R&D target in the Strategy for Science, Technology and Innovation 2006-2013: in 2006, the Irish education system produced a total of 979 PhDs but by 2009, this number had risen to 1,211 — an increase of 24% in four years. This has resulted in Ireland having 0.27 PhD graduates per 1,000 of the population in 2009 which is above the OECD-23 average of 0.22.

The total number of R&D researchers as a percentage of the total labour force increased marginally from an estimated 0.92% in 2007 to 1% in 2008. The number of people with science and technology qualifications as a percentage of the labour force rose from 41.2% in 2007 to 45.9% in 2010. This is an area in which Ireland greatly exceeds the EU average (40.5% in 2010)

The attraction of highly skilled people to Irish Industry and academia is regarded as a key component in positioning Ireland as an innovation leader. A pivotal initiative in helping to deliver on this objective is the Hosting Agreement Scheme, also known as the Scientific Visa. The Hosting Agreement Scheme fast-tracks non-EU researchers' immigration and also allows the researcher's immediate family to live in Ireland for the agreement's duration. The agreement also entitles the researcher's spouse and dependents to apply for a work permit.

Ireland voluntarily signed up to this EU Commission directive in October 2007 and was one of the first Member States to implement it. The scheme has been very successful and to-date the EURAXESS Ireland office has processed Hosting Agreements involving over 1,300 non-EEA researchers from 70 countries with 30 research organisations. The researchers admitted under the Hosting Agreement Scheme account for 15% of the total Irish researcher population. China and India are the two main sources of origin accounting for 19% each of the total number of hosting agreements.

Data supplied by the Irish Universities Association (IUA) indicates that there were 437 live Hosting Agreements as of October 2011 — a significant increase on the 275 agreements recorded as being live in December 2008.

To overcome obstacles facing researchers the European Commission established the EURAXESS Ireland office and portal in 2004. Part of a European Network the office is located at the IUA and is co-funded by the Department of Jobs, Enterprise and Innovation and the IUA. EURAXESS Ireland's services and supports are provided to companies, research organisations and higher education institutions. One element of EURAXESS is its one-stop information portal (www.euraxess.ie)

EURAXESS.ie also hosts a job portal, which provides a free search facility that allows employers to identify potential research vacancy candidates and advertise their research vacancies. Uniquely, the Irish portal allows both the researcher and research organisations to create profiles that link when vacancies of mutual interest arise. There are now over 5,000 registered portal users who receive regular job and funding opportunities updates. Registered researchers can conduct a tailored search for available research positions and funding opportunities according to their disciplinary and professional experience.

Ireland is an enthusiastic supporter of the Marie Curie Actions to facilitate researcher mobility and career development and has advocated the extension of this initiative to include the funding of structured education and training through doctoral programmes and doctoral schools.

Information on the outward flow of Irish researchers is lacking as this data is not collected centrally.

There has been some controversy within the Higher Education sector over the Employment Control Framework (ECF) for the Higher Education Sector 2011-2014 which forms part of the Government's

commitment to the EU/IMF to reduce the cost of the public sector pay bill. The ECF was intended to set ceilings on the number of staff that could be employed in the higher education sector during the period 2011-2014. The controversy arose it initially appeared that HEIs would face restrictions on researcher posts funded from sources other than the recurrent grant such as research grants and contracts but the Government in 2011 moved to ease these restrictions.

Reduced Government funding for the higher education sector is likely to put pressure on individual higher education institutions. In 2010, the government allocated €1,177b to the sector. For 2012 the allocation is €1,119b, which represents a cut of 5%. This is a larger cut than that applying to education overall, at 3%. The government has also announced that there will be further cuts in the two subsequent years, although of a smaller nature.

1.2 Ensure that researchers across the EU benefit from open recruitment, adequate training, attractive career prospects and working conditions and barriers to cross-border mobility are removed

The 2005 European Charter for Researchers and Code of Conduct for their Recruitment were endorsed in 2006 by the heads of the Irish universities. The available evidence suggests that only a small number of the thirteen Institutes of Technology have signed up for the Charter and Code of Conduct.

