ERAWATCH COUNTRY REPORT 2010: Ireland

ERAWATCH Network – Tom Martin & Associates/ TMA

Tom Martin
Acknowledgements and further information:

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The opinions expressed are those of the authors only and should not be considered as representative of the European Commission’s official position.
Executive Summary

Ireland is one of the smallest EU Member States and with a population of 4.5m accounts for less than 1% of the population of the EU-27. The Irish economy which grew strongly during the early part of the 2000-2010 decade went into a steep decline from 2007 onwards due to domestic and international factors, but primarily because of the collapse of the construction/property “bubble.” It was the first country in the EU to officially enter a recession. Gross National Income, a better measure of economic activity in Ireland, fell by 15.1% in 2009 according to the Central Statistics Office. Unemployment has risen sharply since 2008 and now stands at 13.2%.

The most recent data indicate that gross R&D spending in the government, higher education and business sectors in Ireland was estimated to have increased by 7.8% between 2008 and 2009. In 2009, the overall R&D intensity ratio was estimated to have reached 1.77% of GDP (2.15% of Gross National Product), up from 1.25% in 2006 and 1.23% in 2004. This increase in the R&D intensity ratio brings Ireland closer to, but still lower than, the OECD average of 2.33% (2008) and the EU-27 average of 2.01% (2009).

Approximately 51% of gross expenditure on R&D in 2009 (estimated at €2.8b at current prices) was financed by the business sector (BERD) while 32% was financed by the public sector (including the EU) and the balance was funded by other sources. An estimated 66% of GERD in 2009 was performed by the business sector with the higher education and government sectors performing 29% and 5% respectively.

Government figures show that the revised science and technology budget for 2009 is down €117m on 2008 and down €226m on the National Development Plan budget for 2010 — a 26% reduction.

Knowledge triangle

Government policies recognise the centrality of both research and, increasingly, innovation in increasing Ireland’s economic performance and in achieving Ireland’s ambition to be a leading knowledge economy. These policies seek, inter alia, to attract R&D foreign direct investment to Ireland (FDI projects with an R&D component have increased in importance relative to those without) and to facilitate the commercialisation of public sector research as witnessed by increased funding for measures aimed at fostering higher education institution (HEI)-industry research linkages.

The Government has endorsed the report of the Innovation Taskforce, Innovation Ireland, which recommended the development of integrated innovation policies that position Ireland as an innovation hub for Europe. New administrative structures were established to put the Taskforce's recommendations into effect. These structures are separate from those set up to oversee the implementation of the Strategy for Science, Technology and Innovation 2006-2013, and raise potential issues in terms of lack of co-ordination between the two policy fields.

A report by a Government STI advisory board has identified three overarching barriers that impact on the level of company R&D: a shortage of high quality industry relevant skills; the high cost of R&D; and the effectiveness of HEI-industry interactions.
Effectiveness of Knowledge Triangle Policies

<table>
<thead>
<tr>
<th>Research policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Reduced government funding for R&amp;D.</td>
<td>• Cuts in government funding for R&amp;D may hamper Ireland’s ambition to become a leading knowledge economy.</td>
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<tr>
<td></td>
<td>• Increased supports for enterprise R&amp;D.</td>
<td>• Emphasis on innovation policies addresses weakness in Ireland’s STI system.</td>
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<td></td>
<td>• Transfer of responsibility for the Programme for Research in Third Level Institutions (PRTLI) from the Department of Education and Skills to the Department of Enterprise, Trade and Innovation.</td>
<td>• Lack of co-ordination between research and innovation governance systems.</td>
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<td></td>
<td>• New review of research funding priorities.</td>
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<th>Innovation policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• Funding priorities favour HEI-industry linkages.</td>
<td>• Potential to build on Ireland’s research strengths in key sectors (immunology and materials science).</td>
</tr>
<tr>
<td></td>
<td>• Emphasis on commercialisation of publicly-funded research.</td>
<td>• Indigenous enterprises have weak linkages with HEI; long time-line before spill-overs from public R&amp;D are realised.</td>
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<table>
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<tr>
<th>Education policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
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<tr>
<td></td>
<td>• Development of structured PhD courses.</td>
<td>• Universities’ third mission has a low priority.</td>
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<tr>
<td></td>
<td></td>
<td>• R&amp;D funding priorities do not correlate with Ireland’s strengths in internationally traded services.</td>
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<tr>
<td>Other policies</td>
<td>• FDI policies now increasingly focused on attracting mobile R&amp;D investment.</td>
<td>• Limited use of public procurement as a driver for innovation.</td>
</tr>
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</table>

European Research Area

Ireland broadly supports the aims of the Lisbon Agenda and this is reflected in the development of Irish policies. As an example, the research infrastructures funding priorities of the current cycle (Cycle 5) of the Programme for Research in Third Level Institutions (PRTLI) have been influenced by the European Strategy Forum for Research Infrastructures (ESFRI). Additionally, the Irish Government is also examining ways to enhance researcher mobility into and out of Ireland. The Government is also seeking to implement the recommendations of an ACSTI report on the development of a career progression structure for researchers.

Additionally, while Irish research funding agencies have for some time pursued policies aimed at encouraging the participation of foreign researchers for research carried out in Ireland, funding was provided on the basis that the research was carried out in Ireland. In 2010, the legal remit of SFI, a major funder of basic research in ICT, biotechnology and energy, was changed to allow it to fund non-national researchers to carry out research projects in their home countries.
There have been a number of reviews of Ireland’s international participation in research networks, most notably Ireland’s membership of the European Molecular Biology Laboratory and Ireland’s participation in Framework Programme 6.

The government has set ambitious targets for drawdown by Irish researchers in FP7 and a new national FP7 support structure has been 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.

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

<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td>Ireland has transposed the Third Country Directive for Admission of Researchers. Additionally, policy attention is focusing on the implementation of a framework for researcher careers.</td>
<td>Research funding cuts may reduce the attractiveness of Ireland as a destination for international researchers.</td>
</tr>
<tr>
<td>2 Increase public support for research</td>
<td>Government commitment to increased STI funding outlined in new Infrastructure Investment Priorities 2010-2014 document.</td>
<td>Funding cuts may negatively impact on the achievement of 3% investment in R&amp;D targets.</td>
</tr>
<tr>
<td>3 Increase European coordination and integration of research funding</td>
<td>The Government has set a drawdown target of €600m for Irish participation in FP7.</td>
<td>Renewed Irish interest in FP7 is actively supported by network of national contact points.</td>
</tr>
<tr>
<td>4 Enhance research capacity across Europe</td>
<td>Cycle 5 of the Programme for Research in Third Level Institutions aims to further develop Irish research capability.</td>
<td>Government’s Smart Economy Statement places investment in the STI agenda at the core of national policy for economic renewal.</td>
</tr>
<tr>
<td>5 Develop world-class research infrastructures (including e-infrastructures) and ensure access to them</td>
<td>Ireland is committed to ESRI Road-map and this is reflected in the selection of investment priorities for PRTLI Cycle 5 funding.</td>
<td>Government funding constraints may thwart Irish ambitions to develop world-class research infrastructures.</td>
</tr>
<tr>
<td>6 Strengthen research institutions, including notably universities</td>
<td>Increased focus on strengthening the third mission within the HEIs. Emphasis on the development of structured PhD training. ACSTI report on The Role of PhDs in the Smart Economy.</td>
<td>New funding arrangements will assist university autonomy.</td>
</tr>
<tr>
<td>ERA objectives</td>
<td>Main national policy changes</td>
<td>Assessment of strengths and weaknesses</td>
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</table>
| 7 Improve framework conditions for private investment in R&D | • Increased funding for industry-led research collaboration with HEIs through the Competence Centres initiative.  
• Recent budgets have focused on improving taxation incentives for RDI.  
• ACSTI Report on Maximising the environment for Company R&D. | • Difficult economic factors are impacting negatively on business sector R&D. |
| 8 Promote public-private cooperation and knowledge transfer | • Major review of supports for the exploitation of intellectual property emanating from publicly-funded research in the higher level sector.  
• Current policy focuses heavily on commercialisation of research outputs and transforming the enterprise base to drive economic renewal. | • Third mission not yet a high priority for Irish universities.  
• Austerity measures may curtail budget for industry-HEI collaboration support measures. |
| 9 Enhance knowledge circulation across Europe and beyond | • Majority of Irish funding programmes are open to international researchers. | • Science Foundation Ireland’s funding programmes now empowered to non-national researchers to undertake research in their home countries will increase attractiveness. |
| 10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world | • Proposal to develop a more strategic approach to Ireland’s international co-operation.  
• Ireland is committed to the ESFRI process and Irish research infrastructure investment policies continue to be framed within the context of wider European and global strategies.  
• Ireland is a regular participant at SFIC, the EU Strategic Forum on International Co-operation. | • Challenges of managing policies in the context of a more complex and inter-dependent system, both nationally and in ERA. |
<p>| 11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle | • Ireland is a regular participant at ERAC, formerly CREST, and related fora. | • Difficulty of co-ordinating national innovation and research governance structures. |
| 12 Develop and sustain excellence and overall quality of European research | • Renewed focus on funding world class research projects and on attracting high quality international researchers. | • Focus on development of structured PhD training will lead to cadre of researchers with soft and hard skills. |</p>
<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 Promote structural change and specialisation towards a more knowledge-intensive economy</td>
<td>• New government capital investment document prioritises STI funding.</td>
<td>• Increased STI investment planned for 2010-2016 represents a strong signal of intent; however, amount allocated represents reduction on original SSTI plans.</td>
</tr>
<tr>
<td>14 Mobilise research to address major societal challenges and contribute to sustainable development</td>
<td>• Government has initiated a prioritisation exercise to inform research priority areas and future focus of publicly funded STI investment.</td>
<td>• Concern that over-emphasis on increasing the number of PhDs in the Strategy for Science, Technology and Innovation has been misplaced.</td>
</tr>
<tr>
<td>15 Build mutual trust between science and society and strengthen scientific evidence for policy making</td>
<td>• Detailed assessment of the economic impact of State investment in R&amp;D being undertaken.</td>
<td>• Declining numbers of students opting for science, technology, engineering and mathematics.</td>
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</tbody>
</table>
TABLE OF CONTENTS