However, given its difficulties with gaining acceptance across the EU, attention has turned to developing a common research career structure across Europe. Ireland lacks a single national research career structure. There are clear recommendations on this from the Higher Education Research Group and the Advisory Service Council and they all map directly to the agreed European Framework for Research Careers.

The Irish higher education sector is continuing to pursue its fourth level education agenda in which the seven universities are collaborating to offer a wide range of Masters both taught and research and post-graduate diploma programmes across a range of disciplines. This structured approach seeks to preserve the traditional elements of a PhD while providing additional support to the student through the provision of research and generic skills development opportunities.

There is little data available on researcher salaries in the Irish system but anecdotally the level of remuneration within the HE sector is said to have risen in recent years as a result of the significant level of S&T funding provided by the Government through programmes such as Science Foundation Ireland.

Recruitment processes in Ireland are covered by a very comprehensive employment equality legislative framework and consequently academic posts are open to both national and non-national applicants. It is estimated that half of researchers in the HE and PRO sectors are non-nationals, of which 50% are from EU Member States and 50% are non-EU.

The Higher Education Authority plays a key role in furthering the Bologna Process and has undertaken a number of initiatives in conjunction with the National Qualification Authority of Ireland to promote awareness and implementation of the process.

The Government announced in Budget 2009 that agencies with responsibility for qualifications and quality assurance in further and higher education in Ireland would be amalgamated. The amalgamated body, Qualifications and Quality Assurance Ireland, due to be statutorily established in early 2012, will be responsible for the recognition of Irish awards internationally and the recognition of international awards in Ireland.

The new body will continue to provide the existing advisory service to overseas graduates wishing to work or pursue further studies in Ireland on how their qualifications compare with Irish qualifications. This service is also provided to Irish employers.

The general situation in Ireland is that research grants offered by Irish funding agencies are not portable to a foreign institution.

1.3 Improve young people's scientific education and increase interest in research careers

The main vehicle for promoting interest in science and engineering among young people is the Discover Science and Engineering (DSE) programme which is managed on behalf of the Department of Jobs,

Employment and Innovation by Forfás, the enterprise and policy advisory board. The DSE aims to develop more effective ways of engaging students, teachers and the public in science, technology and innovation.

An international strategic evaluation²² of the DSE found that it represented very good value for money and is playing an important role in encouraging young people to study S&T. The evaluators made a number of recommendations in relation to DSE strategy, governance, operations and priorities for future funding. In relation to strategy, the evaluation team recommended that DSE should focus on its unique role as an evidence-driven organisation specialising in the development of new initiatives that deliver the best-possible quality of science teaching and public-science engagement. To do this, DSE needed to be more grounded in international research in science education and engagement.

The Programme for Government (March 2011) prioritised the reform of teaching of mathematics and science teaching at second level. It said that science would be made a compulsory Junior Certificate subject by 2014 (an education qualification awarded to students who have successfully completed the junior cycle of secondary education) and noted that professional development for maths and science teachers would be prioritised.

In addition, Ireland's *National Reform Programme under the Europe 2020 Strategy* emphasised the importance of mathematics and science literacy. It noted that Project Maths, the introduction and application of revised syllabuses for both Junior and Leaving Certificate Mathematics, was introduced nationwide in September 2010 for second-level schools at 1st and 5th years. Project Maths places much greater emphasis on student understanding of mathematical concepts, with increased use of contexts and applications to relate mathematics to everyday experience. The document said that bonus points would be awarded for Leaving Certificate Maths from Summer 2012 (the Leaving Certificate is the educational qualification awarded to students who complete the senior cycle of secondary education).

1.4 Promote equal treatment for women and men in research

There are no specific policies to promote equal treatment of male and female researchers as Irish equality legislation is considered very comprehensive compared with other EU Member States. Irish employment equality legislation covers recruitment, promotion and treatment of employees and outlaws discrimination based on gender along with other eight grounds.

There have been a number of support measures that seek to improve the participation of women in research and included the joint Science Foundation Ireland (SFI)/Dell Computers Young Women in Engineering scholarship awards. The SFI Principal Investigator Career Advancement (PICA) Programme supported outstanding researchers returning to active research after either a prolonged absence e.g. maternity leave, or those within the early consolidating stages of their independent research career. PICA has now been integrated into the Principal Investigator programme.

A report by Forfás on R&D funding in the State sector found that in 2010 male PhD researchers continue to dominate the numbers employed at research level in the government sector and represent 49% of the total. Female PhDs represented 23% of government researchers with another 12% of researchers below PhD level. Male researchers below PhD level each accounted for 16% of the total.

2. Facilitate cross-border cooperation, enhance merit-based competition and increase European coordination and integration of research funding²³

As noted in the Ireland 2010 report, the government has set ambitious targets for drawdown by Irish researchers in the 7th Framework Programme (FP7) and a new national FP7 support structure has been

²² Forfás (2009), An Evaluation of Discover Science and Engineering: A Review by an International Panel, http://www.forfas.ie/media/forfas090514_dse_evaluation.pdf

²³ Promote more critical mass and more strategic, focussed, efficient and effective European research via improved cooperation and coordination between public research funding authorities across Europe, including joint programming, jointly funded activities and common foresight.

- Ensure the development of research systems and programmes across the Union in a more simple and coherent manner.
- Promote increased European-wide competition and access of cross-border projects to national projects funding

developed to assist Irish-based organisations to maximise their participation in the Programme. Additionally, an FP7 Policy Forum has been established to identify and focus opportunities for enhanced strategic engagement in FP7 through leverage of the national investment in R&D.

The NCC Ireland's Competitiveness Scoreboard 2011 report noted that Irish enterprises and higher education institutions were on target to achieve the Government's target of drawing down €600m in FP7 funding.

Ireland is participating in a number of Joint Programming Initiatives: the Health Research Board is a partner in the development of a European strategy aimed at co-ordinating national efforts in neurodegenerative research across the biomedical, clinical and social spectrum which has resulted in the establishment of the Joint Programme on Neurodegenerative Diseases. Other Irish funding agencies such as Science Foundation Ireland, Forfás, the Department of Jobs, Enterprise and Innovation and the Department of Agriculture, Fisheries and Food are also actively involved in the implementation of a number of JPIs where Ireland has particular strengths for example A healthy diet for a healthy life; Agriculture Food Security and Climate Change, Cultural Heritage and Global Change, Oceans.

Irish policy-makers recognise that funding initiatives such as JPIs and ERAnets are an effective way of pooling resources to tackle common challenges. However, they favour emphasis on the identification of ways to enable transnational research and to facilitate synergies between national and international programmes, rather than on enabling transnational funding for its own sake.

As a general rule, individual foreign researchers can participate in the majority of national research and innovation programmes but only Irish HEIs and PROs are eligible for funding.

3. Develop world-class research infrastructures (including e-infrastructures) and ensure access to them

The National Competitiveness Council (NCC) in its *Annual Competitiveness Report 2010* welcomed the Government's commitment to sustain the significant investment in science, technology and innovation programmes to 2016 and to ensure greater efficiencies and value for money. The Council said it was important to focus research investment on the areas that would underpin growth in Ireland's exporting sectors now and into the future. In the context of priority setting, Ireland should focus on centres of excellence with critical mass so that basic and applied research can be supported. The NCC said that as the outputs of investment in R&D were one important driver of innovation, it was critical that actions to unify R&D funding streams and to deliver higher economic returns on R&D investment were progressed.

The main funding vehicle for the development of world-class research infrastructure is the Programme for Research in Third Level Institutions (PRTLTI) which is currently in its fifth cycle. Under Cycle 5 of the programme, the Government will invest €296.1m, with €62.6m coming from private non-Exchequer sources. The PRTLTI funding priorities were significantly influenced by the ESFRI road-map.