Executive Summary .................................................................................................... 3
1 Introduction ......................................................................................................... 10
2 Performance of the national research and innovation system and 
assessment of recent policy changes .................................................................... 10
  2.1 Structure of the national research and innovation system and its 
governance ........................................................................................................... 10
  2.2 Resource mobilisation .................................................................................. 13
    2.2.1 Resource provision for research activities ................................... 13
    2.2.2 Evolution of national policy mix geared towards the national R&D 
    investment targets .................................................................................. 15
    2.2.3 Providing qualified human resources .......................................... 19
  2.3 Knowledge demand ..................................................................................... 20
  2.4 Knowledge production ............................................................................... 22
    2.4.1 Quality and excellence of knowledge production ......................... 22
    2.4.2 Policy aiming at improving the quality and excellence of knowledge 
    production ........................................................................................ 23
  2.5 Knowledge circulation .............................................................................. 24
    2.5.1 Knowledge circulation between the universities, PROs and 
    business sectors ................................................................................. 24
    2.5.2 Cross-border knowledge circulation ............................................ 25
    2.5.3 Main societal challenges ............................................................. 25
  2.6 Overall assessment ...................................................................................... 25
3 Interactions between national policies and the European Research Area ........ 27
  3.1 Towards a European labour market for researchers ................................... 27
    3.1.1 Stocks and mobility flows of researchers .................................... 27
    3.1.2 Providing attractive employment and working conditions .......... 28
    3.1.3 Open recruitment and portability of grants .................................. 28
    3.1.4 Meeting the social security and supplementary pension needs of 
    mobile researchers .............................................................................. 29
    3.1.5 Enhancing the training, skills and experience of European 
    researchers ......................................................................................... 29
  3.2 Research infrastructures .............................................................................. 30
    3.2.1 National Research Infrastructures roadmap ................................ 30
    3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010 .... 31
  3.3 Strengthening research institutions .............................................................. 32
    3.3.1 Quality of National Higher Education System .............................. 32
    3.3.2 Academic autonomy .................................................................... 33
    3.3.3 Academic funding ........................................................................ 34
  3.4 Knowledge transfer ..................................................................................... 34
    3.4.1 Intellectual Property Policies ........................................................ 35
    3.4.2 Other policy measures aiming to promote public-private knowledge 
    transfer .................................................................................................. 36
  3.5 Cooperation, coordination and opening up national research 
programmes within ERA .................................................................................... 37
3.5.1 National participation in intergovernmental organisations and schemes

3.5.2 Bi- and multilateral agreements with other ERA countries

3.5.3 Other instruments of cooperation and coordination between national R&D programmes

3.5.4 Opening up of national R&D programmes

3.6 International science & technology cooperation

3.6.1 International cooperation strategies

3.6.2 Mobility schemes for researchers from third countries

4 Conclusions

4.1 Effectiveness of the knowledge triangle

4.2 ERA 2020 objectives — a summary

References

List of Abbreviations
1 Introduction

The main objective of the ERAWATCH Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals and of the 2020, post-Lisbon Strategy. The assessment will focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments into R&D, the articulation between research, education and innovation, and on the realisation and better governance of ERA. In doing this, the 15 objectives of the ERA 2020 are articulated.

The report builds on the 2009 report streamlining the structure and updating the 2009 policy assessment in the domains of human resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. The information related to the four ERA pillars covered in the 2009 report is also updated and it is extended in order to cover all six ERA pillars and address the corresponding objectives derived from ERA 2020 Vision.

Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report is not aimed to cover innovation per se, but rather the 'interlinkage' between research and innovation, in terms of their wider governance and policy mix.

2 Performance of the national research and innovation system and assessment of recent policy changes

The aim of this chapter is to assess the performance of the national research system, the 'interlinkages' between research and innovation systems, in terms of their wider governance and policy and the changes that have occurred in 2009 and 2010 in national policy mixes in the perspective of the Lisbon goals. The analysis builds upon elements in the ERAWATCH Country Report 2009, by updating and extending the 2009 policy assessment in the domains of resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. Each section identifies the main societal challenges addressed by the national research and innovation system and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment.

2.1 Structure of the national research and innovation system and its governance

This section gives the main characteristics of the structure of the national research and innovation systems, in terms of their wider governance.

Ireland, with a population of 4.5m, is one of the smallest EU Member States accounting for less than 1% of the population of the EU-27. The Irish economy has been severely impacted by domestic factors (over-reliance on the property/construction sector) and international factors, and was the first country in the EU to officially enter a recession. GDP fell by 5% in 2008 and by 11.3% in 2009.
(GNP, a better measure of economic output in Ireland, fell by 15.1% in 2009\(^1\)). Unemployment has risen sharply since 2008 and now stands at 13.2%.

Ireland’s total investment in research and development in 2009 is estimated at 1.77% of GDP (2.15% of GNP). While investment remains below the EU-27 average of 2.01%, the current level of expenditure in Ireland reflects rapid convergence with the EU since 2000, when the differential between Ireland and the EU was 1.12% and 1.74% of GDP respectively.

In 2009 the share of gross R&D financed by the public sector was 32%, while the percentage of gross R&D financed by industry (BERD) amounted to 51% with other sources accounting for the balance. The percentage of gross R&D performed by industry in 2009 is expected to be 66%, with the higher education sector accounting for 29% and the public sector 5%.

**Table 1: Performance of national R&D by sector**

<table>
<thead>
<tr>
<th>% of GERD performed by:</th>
<th>2002</th>
<th>2009</th>
</tr>
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<tbody>
<tr>
<td>Industry</td>
<td>69.1%</td>
<td>66%</td>
</tr>
<tr>
<td>Higher education sector</td>
<td>22.3%</td>
<td>29%</td>
</tr>
<tr>
<td>Government sector</td>
<td>8.6%</td>
<td>5%</td>
</tr>
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</table>

Sources: Eurostat, Forfás

Business expenditure on R&D increased to €1.9b in 2009 with the BERD intensity ratio growing from 0.82% in 2006 to 1.17% of GDP in 2009, just below the EU-27 average of 1.25%. The rate of growth in business sector R&D expenditure grew by 16.5% during the period 2007-2009 though estimates of expected expenditure for 2010 indicate a fall from the 2009 level.

Expenditure on R&D in the higher education sector rose to an estimated €0.75b in 2008. The HERD intensity ratio (HERD as a % of GDP) was 0.39% which puts Ireland level with the EU-27 and OECD average of 0.39%.

**Main actors and institutions in research governance**

The main actors in the research and innovation policy governance structure are the Cabinet Sub-Committee on Science, Technology and Innovation (STI), the Inter-Departmental Committee on STI, the Office of Science, Technology and Innovation at the Department of Enterprise, Trade and Innovation, the Chief Scientific Adviser, ACSTI and the Innovation Taskforce Implementation Group.

A number of new structures were established in 2007 to assist in the implementation of the Government’s main research and innovation strategy document, the *Strategy for Science, Technology and Innovation* (SSTI). These are Technology Ireland, the Higher Education Research Group and the Health Research Group, all of which report to the Inter-Departmental Committee on STI. These are not research funding or performing organisations; their main role is in the administration and co-ordination of the implementation of the SSTI. Their membership includes, however, organisations that fund research.

The Innovation Taskforce Implementation Group was established in 2010 following the publication of the report of the Innovation Taskforce which had been appointed in

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\(^1\) It should be noted that Ireland's GDP is significantly larger than GNP because of the net profit repatriation by multinationals located in Ireland.
2009 to advise the Government on its strategy for positioning Ireland as an International Innovation Development Hub and to assist in making the Smart Economy a reality. The Implementation Group have been tasked with overseeing the implementation of the recommendations contained in the Innovation Taskforce’s report. The Taskforce’s first key recommendation was the Government to deliver the investment framework that was 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.

In March 2010, the Government announced changes in the structures and responsibilities of a number of government departments (ministries). The Department of Enterprise, Trade and Employment became the Department of Enterprise, Trade and Innovation while the Department of Education and Science became the Department of Education and Skills. The two departments are the main funders of research and innovation.

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

Source: ERAWATCH Research Inventory

Another major change announced by the Government was the transfer of responsibility for the Programme for Research in Third Level Institutions (PRTLI), a major funding programme for infrastructure development for higher education institutions, from the Department of Education and Skills to the Department of Enterprise, Trade and Innovation. The Taoiseach (Prime Minister) said that this transfer of responsibility for the PRTLI would help to bring together a streamlined and focused programme of funding of research and development that is aligned with the objectives of enterprise policy. Concern has been expressed that this reallocation of
responsibility for the PRTLI may curtail funding for the humanities and social sciences.

The institutional role of regions in research governance

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 very limited.

Main research performer groups

The seven universities are the main performers of publicly funded research in Ireland while the Irish-based subsidiaries of multinational companies are the main performers of research in the business sector.

Ireland has a very small PRO sector with only one agency, Teagasc, the agriculture and food development authority, having a significant research budget (€60m in 2009). Teagasc accounted for over 50% of total GOVERN in 2009. The Science Budget 2008-2009 publication indicates that expenditure on R&D performed in the government sector fell from €140m in 2008 to €122m to 2009, a 13% decline.

2.2 Resource mobilisation

Since 2000, Europe has made evident progress towards ERA but at the same time it is clear that Europe's overall position in research has not improved, especially regarding R&D intensity, which remains too low. The lower R&D spending in the EU is mainly a result of lower levels of private investment. Europe needs to focus on the impact and composition of research spending and to improve the conditions for private sector R&D investments.

This section assesses the progress towards national R&D targets, with particular focus on private R&D and of recent policy measures and governance changes and the status of key existing measures, taking into account recent government budget data. The need for adequate human resources for R&D has been identified as a key challenge since the launch of the Lisbon Strategy in 2000. Hence, the assessment includes also the human resources for R&D. Main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy instruments.

2.2.1 Resource provision for research activities

The Government’s Smart Economy Statement (December 2008) placed STI agenda at the core of national policy for economic renewal. The strategy pledged to ‘invest heavily in R&D, incentives more multi-national companies to locate more R&D capacity in Ireland and ensure the commercialisation and retaining of ideas that flow from that investment’. Support for STI activities is, therefore, seen as central to enterprise policy and, by extension, efforts to secure a return to economic growth.

The report of the Innovation Taskforce, Innovation Ireland, reinforced the Government’s commitment to placing STI agenda at the core of economic renewal policy.
The Government also reiterated under its Smart Economy framework its commitment to implementing the *Strategy for Science, Technology and Innovation 2006-2013* (SSTI) and has set a target of achieving an overall investment in R&D (public and private combined) of 3% of GDP (also recommended by the Innovation Taskforce).

The pressure on Government revenues arising from the decline in the economy has, however, resulted in public STI investment falling behind the original projections laid out under the SSTI and the *National Development Plan 2007-2013*. This has had significant negative impacts during the period 2009-2010 in terms of STI funding allocations. However, the publication in July 2010 of the Government’s revised capital framework has restored a level of certainty with regard to Ireland’s commitment to further strengthening its STI base. The investment envisaged over the period to 2016, while still behind previous SSTI projections, represents a significant focus on the STI agenda in the context of economic renewal.

The following table shows Ireland’s gross expenditure on R&D vis-à-vis the EU-27 and the OECD averages over the period 1998-2009. The data indicate that current level of gross expenditure on R&D in Ireland reflects a rapid convergence with the EU since 1998, however it is still substantially below OECD levels.

**Table 2: Ireland’s Gross Expenditure on Research and Development**

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<tbody>
<tr>
<td>OECD</td>
<td>2.13%</td>
<td>2.21%</td>
<td>2.22%</td>
<td>2.19%</td>
<td>2.26%</td>
<td>2.33%</td>
<td>n.a.</td>
</tr>
<tr>
<td>EU-27</td>
<td>1.67%</td>
<td>1.74%</td>
<td>1.76%</td>
<td>1.73%</td>
<td>1.76%</td>
<td>1.92%</td>
<td>2.01%</td>
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<tr>
<td>GERD/GNP</td>
<td>1.41%</td>
<td>1.32%</td>
<td>1.36%</td>
<td>1.46%</td>
<td>1.45%</td>
<td>1.68%</td>
<td>2.15%</td>
</tr>
<tr>
<td>Ireland</td>
<td>1.24%</td>
<td>1.12%</td>
<td>1.11%</td>
<td>1.23%</td>
<td>1.25%</td>
<td>1.45%</td>
<td>1.77%</td>
</tr>
</tbody>
</table>

Source: Eurostat, OECD, Forfás. * Estimate

The main sources of funding of national R&D in 2009 were industry (50.8%), public sector (including the EU) (48.7%) and other (0.5%).

The main R&D funding agencies are Science Foundation Ireland, Enterprise Ireland, IDA Ireland, Higher Education Authority and the Health Research Board. 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), provide funding for individual researchers via competitively awarded grant schemes.

The Department of Agriculture, Fisheries and Food, the Marine Institute and the Environmental Protection Agency provide research funding for the agri-food, marine and environmental sectors respectively.

In addition to direct supports provided to the business sector, the Government has since 2004 provided an R&D tax credit to stimulate innovation and promote R&D activity. Recent budgets have increased the tax credit for qualifying expenditure from 20% to 25% and fixed the base year for calculating incremental R&D spend at 2003.

Future policy in relation to resource provision is anticipated to increasingly focus on the commercialisation of research outputs and transforming the enterprise base to drive economic renewal.
The Higher Education Authority (HEA) is the largest public sector R&D fund provider. The Science Budget 2008-2009 estimates that it allocated €345.7m in 2009 to R&D activities (or 37.2% of the total State spending on R&D). This spending includes expenditure on R&D programmes including, direct funding via the Programme for Research in Third-Level Institutions (P RTLI), and also indirect funding via the HEA block grant to supported third level institutions.

The next largest funder of R&D activities is Science Foundation Ireland, which allocated an estimated €165m to R&D in 2009 via research grants and other research supporting programmes. SFI’s Annual Report for 2009 indicates that it made grant commitments of €26.5m to principal investigators and €24.2m for its Centres for Science, Engineering and Technology (CSET) support measure which aims to link academia with the industrial sector.

Enterprise Ireland, the state agency with responsible for the development of indigenous industry, provided an estimated €70.3m in R&D funding in 2009 while IDA Ireland which is responsible for attracting foreign direct investment allocated an estimated €60m in 2009.

Other public agencies with a significant R&D funding provision in 2009 were Teagasc (the agriculture and food development authority): €60.1m, the Health Research Board: €44.5m and the Department of Agriculture, Fisheries and Food: €26.6m.

The two research councils, IRCSET and IRCHSS, allocated an estimated €29.5m in 2009.

### 2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

Business expenditure on R&D in Ireland rose steadily during the period 1998-2009. Ireland’s BERD intensity ratio grew strongly from 0.82% in 2006 to 1.17% of GDP in 2009, thus bringing it closer to the EU-27 average of 1.25%. However, despite this increased growth, Ireland’s BERD performance was considerably lower than the 2008 OECD average.

#### Table 3: Business sector performed R&D in Ireland as a percentage of GDP/GNP

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD</td>
<td>1.46%</td>
<td>1.53%</td>
<td>1.50%</td>
<td>1.48%</td>
<td>1.56%</td>
<td>1.59%</td>
<td>n.a.</td>
</tr>
<tr>
<td>EU-27</td>
<td>1.04%</td>
<td>1.11%</td>
<td>1.11%</td>
<td>1.09%</td>
<td>1.11%</td>
<td>1.12%</td>
<td>1.25%</td>
</tr>
<tr>
<td>BERD/GNP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>1.02%</td>
<td>0.94%</td>
<td>0.94%</td>
<td>0.96%</td>
<td>0.96%</td>
<td>1.09%</td>
<td>1.42%</td>
</tr>
<tr>
<td>BERD/GDP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>0.89%</td>
<td>0.80%</td>
<td>0.77%</td>
<td>0.81%</td>
<td>0.82%</td>
<td>0.93%</td>
<td>1.17%</td>
</tr>
</tbody>
</table>

Sources: Eurostat, Forfás

The most recent data on BERD published by the Central Statistics Office and Forfás, the national policy and advisory board for enterprise and science, indicates that while expenditure on research and development and R&D staff personnel both increased the number of R&D performing companies fell in 2007.

The results of the European Commission's 2010 "EU Industrial R&D Investment Scoreboard" indicate that spending on research and development in Ireland was up 13% in 2009 compared to 2008. The Scoreboard data shows that Ireland had 16
companies in the top 1000 companies for R&D spending in the EU in 2009, up from 12 companies in 2008.

Recent policy focus has been on increasing industry-HEI linkages in order to build on the substantial State investment in research infrastructure and human capital within the third level education sector.

**Policy mixes towards increased private R&D investment**

Recent policy documents such as *Building Ireland’s Smart Economy* and *Innovation Ireland* set out a vision for Ireland as an international innovation hub for Europe. The latter document calls for innovation to be placed at the heart of enterprise policy. It notes that Ireland’s future economic success depends on increasing levels of innovation across all aspects of Irish enterprise — from large Irish-owned multinationals to foreign multinationals located in Ireland to established SMEs in services and manufacturing, as well as start-ups and existing companies with high growth potential.

The publication of these policy documents highlight the growing importance that Government attaches to innovation as a key driver of economic growth. It can be said that R&D and innovation now both occupy a central position in enterprise development policy. The Government makes it clear in the *National Reform Programme 2008-2010* publication that their research and innovation objectives are not mutually exclusive.

Irish STI/enterprise policies utilise a range of different policy mix routes in seeking to achieve the Government’s target of investing 3% of GDP in R&D. The attraction of R&D foreign direct investment (FDI) is a major element of Government economic development policy. IDA Ireland has responsibility for FDI and in recent years, FDI projects with an R&D component have increased in importance relative to those without. Less than a tenth of IDA Ireland’s investments in 2004 were in research, development and innovation; in 2009 this grew to almost 50%, with investments valued at over €500m. The enhancement of the existing R&D tax credit (see below) is another support measure aimed at attracting R&D performing companies from abroad (policy mix route 4).