Recent data from the HEA indicates that the PRTLTI has resulted in the establishment of quality infrastructure: 35 centres with in excess of 99,000 square metres of space for around 5,800 researchers.

As noted previously, responsibility for the PRTLTI was transferred from the Department of Education and Skills to the Department of Jobs, Enterprise and Innovation in 2010.

Ireland is an active participant at initiatives to develop research infrastructures at an EU level as epitomised by its membership of the DARIAH consortium which aims to conceptualise and build an infrastructure in support of ICT-based research practices in the arts and humanities and to support researchers in the creation and use of research data and tools. DARIAH is currently in its Preparatory Phase, which will design the infrastructure and build a sound business and governmental model. From 2011 DARIAH will begin its Construction Phase. To start with, Ireland and five partners will join the DARIAH European Research Infrastructure Consortia as a Member for the Construction Phase: Germany, France, The Netherlands, Austria, and Denmark (in 2011).

The HEA is the project coordinator for e-InfraNet, an FP7 ERA-NET project comprising of 11 partner countries, which aims to build a network that will develop and strengthen policy cooperation and coordination between national e-Infrastructures and smooth their efficient integration in the ERA.

Irish policy-makers are particularly keen to ensure that the business sector can fully benefit from infrastructures, both as a user of facilities and as a supplier of such facilities.

4. Strengthen research institutions, including notably universities

The *National Strategy for Higher Education to 2030* (January 2011), was developed by a Government-appointed High Level Group and set out changes for the higher education sector that are aimed at providing 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;
- 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.
- Among the many structural changes recommended by the Strategy were:
 - having a smaller number of higher education institutions of greater strength, critical mass and governed according to international best practice;
 - providing for the establishment of Technological Universities (the Government envisages a small number of substantial but as of yet undesignated technological universities having a strong regional innovation and skills focus; three Dublin-based Institutes of Technology have announced that they are making a joint bid for re-designation as a technological university);
 - ensuring that public funding is more aligned to national priorities and needs;
 - requiring greater interaction between the higher education and enterprise sectors.

The high level of legal autonomy enjoyed by higher education institutions is a major strength of the Irish system. The principle is enshrined in the Universities Act of 1997, and the Institutes of Technology Act of 2006 grants limited autonomy to the institutes of technology.

The Strategy document notes that Ireland is regarded as a leader in the advancement and implementation of the Bologna Declaration and its higher education structures and national guiding principles resonate well with the values of institutional autonomy, academic freedom and social equity highlighted in the Bologna Declaration and in subsequent communiqués.

It states that Ireland has built upon this alignment over the last decade. To facilitate student transfer, flexibility and mobility, the European Credit Transfer System (ECTS) has been put in place as well as a system of modularisation and semesterisation.

The report highlighted the need to establish a shared sense of autonomy between the higher education institutions and other stakeholders, including students, private sector interests and the wider community. In return for this autonomy, the report said that the HEIs must become accountable in ways that are sufficiently transparent and robust to ensure the confidence of the wider society.

The Government has signalled that there will be changes to the funding of the higher education sector and has requested the Higher Education Authority to undertake further work on the sustainability of the existing funding framework.

The main feature of the current funding system is the block or core grant which is provided by the State via the HEA for the purposes of funding the recurrent activities of universities, institutes of technology and other designated colleges. This core grant is allocated as a block grant to cover core teaching and research activities within institutions — the internal allocation of funds as between teaching and research are at present a matter for each institution. The allocation of the core grant is determined on a formula basis. The allocation will be 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. Facilitate partnerships and productive interactions between research institutions and the private sector

The development of enhanced linkages between the higher education sector and the industry sector is a key priority in Government STI policy so as to facilitate the transfer knowledge from the HEIs to the private sector where it can be translated into commercial products and services. A number of initiatives have been established to assist in the development of networks and clusters such as the Strategic Research Clusters programme promoted by Science Foundation Ireland and the Competence Centres initiative supported by Enterprise Ireland. In the programme for government published in March 2011, *Government for National Recovery 2011-2016*, the Government announced that a network of Technology Research Centres would be established focused on applied technological research in specific areas, to be linked to appropriate higher education institutions. The centres would accelerate exploitation of new technologies by providing infrastructure that bridges gap between research and technology commercialisation.

The Programme for Government also commits to the development of a national IP protocol to give predictability about the terms on which the enterprise sector can access IP created in HEIs and the wider digital sector.

Enterprise Ireland has invested significantly in the development of Technology Transfer Offices within the higher education sector; in 2010, the agency spent €7.1m on its Technology Strengthening Programme which is intended to increase the commercialisation of IP in Irish universities and to transfer this IP into industry. This support measure also includes customised training events in order that the highest professional standards of technology transfer practice are adopted in the Irish higher educational system.

A key outcome of the *Strategy for Science, Technology and Innovation 2006-2013* is the increase in numbers of PhDs produced by the Irish education system. The expectation was that these researchers would then transfer to the private sector where their skills could be used in connection with RTDI. It is not clear to what extent this has happened with some data indicating that the level of movement of trained PhDs from the HEIs to the private sector up till now has been small. However, with the constraints on research funding within the HEIs the reduced number of research positions could result in researchers seeking employment in the enterprise sector or seeking employment opportunities abroad.

The report of the higher education strategy group, *National Strategy for Higher Education to 2030* (January 2011), made a number of recommendations on the governing authorities of higher education institutions primarily in relation to the number of members (not more than 18) and that the majority of members should be lay people with expertise relevant to the governance of higher education. Thus while representatives of the business sector are involved in the governance of HEIs, their involvement is not mandatory.

The strategy also made a number of recommendations on the HEI's "third mission" in terms of greater engagement with business, industry and the community.

6. Enhance knowledge circulation across Europe and beyond

As a small island nation with a relatively recent RTDI base, Ireland has always placed emphasis on the importance of international connections. Ireland has gained significantly in the last decade from the transfer of knowledge and expertise embodied in foreign direct investment; in 2009, Ireland secured €500m in foreign R&D investment.

The Strategy for Science, Technology and Innovation 2006-2013 notes that transnational cooperation brings together resources, disciplines, and scientific excellence, thus achieving a critical mass, which cannot be attained at national level.

National efforts to support the development of a European scientific information system have to be seen in the context of Ireland's participation in FP7 and related funding programmes. The main emphasis has

been the establishment of a national FP7 support structure — which is administered by Enterprise Ireland — to assist Irish entities to successfully participate in research projects.

Legislation is being drafted to extend the legal remit of Science Foundation Ireland to enable it to fund research projects in Northern Ireland and, where appropriate, in the countries of the European Economic Area or such other countries that may be designated. The existing legislation restricts such opportunities.

Science Foundation Ireland and the Health Research Board have entered into a collaborative arrangement with the Wellcome Trust in the UK to support Irish-based researchers to access funding from the Trust.

Ireland supports the open circulation of knowledge even though there are no specific measures in this area. Policy-makers, in line with current Government strategic policy focus, are supportive of initiatives to facilitate the transfer of knowledge to industry.

Ireland also supports the open access of publications and recognises the value of agreeing common standards in data collection at a European level. Irish open access policy allows for the usual copyright and fair practice considerations.

7. Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world

There is no specific strategy document relating to international cooperation in the area of science and technology. The Advisory Science Council published a report in 2008, *Ireland's International Engagement in Science, Technology and Innovation*, which recommended that a more strategic approach to international collaboration required both the re-evaluation of existing arrangements and a systematic, evidence-based approach to new engagements. The report outlined a set of guidelines to support a strategic approach to international linkages.

Ireland has signed Scientific and Technological Cooperation agreements with China (2000) and India (2006). It has also signed a series of Joint Economic Commissions for governing bilateral economic agreements with China, Russia, South Korea, Saudi Arabia and Brazil. These agreements while focusing primarily on economic issues also have a science and technology dimension. In 2010, the Government transferred responsibility for bilateral economic and trade relations from the Department of Jobs, Enterprise and Innovation to the Department of Foreign Affairs (now called the Department of Foreign Affairs and Trade). However, the Department of Jobs, Enterprise and Innovation still retains responsibility for the development of bilateral RDI agreements. The Department is considering the development of bilateral RDI arrangements with China. Resource constraints are an issue for ministries in terms of development and administering bilateral agreements with non-EU countries.