As noted in the 2009 Policy Mix report for Ireland, there has been increasing emphasis on the development of research linkages between academia and industry with a view to commercialising the research produced by the HEIs (route 5). This intensified in 2010 with the publication of a DETI/Forfás review of supports for exploitation of intellectual property from higher education research and the announcement by the Government in March 2010 of the provision of €56m in funding for the Competence Centres programme which supports industry-HEI collaboration. Science Foundation Ireland’s annual report for 2009 indicates that there has been a 25% increase in collaborative research projects undertaken between academic researchers and industry that it funds. SFI says that it funds HEI-based research teams who collaborate with 389 organisations, including 184 multinational companies and 165 small and medium sized enterprises.

Route 2, the stimulation of greater R&D investment in R&D performing firms, is underpinned by a number of support measures provided by Enterprise Ireland, the agency responsible for the development of indigenous industry. In 2008, the agency provided €48m in grants for RTDI investments to its client companies in the manufacturing and internationally traded service sectors.
The Government is also committed to promoting the establishment of new indigenous R&D performing firms. Policy actions in this policy mix route category have focused on facilitating access to venture capital. In July 2010, the Government announced the launch of the Innovation Fund Ireland (IFI), a €500m fund to support enterprise development and job creation. Some €125m will come from the exchequer and another €125m will be provided by the National Pension Reserve Fund. The remaining €250m will come from venture capital companies. The Government also announced the appointment of an Advisory Board to maintain and enhance the strategic direction, progress and performance of the Fund and assist in disseminating information globally on the Fund. The IFI was a key action point in the Government's Sustainable Economic Renewal Framework: Building Ireland's Smart Economy and was endorsed by the report of the Innovation Taskforce.

The Government underlined its commitment to increasing research in the public sector (route 6) with its announcement in July 20100 that it was investing €296m through Cycle 5 of the PRTLI to develop infrastructure and research capacity across the higher education sector. With universities and institutes of technology bringing in €63m from private and international competitive sources this makes of an investment total of €359m. Fiscal difficulties may, however, constrain the Government’s capacity to continue to invest in public sector research at the levels of recent years.

An assessment of policy mix routes and their balance indicates that issues may arise in the future due to the fact that separate implementation and review structures have been developed for both the research and innovation policy spheres. Another issue relating to the implementation of RTDI policy is that there is a lack of co-ordination between enterprise policy development which is the responsibility of the Department of Enterprise, Trade and Innovation and sectoral research policies which are under the aegis of a variety of government ministries. This lack of co-ordination raises concerns of overlaps in research funding and reduced potential for commercialisation.

The emphasis given to policy mix route 5 is predicated on encouraging HEIs — which account for the bulk of publicly-funded research — to develop strong RTDI linkages with the private sector though studies have shown that indigenous firms have a poor absorptive capacity and that technology transfer does not currently have high profile within universities.

Concern has also been expressed that national policy mixes may not fully build on Irish strengths; for example, though Ireland is a substantial exporter of services there is a lack of specific RTDI supports for service sector firms.

**Research and innovation supports for businesses**

The supports for enterprise in relation to research and innovation, particularly those provided by Enterprise Ireland (EI), are generally differentiated according the needs of firms and their stage of development. The funding available ranges from Innovation Voucher grants of €5,000 which allow small firms to access expertise in the higher education sector to multi-million euro funding for clusters of companies seeking to pursue common research agendas. EI carries out evaluations of the operation of its research funding programmes on a periodic basis.

**Public procurement**

While numerous Government-initiated studies have identified public procurement as a potential driver of innovation, the actual implementation of such policies have yet to be realised.
Other policies that affect R&D investment

In addition to direct funding supports provided to industry, Ireland has a 25% R&D Tax Credit scheme since 2004 (in addition to a tax deduction at 12.5% for R&D expenditure in Ireland). The aim of the R&D tax credit is to encourage both foreign and indigenous companies to undertake new and/or additional R&D activity in Ireland. The R&D tax credit is available to Irish resident companies and branches on the incremental cost of in-house, qualifying R&D undertaken within the European Economic Area (EEA), provided such expenditure is not otherwise eligible for tax benefits elsewhere within the EEA. Incremental spend is calculated in comparison to a base year of 2003; therefore, for new entrants to the R&D sector the credit is essentially volume-based.

With the enactment of the Finance Act 2010, the Government has given legal effect to fiscal and taxation measures announced in the Budget to increase Ireland’s attractiveness as a hub for intellectual property through the expansion of the IP regime to include software and applications for the grant or registration of patents, copyright, etc., and a broader definition of know-how.

Barriers and risks to attaining the 2% BERD

Though recent data indicate that the number of significant R&D performing enterprises is increasing this has to be put in the context of a declining number of firms undertaking R&D and that the strong growth in BERD that had been evident during the middle of the decade appears to be tapering off. Additionally, the economic crisis is likely to have a negative impact on the availability of private and public sector funding for research.

The Advisory Council for Science, Technology and Innovation (ACSTI) published a report in March 2010 in which it made a series of recommendations on how to improve the environment for companies to engage in research, development and innovation in Ireland. The report entitled, *Maximising the Environment for Company R&D*, highlighted the continuing need to encourage enterprise to invest in RD&I, in order to increase the stock of knowledge, and to use of that knowledge for the development of new goods, processes and services.

The report identified three overarching barriers that impact on the level of company R&D in Ireland across all enterprise sectors:

- A shortage of high quality industry relevant skills;
- The high cost of R&D;
- The effectiveness of HEI-industry interactions.

The report’s recommendations to address these barriers included:

- Greater involvement of industry in developing postgraduate programmes and this can be achieved through prioritising some of the 4th level funding from PhD programmes towards the development of industry driven Masters Programmes;
- Support for the development of world class Masters programmes that are industry relevant, sector specific and in which industry is engaged;
- Industrial postgraduate programmes should be developed, based on the model of the Danish Industrial PhD Programme;
• Allow profit and loss making companies the option to offset their R&D tax credit against payroll taxes.

2.2.3 Providing qualified human resources

National context

Data produced by Forfás indicates that the number of total researchers (on a full time basis) per 1,000 total employment in Ireland exceeds the EU-27 figure. In 2007, Ireland had 6.4 researchers per 1,000 employed compared with the equivalent figure of 6.0 for the EU-27. The number of researchers in the business sector rose from 6,937 in 2001 to 8,242 in 2007. The data also indicates that the level of skilled researchers has also increased: the number of PhDs as a proportion of total researchers employed in the business sector rose from 6% in 2001 to 14.3% in 2007.

The business sector accounted for 62% of R&D FTE personnel (researchers plus support staff) in 2007 while the higher education and public sectors accounted for 31.2% and 6.8% respectively.

Male R&D personnel outnumbered their female counterparts in the business sectors by a ratio of 3:1. There were also more male R&D personnel than female in the public and higher education sectors though the differences were less pronounced.

Table 4: Number of R&D FTE personnel by gender and by sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Female headcount</th>
<th>Male headcount</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>3,522</td>
<td>10,429</td>
<td>13,951</td>
</tr>
<tr>
<td>Public sector</td>
<td>542</td>
<td>841</td>
<td>1,283</td>
</tr>
<tr>
<td>Higher education</td>
<td>7,614</td>
<td>8,744</td>
<td>15,358</td>
</tr>
</tbody>
</table>

Source: Forfás

Education policies

A key objective of the Irish government's Strategy for Science, Technology and Innovation 2006-2013 is a cumulative net increase in PhD student places, representing an increase in annual output from 730 PhD graduates in 2005 to 1,312 in 2013; a total output of 8,858 PhD graduates between 2006 and 2013.

The higher education institutions and the Higher Education Authority (HEA) have adopted a new approach to PhD training and education that seeks to prepare graduates for careers in the business sector. This new approach, the provision of structured education programmes, seeks to provide structured relevant professional skills training to enable PhDs to develop their careers in diverse sectors of the economy.

The new approach proposes a more structured PhD programme with the possibility of more than one supervisor (doctoral committees) and that these may be based in more than one institution. The focus will still be the PhD thesis and contributing a unique body of knowledge but the generic and transferable skills will be embedded in their education and training. This new approach to PhD education requires changes at a number of levels within the HEI system — systematic changes within the overall structures, changes at an institutional level, changes within colleges/schools and changes at research topic or theme level.

A report by ACSTI in December 2009 revealed that the availability of advanced researcher skills was critical to attracting investment. It found that Irish R&D firms employing PhD researchers had rates of patenting 2.5 times greater than similarly
active firms which did not employ PhD researchers and had vastly higher collaboration rates with both higher education institutes and other firms. The report recommended continuing investment in PhD qualified researchers but stressed the importance of aligning PhD training with the needs of indigenous enterprises.

Recognising the central role played by the HEIs in providing qualified human resources to the STI system, the Minister for Education and Skills launched a new national strategy for higher education and announced the membership of a high level Strategy Group under the Chairmanship of Dr Colin Hunt, Managing Director of Macquarie Capital (Europe) Advisers. The Strategy Group, which is tasked with developing the strategy, is expected to report before the end of 2010.

In July 2010, the Government announced the awards of funding for the 5th cycle of the PRTLI which will, *inter alia*, support the career development and international mobility of researchers, along with driving scientific excellence.

The two research councils, IRCSET and IRCHSS, are using EU Marie Curie funding to create new fellowship schemes. These enable Irish researchers to go abroad to gain experience for up to two years. Crucially, there is a third year of funding where they return to Ireland to bring back the knowledge they have gained.