A number of research related agreements have been signed between Irish research funders and international organisations. These include the agreements signed between Science Foundation Ireland and the Indian National Science Academy (2006).

SFI is responsible for managing the US-Ireland R&D Partnership Programme in the Republic of Ireland in which the Governments of the United States of America, Northern Ireland and the Republic of Ireland have come together to advance scientific progress in Nanotechnology, Diabetes, Sensors, Cystic Fibrosis, Telecommunications and Energy & Sustainability.

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List of Abbreviations

ACSTI	Advisory Council for Science, Technology and Innovation
BERD	Business Expenditure on Research and Development
BMW	Border, Midland and Western Region
CSF	Community Support Framework
CSO	Central Statistics Office
DARIAH	Digital Research Infrastructure for the Arts and Humanities

DES	Department of Education and Skills
DJEI	Department of Jobs, Enterprise and Innovation
DSE	Discover Science and Engineering
ECF	Employment Control Framework
EEA	European Economic Area
EI	Enterprise Ireland
ERA	European Research Area
ERDF	European Regional Development Fund
EPO	European Patent Organisation
ESF	European Social Fund
EU	European Union
FAS	Foras Aiseanna Saothair (Training and Employment Authority)
FDI	Foreign Direct Investment
FP	European Framework Programme for Research and Technology Development
FP7	7th Framework Programme
FTE	Full Time Equivalent
GBAORD	Government Budget Outlays or Appropriations of R&D
GDP	Gross Domestic Product
GNP	Gross National Product
GERD	Gross Expenditure on Research and Development
GOVERD	Government sector performed R&D
HEA	Higher Education Authority
HEI	Higher education institutions
HERD	Higher Education Expenditure on Research and Development
HERG	Higher Education Research Group
HES	Higher education sector
HRB	Health Research Board
HRG	Health Research Group
ICT	Information and Communications Technology
IDA	Industrial Development Authority
IFI	Innovation Fund Ireland
IMF	International Monetary Fund
IP	Intellectual Property
IRCHSS	Irish Research Council for the Humanities and Social Sciences
IRCSET	Irish Research Council for Science, Engineering and Technology
JPI	Joint Programming Initiative
MNC	Multinational corporation
NCC	National Competitiveness Council
NDP	National Development Plan
NESDO	National Economic and Social Development Office
NRP	National Reform Programme
NRPE	National Research Prioritisation Exercise
OP	Operational Programme
OSTI	Office of Science, Technology and Innovation
PICA	Ireland Principal Investigator Career Advancement
PRO	Public Research Organisations
PRTLII	Programme for Research in Third Level Institutions
R&D	Research and Development
RTDI	Research, Technological Development and Innovation
S&E	Southern and Eastern Region
SFI	Science Foundation
SSTI	Strategy for Science, Technology and Innovation
STI	Science Technology and Innovation

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Abstract

The main objective of the ERAWATCH Annual Country Reports is to characterise and assess the performance of national research systems and related policies in a structured manner that is comparable across countries. EW Country Reports 2011 identify the structural challenges faced by national innovation systems. They further analyse and assess the ability of the policy mix in place to consistently and efficiently tackle these challenges. The annex of the reports gives an overview of the latest national policy efforts towards the enhancement of European Research Area and further assess their efficiency to achieve the targets.

These reports were originally produced in November - December 2011, focusing on policy developments over the previous twelve months. The reports were produced by the ERAWATCH Network under contract to JRC-IPTS. The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) and Directorate General for Research and Innovation with contributions from ERAWATCH Network Asbl.

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new standards, methods and tools, and sharing and transferring its know-how to the Member States and international community.

Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.