**Main societal challenges**

The declining number of students opting for science, technology, engineering and mathematics continues to be a cause for concern among policy-makers, educationalists and industry. Consequently, considerable efforts are being made to implement the Project Maths project involves the introduction of revised syllabuses for mathematics in both junior and senior cycles within the second level education system. The project aims to provide for an enhanced student learning experience and greater levels of achievement for all students. Much greater emphasis is being placed on student understanding of mathematical concepts, with increased use of contexts and applications that will enable students to relate mathematics to everyday experience.

The National Skills Strategy (NSS), launched in March 2007, sets out clear long-term objectives for the lifelong learning of those in employment and for developing Ireland’s human capital through upskilling, training and education for the period to 2020. One of the NSS’s key targets is to upskill an additional 500,000 people by at least one level on the National Framework of Qualifications by 2020. Ireland faces particular challenges in the upskilling of people in the working population as Eurostat data for 2007 indicates that only 7.6% of all persons in Ireland aged 25-64 participated in lifelong learning compared with 9.7% for the EU-27.

The *National Reform Programme 2008-2010* (NRP) notes that Enterprise Ireland has developed an Entrepreneurship and Regional Development Business Unit which has responsibility for driving the conditions (in partnership with other relevant agencies such as City and County Enterprise Boards) for entrepreneurship throughout Ireland. In addition to the funding of externally delivered training courses, the City/County Enterprise Boards provide a range of soft supports, including mentoring, entrepreneurship promotion (particularly in schools) and management development.

### 2.3 Knowledge demand

This section focuses on structure of knowledge demand drivers and analysis of recent policy changes.
Data from the Central Statistics Office and Forfás indicate that in 2007 just under €1.6b was spent on research and development activities by enterprises across all business sectors in Ireland (0.9% of GDP). In addition, estimates of expected expenditure by enterprises in 2008 indicate that this spend would increase to over €1.68b in 2008.

The business sectors performing the largest percentage of R&D in 2007 were the computer and related sectors and the chemicals, chemical products and man-made fibres sector with 24.5% and 20% respectively of the total. Both sectors are dominated by the Irish affiliates of multinational companies.

Table 5: Business sector performed R&D by industrial sector, 2007

<table>
<thead>
<tr>
<th>Sector</th>
<th>€m</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals, chemical products and man-made fibres</td>
<td>320.4</td>
<td>20.0%</td>
</tr>
<tr>
<td>Medical, precision and optical instruments, watches and clocks</td>
<td>147.0</td>
<td>9.2%</td>
</tr>
<tr>
<td>Electrical machinery and apparatus</td>
<td>112.1</td>
<td>7.0%</td>
</tr>
<tr>
<td>Radio, television and communication equipment and apparatus</td>
<td>91.8</td>
<td>5.7%</td>
</tr>
<tr>
<td>Food, beverages and tobacco</td>
<td>85.9</td>
<td>5.4%</td>
</tr>
<tr>
<td>Other manufacturing</td>
<td>156.6</td>
<td>9.8%</td>
</tr>
<tr>
<td>Computer and related activities</td>
<td>392.8</td>
<td>24.5%</td>
</tr>
<tr>
<td>Research and development services</td>
<td>119.8</td>
<td>7.5%</td>
</tr>
<tr>
<td>Wholesale and retail trade</td>
<td>91.8</td>
<td>5.7%</td>
</tr>
<tr>
<td>Other business activities</td>
<td>43.3</td>
<td>2.7%</td>
</tr>
<tr>
<td>Other services</td>
<td>41.6</td>
<td>2.6%</td>
</tr>
<tr>
<td>Total: all enterprises</td>
<td>1,603.2</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Forfás

Though data on the split between thematic versus generic R&D funding is not available, the available information points to the significant amount of public funding going to research being carried out in the HEIs in the ICT, biotechnology and energy sectors (largely from Science Foundation Ireland) with smaller funding going to other sectoral areas such as agrifood, health, marine and the environment.

Researcher-driven demand plays a smaller part of the overall Irish research system; the funding provided by the two research councils, the IRCSET and IRCHSS, was estimated to account for just over 4% of publicly funded research in 2009.

ACSTI in a report entitled, *Sustaining Investment in Research and Development* (December 2009), recommended that priority-setting mechanism should be put in place to validate the areas/disciplines in which investment should be concentrated. Priorities should be reviewed every three to four years so that research and innovation policies are kept under continuous review.

In September 2010, the Minister for Enterprise, Trade and Innovation appointed a high-level group led by one of Ireland’s top industrialists to work on a five-year prioritisation plan for Government investment in research and ‘smart’ jobs. The research prioritisation steering group has been asked to identify up to 20 target areas on which the Government should focus its allocation of public funding for research and development over five years. The steering group has been asked to report within 12 months with an action plan for each priority area setting out specific goals over five years.

As noted above, the Government in 2010 announced that the Minister for Enterprise, Trade and Innovation would head a high-level group comprising leading industrialists
and public servants to implement the report of the Innovation Taskforce. The Taskforce had been formed in 2009 to address one of the five action areas outlined in the Government’s medium-term economic framework, *Building Ireland’s Smart Economy*, specifically in relation to positioning Ireland as an international innovation hub.

The Taskforce’s report endorsed the Government’s vision for Ireland as “an innovative, high-value export-led economy with some of the world’s leading research-intensive multinationals and thousands of innovative small and medium enterprises” and recommended a step-change in the level of company start-ups and their growth to international scale in order drive job creation in innovative, export-focused sectors.

The Government has 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 *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.

The awards announced in July 2010 under the 5th cycle of the PRTLI will direct funding towards research on climate change, energy and food security, health and ageing.

### 2.4 Knowledge production

The production of scientific and technological knowledge is the core function that a research system must fulfil. While different aspects may be included in the analysis of this function, the assessment provided in this section focuses on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.

#### 2.4.1 Quality and excellence of knowledge production

Science Foundation Ireland’s Annual Report for 2009 notes that Ireland’s research impact in the mid-1980s as measured in terms of the quality and quantity of its scientific publications was low by international standards. Following shifts in Government policy from the late 1990s onwards, Irish research impact has increased, moving from the bottom of the table to equal or above the world, EU-27 and OECD averages.

Not only has Ireland increased the number of publications (output by researchers) but at the same time the quality of the research has also increased. According to Thompson Reuters Essential Science Indicators, Ireland’s international citations ranking has moved from 36th to 19th. According to the Thomson Reuters InCites citations-based information service, Ireland broke into the top 20 countries for the first time in 2008. In specific fields Ireland’s impact ranks even higher, indicating the particular strength of investment in specific disciplines (for example, Ireland is ranked third in immunology and eight in materials science).

A joint Forfás/HEA report, *Research strengths in Ireland: a bibliometric study of the public research base* (2009), showed that Ireland ranks 18 of 20 countries studied by
volume of publications but 8 of 20 in terms of citation impact. Ireland contributes 0.5% of global papers by volume but contributes 0.64% of citations.

Ireland’s position in terms of the quality of higher education performance has shown some improvement. The Times Higher Education World University Rankings for 2010-2011 place two Irish universities in the top 100, Trinity College Dublin (TCD) at 76 and University College Dublin (UCD) at 94. Ireland was ranked at 17 in the world for the overall quality of its higher education system.

Another international university rankings provider, the QS Survey of Top Universities, gave broadly similar rankings for Irish universities as The Times Education World University Rankings with TCD and UCD leading the Irish university rankings. The QS Survey provided more detailed rankings by main academic subject area, and here again both TCD and UCD topped the Irish university rankings.

There is concern among university leaders that anticipated budget cuts in third level education funding would negatively impact on their international rankings in the future.

2.4.2 Policy aiming at improving the quality and excellence of knowledge production

The small size and relatively recent nature of the Irish research sector, allied with a national policy aspiration to be a world-leading knowledge economy, means that international peer review is used extensively in the selection process for the majority of Irish competitively awarded research funding programmes.

Science Foundation Ireland uses international peer reviews as part of its selection process, and also assesses the outputs of research projects through the number of peer-reviewed publications produced. SFI’s strategy statement covering the period 2009-2013, Powering the Smart Economy, states that international peer review would remain the cornerstone of its evaluation system for selecting and retaining principal investigators and their teams in Ireland. The strategy document said that interactions with this high-powered cohort of experts was one way to further the reputation of research in Ireland, and this would be actively built upon over the next five years.

The Higher Education Authority also uses international peer review to assess applications to the Programme for Research in Third Level Institutions (PRTLI) which is designed to provide key research infrastructure and research capacity across all disciplines and to provide a platform for further national and international research investments. PRTLI awards are made on the basis of peer review against international standards of research excellence.

The Government has instituted a rolling programme of organisational evaluations; there have been major recent evaluations, for example, of S&T funders such as SFI and IRCSET. There have also been regular reviews of the Strategy for Science, Technology and Innovation; there have been a number of brief overviews of the national innovation arising from the preparation of recent policy development, most notably the report of the Innovation Taskforce.

Main societal challenges

The Government in its revised capital expenditure plan, Infrastructure Investment Priorities 2010-2016, noted that in relation to the funding of PhDs on the scale currently being pursued under the Strategy for Science, Technology and Innovation
2006-2013, greater regard should be had for the employability of graduates and the relevance of research projects supported to the country’s enterprise base. The review said it would also be critical to ensure that all resources for basic research are specifically targeted at attracting genuinely world-class researchers.

2.5 Knowledge circulation

Tackling the challenges that European society faces in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

2.5.1 Knowledge circulation between the universities, PROs and business sectors

The issue of knowledge transfer has become a prominent policy issue as a result of the economic downturn and the need to capitalise on the large public investment in research in the third level sector since 1998 with a view to creating job opportunities.

*Innovation Ireland*, the report of the Innovation Taskforce, made knowledge transfer one of its key priorities. The report recommended action in a number of different areas to improve the linkages between HEIs and other elements of the national innovation system, particularly industry and relevant Government Agencies. The Taskforce focused on the need to further incentivise innovation within HEIs and on the need to improve the efficiency and effectiveness of the system for converting IP into commercialised products and services. It said that the goal should be to:

- facilitate optimum knowledge transfer between HEIs and industry;
- fast-track the access by entrepreneurs, existing companies and start-ups to HEI IP, enabling existing companies to scale, and supporting developments in areas such as converging technologies.

The report's main recommendation in relation to knowledge circulation was to establish and implement a National Intellectual Property (IP) Protocol.

The Government has been stressing the importance of industry-higher education collaboration and this has been reflected in its funding allocation in March 2010 of €56m to the Competence Centres initiative. This initiative involves clusters of companies in partnership with HEIs working together to overcome common research challenges and drive opportunities for innovation, growth and jobs. The then Minister for Enterprise, Trade and Innovation noted that this investment departure marked a departure from the traditional approach to R&D in favour of a collaborative system where companies that might ordinarily be competitors agree to share knowledge, risk and the rewards of pooling their research resources. The Competence Centre funding will support 180 SMEs and multinational companies involved in nine centres (Bioenergy & Biorefining, IT Innovation, Applied Nanotechnology, Composite Materials, Microelectronics, Manufacturing Productivity, Energy Efficiency, Financial Services and E-learning). This emphasis on knowledge circulation/transfer is also evident in SFI’s distribution of funding. SFI-funded academic-industry partnerships
grew extensively in 2009 with 601 collaborations with companies being reported (up from 402 in 2008). SFI allocated approximately €57m in 2009 to its Centres for Science, Engineering and Technology (CSET) and Strategic Research Cluster programmes which aim to foster academia-industry research collaboration.

2.5.2 Cross-border knowledge circulation

The *Strategy for Science, Technology and Innovation 2006-2013* emphasises the importance of international connections for a small and, relatively new, R&D player like Ireland. It notes that transnational cooperation brings together resources, disciplines, and scientific excellence, thus achieving a critical mass, which cannot be attained at national level. The SSTI document highlights the importance of developing linkages not only with Europe but also with Northern Ireland. In particular, it highlights the benefits of all-Ireland programmes, networks and activities such as the INNOVA and FUSION programmes that aim to promote collaborative R&D and technology transfer respectively. The SSTI also seeks to promote North-South research collaboration in key sectoral areas such as agriculture and food, health, energy and environment.

2.5.3 Main societal challenges

Recent policy documents have highlighted the importance of aligning Ireland’s research system with targeted areas of potential strategic and economic advantage so as to yield rewards to the economy and society in terms of employment, revenue and solutions to societal challenges. The *Innovation Ireland* and other policy documents identify the need for innovation in areas of societal importance such as health, energy, ageing, food and the environment. In the food sector, policy focus is examining how Irish participation in Joint Programming Initiatives (JPIs) can advance societal challenges such as tackling obesity in adults.

The Department of Enterprise, Trade and Innovation and Forfás in a report on the exploitation of IP from the HEIs published in April 2010 said that while the SSTI was a great step forward at the time it was written it had some fundamental weaknesses. In particular, it focused on stimulating the creation of new science and technology and did not focus to any great extent on turning that technology into wealth, for example through building innovation networks. This led to measures and metrics that focused on finding new technologies in HEIs and pushing them out (through doing deals), with relatively less attention being paid to building relationships, understanding industry needs and supporting onward development after a licence has been signed or a start-up company formed.

2.6 Overall assessment

Table 6: Summary of main policy related opportunities and risks

<table>
<thead>
<tr>
<th>Domain</th>
<th>Main policy opportunities</th>
<th>Main policy-related risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource mobilisation</td>
<td>Renewed commitment to 3% target and STI capital expenditure</td>
<td>Reduced exchequer income may jeopardise future STI resource allocation</td>
</tr>
<tr>
<td>Knowledge demand</td>
<td>High-level group to review R&amp;D funding prioritisation</td>
<td>Belated recognition of potential for service innovation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evidence that growth in BERD is tapering off and may decline due to reduced economic activity</td>
</tr>
</tbody>
</table>
The Irish economy has been severely impacted by the recession with GDP falling by 11.3% in 2009 and unemployment standing at 13.2%. While the Government has committed to investing 3% of GDP on R&D, funding for R&D set out in the SSTI has been scaled back due to pressure on the public finances.

In March 2010, the Government announced changes in the structures and responsibilities of the two main research funding ministries (DETI and DES) and it also decided that responsibility for the PRTLI would transfer to DETI.

An assessment of Ireland’s policy mixes indicate the attraction of R&D foreign direct investment and development of linkages between industry and the higher education sectors are key policy objectives.

The Government has launched a new innovation strategy which seeks to position Ireland as an international innovation hub for Europe. New innovation policy structures have been established to oversee the implementation of the Innovation Ireland report.

The Minister for Enterprise, Trade and Innovation appointed a high-level group in September 2010 to develop a five-year prioritisation plan for Government investment in research and ‘smart’ jobs.

Table 7: Main barriers to R&D investments and respective policy opportunities and risks

<table>
<thead>
<tr>
<th>Barriers to R&amp;D investment</th>
<th>Opportunities and Risks generated by the policy mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declining numbers of firms performing R&amp;D</td>
<td>Risk that national R&amp;D targets will not be achieved</td>
</tr>
<tr>
<td>Shortage of high quality, industry-relevant skills</td>
<td>Opportunity to develop new masters and postgraduate training programmes that are industry and sector-relevant</td>
</tr>
<tr>
<td>Limited industry-HEI linkages</td>
<td>New measures (Competence Centres, Innovation Vouchers, etc) aim to increase industry-HEI networking and collaboration</td>
</tr>
<tr>
<td>High cost of R&amp;D</td>
<td>Existing R&amp;D tax credit lacks flexibility to allow companies to offset payroll costs</td>
</tr>
<tr>
<td>Duplication and lack of co-ordination between national innovation and R&amp;D policy governance systems</td>
<td>Risk that current policy emphasis on commercialisation of research outputs will be sub-optimal because of inadequate policy co-ordination linkages</td>
</tr>
</tbody>
</table>
3 Interactions between national policies and the European Research Area

3.1 Towards a European labour market for researchers

The Communication Better careers and more mobility: A European Partnership for Researchers proposed by EC in May 2008 aims to accelerate progress in four key areas:

- Open recruitment and portability of grants;
- Meeting the social security and supplementary pension needs of mobile researchers;
- Providing attractive employment and working conditions;
- Enhancing the training, skills and experience of researchers

The Commission has also launched concrete initiatives, such as dedicated information services for researchers, in particular through the activities grouped under the name of EURAXESS – Researchers in Motion. Based on the assessment of the national situation in the four key dimensions detailed above, this section will conclude if national policy efforts are supporting a balanced ‘brain circulation’, with outward mobility levels matching inward mobility levels. High levels of outward mobility coupled with low levels of inward mobility often signal an unattractive national labour market for researchers and unsuitable research infrastructures. This may trigger, despite the policy efforts supporting the mobility the ‘brain drain’ rather than brain circulation.

3.1.1 Stocks and mobility flows of researchers

Data produced by Forfás on R&D FTE personnel (researchers plus support staff) by sector of employment indicates that there has been a large increase in numbers over the period 2001-2007. In 2001, there were 15,756 R&D personnel while that number had jumped to 19,962 in 2007. While the number of R&D FTE personnel in the public sector had fallen over the period this was more than compensated for by increases in the business sector and, particularly, the higher education sector.

Table 8: R&D FTE personnel by sector of employment, 2001-2007

<table>
<thead>
<tr>
<th>Sector</th>
<th>2001</th>
<th>2003</th>
<th>2005</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>9,126</td>
<td>9,280</td>
<td>10,338</td>
<td>10,956</td>
</tr>
<tr>
<td>Public sector</td>
<td>1,739</td>
<td>1,162</td>
<td>1,133</td>
<td>1,278</td>
</tr>
<tr>
<td>Higher education</td>
<td>2,890</td>
<td>4,010</td>
<td>5,211</td>
<td>5,721</td>
</tr>
<tr>
<td>Total</td>
<td>15,756</td>
<td>16,455</td>
<td>18,687</td>
<td>19,962</td>
</tr>
</tbody>
</table>

Source: Forfás

Limited data are available on the numbers and flows of researchers into and out of Ireland. The Researcher Mobility Office, a unit within the Irish University Association (IUA), which is responsible for Hosting Agreement Scheme in Ireland, has published data on the number of processed agreements concerning the number of researchers coming to Irish universities between 2007 and 2010.

The Researcher Mobility Office has recorded the following:

- 940 hosting agreements processed;
- 25 research institutions accredited of which 4 were industrial organisations;
Researchers represent 65 different nationalities.

The number of hosting agreements which were issued per institution is as follows: University College Dublin: 180, Trinity College Dublin: 160, National University of Ireland Galway: 145, University College Cork: 121, Dublin City University: 98, University of Limerick: 64 and National University of Ireland Maynooth: 32.

Data published by the IUA in August 2010 indicate that about 35 per cent of PhD students and 38 per cent of researchers on contract in the seven Irish universities are foreign, figures that are evenly split between EU and non-EU nationals. The three countries that dominate the latter category are China (179), India (176) and the US (113).

These figures echo the findings of a 2008 study by ACSTI on Ireland’s international STI engagement which revealed that there was a strong international researcher profile within existing research centres and R&D units in both the public and private sectors. The ACSTI study indicated that more than 40 per cent of the 1,300 researchers employed within the research centres and enterprises covered by the study were non-Irish. The study found that approximately two-thirds of the non-Irish were from Europe and one-third was from outside Europe altogether.

3.1.2 Providing attractive employment and working conditions

The Researchers’ Mobility Office, a unit within the Irish Universities Association, is responsible for managing the online information portal, EURAXESS Ireland — the National Service Centre, which provides a single access point to information across all countries including a network of walk-in centres offering personalised assistance to researchers moving to another country.

The EURAXESS Ireland web site offers information on a range of issues including social security, taxation, finance and pensions.

The Researchers’ Mobility Office offers researchers, who are undertaking research positions either in Ireland or in a new country, comprehensive and up-to-date information and assistance in all matters relating to their professional and daily lives.

The National Reform Programme 2008-2010 notes that Ireland’s implementation of the Third Country Directive in 2007 means there is now an administratively light procedure for accredited research organisations in the Irish public and private sectors which allows them to recruit researchers from outside Europe for specific research contracts. Additionally, the implementation of the Directive facilitates researchers to bring direct family members (spouses and children) to Ireland for the duration of the research contract.

3.1.3 Open recruitment and portability of grants

The National Reform Programme 2008-2010 notes that building up the required number of researchers in the form of Principal Investigators and their teams to achieve the goals set out in the SSTI will not be achieved by organic growth alone. There is an explicit recognition that researchers will need to be attracted to Ireland in greater numbers than before.

As a consequence of the need to attract international researchers, the majority of Irish R&D funding programmes are open to EU and non-EU researchers; many of funding programme offered by Science Foundation Ireland are, for example, specifically intended to target high profile international researchers to carry out their research work in Irish third level institutions.
Key to the achievement of ERA is a single labour market for researchers, and integral to this is the need for open and transparent recruitment procedures that do not favour Irish incumbents. The Irish Universities Association has contended that the Irish system for academic recruitment is a very open system with positions being filled on the basis of qualifications.

3.1.4 Meeting the social security and supplementary pension needs of mobile researchers

The social security rights of people from other EU Member States living and working in Ireland are governed by EU Regulations 1408/71 and 574/72. The regulations co-ordinate social security systems within the EU and are designed to remove obstacles to freedom of movement which would otherwise arise from loss or reduction of social security cover or entitlements when a person moves from one country to another. Ireland has supported the extension of Regulation (EEC) No 1408/71 to third country nationals on the basis that this extension is fully in line with national policy.

The Irish Universities Association has pointed out that while Ireland was an early adopter of fast-track immigration procedures for third country researchers, the issue of pension transferability — despite a number of initiatives in this area — was a long way from resolution.

The Innovation Taskforce (which reported in March 2010) recommended that the current limited form of remittance basis of taxation for non-Irish domiciled individuals should be overhauled. The Taskforce noted the positive changes made to broaden the relief in Finance Bill 2010 (this extended the relief to include assignees from EEA countries as well as tax treaty countries who take up assignment here on or after 1 January 2010 and it also reduced the required duration of the assignment from three years down to one year) but said that a new taxation regime was needed to act as an incentive for foreign based academic and entrepreneurial talent to come to Ireland.

The situation in Ireland in relation to dual career opportunities (positions offered to couples in same institution) is that these may be offered at the discretion of the higher education institution concerned.

3.1.5 Enhancing the training, skills and experience of European researchers

In 2008, ACSTI published a report, Towards a Framework for Researcher Careers, in which it recommended the development of a career progression structure for researchers. The report noted that continuing to assure world-class research excellence would require an appropriate career structure enabling the professionalisation of researcher careers. ACSTI argued that progress through the levels should be competitive, transparent and peer reviewed and should reward and facilitate both national and international mobility and between higher education institutes, enterprise, the public sector and research institutes.

A working group was established by the Higher Education Research Group, a new implementation body set up under the framework of the Strategy for Science, Technology and Innovation, to focus specifically on career paths for researchers in the higher education domain. The work programme of the working group is being guided by the need to firstly, retain and/or attract back to Ireland, a significant proportion of those trained in the Irish system, recognising at all times the benefit of international experience to researchers in their careers and secondly, to attract excellent researchers to Ireland at all stages of their careers.
Other ACSTI studies recommended there should be greater involvement of industry in developing postgraduate programmes and this can be achieved through prioritising some of the 4th level funding from PhD programmes towards the development of industry-driven Masters programmes and the development of industrial PhD programmes.

As noted previously, the two research councils, IRCSET and IRCHSS, have developed new fellowship schemes which enable Irish researchers to go abroad to gain experience for up to two years. These schemes have a third year of funding under which the researchers return to Ireland to bring back the knowledge they have gained.

3.2 Research infrastructures

Research infrastructures (RIs) are a key instrument in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities. Recently, most EU countries have begun to identify their future national RI needs, budgets and priorities in the so called National Roadmaps for Research Infrastructures. These strategic documents also set out a strategic view on how to guarantee and maintain access to research facilities. Although some countries invest heavily in RIs, none can provide all the required state-of-the-art facilities on a national basis. Several large RIs have already been created in Europe. While optimising the use and development of existing RIs remains important, new infrastructures are needed to respond to the latest research needs and challenges.

European Strategic Forum for Research Infrastructures (ESFRI) was established in April 2002 to support a coherent approach to policy-making on RIs in Europe and to act as an incubator for international negotiations on concrete initiatives. This section assesses the research infrastructures national landscape, focusing on the national RI roadmap and national participation in ESFRI.

3.2.1 National Research Infrastructures roadmap

Ireland has been actively engaged in the ESFRI process since the group was formed in 2002 and fully supports its rationale and activities. Policy-makers have recognised that Ireland’s investment in research infrastructure should take account of developments at the European level including the ESFRI process.

Consequently, the ESFRI road-map has had significant impact on Irish investments in research infrastructures particularly under Cycle 5 of the PRTLI. Cycle 5, which was launched in 2009, seeks to build on the stock of physical infrastructure developed under Cycles 1-4 which involved enhancement of the national research infrastructure and harnessing of funding from private sources to contribute to the delivery of 80,000 square metres of new research space. Though funding for research infrastructure operates, for a large part, on a competitive process based on funding proposals submitted by higher education institutions, there are many areas where national investment in infrastructure has been integrated into a wider European effort and where synergies with existing and planned European research infrastructure investments can be maximised.

In 2006, the Higher Education Authority and Forfás undertook a review of research infrastructures in Ireland in order to take stock of existing investment and to inform decision-making in relation to future rounds of PRTLI and related investments under SSTI. In undertaking the review, a deliberate decision was taken to involve partners
from the ESFRI network in order to maximise the alignment between national research priorities and the ESFRI Roadmap.

The key finding of the review was that notwithstanding the significant investment of funds in research infrastructure since 1998, and the remarkable transformation of the Irish research landscape since that time, weaknesses exist and gaps remain in the higher education and national research infrastructure. This finding, in the context of the lack of investment prior to 1998, means in effect that Ireland was still in ‘catch up’ mode whilst at the same time trying to compete with its international competitors.

The report also demonstrated that there was sufficient strength in many areas to be used as a foundation on which to build critical mass but importantly raised concerns in a number of instances where there had been a lack of investment in spite of the strategic importance of the area nationally.

The National Reform Programme 2008-2010 notes that following the December 2008 publication of the update to the ESFRI roadmap identifying a further ten projects in areas such as energy, environmental sciences and biological and medical sciences, Ireland was working with the national funders of research and research infrastructure to ensure continued engagement in the ESFRI process and to ensure that Irish research infrastructure continues to be planned within the context of wider European and global strategies.

### 3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010

Ireland is supportive of 20 of the 44 areas identified in the original ESFRI road-map and Irish involvement in these areas ranges from simply having access to facilities to being a full partner and contributing to core funding.

Ireland has been a participant in seven FP7-funded Research Infrastructure preparatory phase projects and has also been a participant in a number of more recent FP7 RI projects that are exploring the potential to form European Research Infrastructure Consortiums (ERICs are legal entities based on EU law (Article 171 of the EC Treaty) which is reserved for the purpose of establishing and operating a research infrastructure). Discussions are currently taking place among Irish participants in these projects and governmental stakeholders on issues relating to the governance and financing.

Ireland is also participating in a number of projects linked to the ESFRI roadmap for European research infrastructures. Research groups in Ireland are associated with the preparatory actions for at least eight of the projects on the ESFRI roadmap including:

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBMRI</td>
<td>Network of existing and new biobanks</td>
</tr>
<tr>
<td>ECRIN</td>
<td>Network of clinical research centres</td>
</tr>
<tr>
<td>EMSO</td>
<td>Multidisciplinary seafloor observatory</td>
</tr>
<tr>
<td>EURO ARGO</td>
<td>Ocean observing buoy system</td>
</tr>
<tr>
<td>DARIAH</td>
<td>Digital infrastructure for cultural heritage institutions</td>
</tr>
<tr>
<td>SHARE</td>
<td>Data infrastructure for research of population ageing</td>
</tr>
<tr>
<td>KM3NET</td>
<td>Underwater Neutrino Observatory</td>
</tr>
<tr>
<td>PRACE</td>
<td>Integrated European High Power Computing Service</td>
</tr>
</tbody>
</table>

National planning for the provision of research infrastructures is undertaken with direct reference to the ESFRI roadmap and Ireland will make decisions regarding its
formal membership status of the different pan-European infrastructure projects (including but not limited to the list above) as and when they move towards the actual construction/implementation phase.

There have been calls for the new higher education strategy to encourage Irish higher education institutions to make strategic alliances with international HEIs, for example, under the European Framework Programme, the European Institute of Innovation and Technology and in terms of shared approaches to the development of specialist research infrastructures.

In July 2010 the Government continued its commitment to investing in research with more than €296m being allocated under the PRTLI to develop infrastructure and research capacity across the higher education sector. With universities and institutes of technology bringing in €63m from private and international competitive sources this makes of total of €359m.

This latest funding complements the €1.2b which has been invested to date under the PRTLI. Of this €795m has been used to build state-of-the-art research infrastructure.

One of the key principles of the Innovation Taskforce was that the State should actively accelerate success by encouraging flagship projects and by prioritising the provision of excellent shared infrastructure. The Taskforce identified the need for investment in broadband and laboratory infrastructures to assist the Government in achieving its Smart Economy programme.

### 3.3 Strengthening research institutions

The ERA green paper highlights the importance of excellent research institutions engaged in effective public-private cooperation and partnerships, forming the core of research and innovation 'clusters', mostly specialised in interdisciplinary areas and attracting a critical mass of human and financial resources. The Universities/ research institutions should be embedded in the social and economic life where they are based, while competing and cooperating across Europe and beyond. This section gives an overview of the main features of the national higher education system, assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.

#### 3.3.1 Quality of National Higher Education System

The Irish higher education sector comprises seven universities and fourteen institutes of technology, colleges of education and other recognised institutions, including private colleges.

The Irish Universities Association (IUA) is the representative body for the seven universities and the Institutes of Technology Ireland (IOTI) is the representative body for thirteen of the institutes of technology.

Ireland has a binary system of higher education, comprising a range of higher education institutions that offer different types and levels of programmes. The universities award a full range of undergraduate and postgraduate qualifications based on their combined missions of education, research and innovation. The main focus of the institutes of technology is in undergraduate programmes, with a smaller number of postgraduate programmes and a growing involvement in regionally orientated applied research.
Expenditure on R&D in the higher education sector (HERD) was calculated at €750m in 2008.

Table 9: Higher education sector performed R&D in current and constant prices - Ireland 1998-2008

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>HERD €m current prices</td>
<td>204</td>
<td>238</td>
<td>322</td>
<td>492</td>
<td>601</td>
<td>750</td>
</tr>
<tr>
<td>HERD €m constant prices</td>
<td>296</td>
<td>321</td>
<td>396</td>
<td>572</td>
<td>656</td>
<td>685</td>
</tr>
</tbody>
</table>

Source: Forfás

The HERD intensity ratio (HERD as a % of GDP) is, therefore, 0.39% which is the same as the OECD and EU-27 averages.

Table 10: HERD as a percentage of GDP/GNP

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</thead>
<tbody>
<tr>
<td>OECD</td>
<td>0.34%</td>
<td>0.35%</td>
<td>0.39%</td>
<td>0.39%</td>
<td>0.39%</td>
<td>0.39%</td>
</tr>
<tr>
<td>EU-27</td>
<td>0.35%</td>
<td>0.36%</td>
<td>0.39%</td>
<td>0.38%</td>
<td>0.39%</td>
<td>0.39%</td>
</tr>
<tr>
<td>HERD/GNP Ireland</td>
<td>0.30%</td>
<td>0.27%</td>
<td>0.30%</td>
<td>0.39%</td>
<td>0.39%</td>
<td>0.48%</td>
</tr>
<tr>
<td>HERD/GDP Ireland</td>
<td>0.26%</td>
<td>0.23%</td>
<td>0.25%</td>
<td>0.33%</td>
<td>0.34%</td>
<td>0.39%</td>
</tr>
</tbody>
</table>

Source: Forfás

Data produced by the Higher Education Authority indicate that as of January 1, 2009, there were 54,464 full-time students (undergraduates and post-graduates) in the Institutes of Technology and there were 91,226 full-time students in the seven universities and three other designated third level colleges.

The missions of the Irish higher education institutions have traditionally been focused on teaching, though research has become an increasingly important activity within the seven universities. The endorsement of the third mission, innovation, within the university sector has been more belated despite the exhortations of the enterprise development agencies. The relationship between teaching, research, innovation and other potential missions such as civic engagement are being considered the Higher Education Strategy Group.

3.3.2 Academic autonomy

The higher education sector and the Irish government have recognised that the evolution of higher education within a rapidly changing global environment demands a strong and dynamic policy formulation process that will allow the system to meet new challenges. In February 2009, the Minister for Education and Skills initiated the development of a new national strategy for higher education and announced the membership of a high level Strategy Group.

The Strategy Group supported by a secretariat are working to their terms of reference, analysing the current environment of Irish higher education and considering the role that higher education plays in modern societies. The Group is seeking to formulate a comprehensive strategic policy framework that will ensure that national objectives for the sector are achieved in the coming decades.

One issue that the Steering Group is analysing is the number and roles of institutions within Higher Education sector in the context of the drive for improved national competitiveness and the need to add maximum value through public investment. Two of the largest universities, Trinity College Dublin and University College Dublin, have
already announced an Innovation Alliance while the University of Limerick and National University of Ireland, Galway have also agreed a strategic alliance between their institutions.

One of the most significant changes in the structure of the Irish third level sector in recent years was the transfer of responsibility for the administration of the Institutes of Technology from the Department of Education and Skills to the Higher Education Authority (HEA), the statutory planning and policy development body for the higher education sector. The change means that the HEA is now the funding body for both universities and the Institutes of Technology. The HEA regards the fact that Irish universities enjoy high levels of legal autonomy compared with equivalent publicly-funded counterparts in other OECD countries as a major strength. It notes that the benefits of greater autonomy are readily identifiable through improved outcomes such as access, completion rates, research achievements and contribution to innovation across teaching and research.

The IPTS report, *Towards a European Observatory of Research-Active Universities*, notes that in terms of the governing structures Ireland follows the managerial model which is associated with a hierarchical decision-making system. The report also points out that Ireland showed high degree of diversity in relation to the configuration of universities’ governing bodies. In relation to the selection of the head of Irish universities, the report said they have implemented (or are in the process of implementing) a new selection process. Irish universities are moving from a "collegial" process to a more "professional" system of recruitment. In this new selection process, the university engages with private sector recruitment consultants to assist the decision making process. Interviews to the final candidates are also part of the process. This system is closer to the ones used by private companies to select their CEOs.

### 3.3.3 Academic funding

The largest share of publicly funded R&D is allocated to the higher education sector through the Higher Education Authority (HEA) which in 2008 is estimated to have been the source of funding programmes worth €354.3m, 78% (€278m) of which is funding through the HEA block grant and 22% (€76.4m) through the Programme for Research in Third Level Institutions.

The block or core grant is the annual funding 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.

### 3.4 Knowledge transfer

The importance of knowledge dissemination and exploitation in boosting competitiveness and contributing to the effectiveness of public research has been increasingly recognised by EC and EU Member States. Following the publication of the [ERA Green Paper](http://www.cordis.europa.eu/era/greenpaper/index_en.html) in April 2007, the EC Communication "Improving knowledge..."
transfer between research institutions and industry across Europe" was issued, highlighting the importance of the effective knowledge transfer between those who do research, particularly HEIs and PROs, and those who transform it into products and services, namely the industry/SMEs.

Several Member States have taken initiatives to promote and facilitate knowledge transfer (for instance new laws, IPR regimes, guidelines or model contracts) and many others are planning to intensify their efforts in this direction. However, these initiatives are often designed with a national perspective, and fail to address the transnational dimension of knowledge transfer. This section will assess the national policy efforts aimed to promote the national and trans-national public-private knowledge transfer.

### 3.4.1 Intellectual Property Policies

The Department of Enterprise, Trade and Innovation and Forfás conducted a review of supports for exploitation of IP from the higher education institutions (HEIs). In their report, *Review of supports of exploitation of Intellectual Property from Higher Education Research* (April 2010), the two organisations found that the principles that run through national policies and guidelines closely followed international practice, especially that emerging at European Union level, described in the two most recent and important documents, the Commission Recommendation of April 2008 and the latest (October 2009) version of the Responsible Partnering Guidelines. The IP review report noted that these common principles included, for example, the need to maximise the economic and social benefits of public investment in research and the preference for HEI ownership of IP arising from most forms of collaborative research.

The report advocated the introduction of a scoreboard for measuring the transfer of knowledge from the HEIs and highlighted the value of including metrics developed by the EU Commission in the recommended scoreboard. The report pointed out that the inclusion of the Commission’s metrics in the scoreboard would help Irish HEIs to monitor and compare their achievements against each other and against themselves over time, and would also assist Irish policy-makers to identify improvements in the knowledge transfer system.

The research undertaken for the report revealed that while national policies and guidelines were broadly in line with current EU practice, one area where there was a substantial degree of uncertainty and frustration related to compliance with EU state aid rules. The report found that Irish policy on ensuring compliance with EU rules on state aid was widely perceived by key stakeholders to be confused and unnecessarily cautious. The report recommended that HEIs and State funding agencies should explore approaches to IP commercialisation that remain within state aid rules, document these approaches and use them to provide practical advice on this to Technology Transfer Offices and other stakeholders.

The issue of knowledge transfer was also addressed by the Innovation Taskforce which highlighted the need for a clear, consistent, speedy and predictable system for industry-higher industry engagement and the need to ensure that the IP tax regime remains competitive to overseas innovation intensive companies.

Enterprise Ireland through its Technology Transfer Office (TTO) initiative supported the development of ten TTOs in Irish higher education institutions which are tasked with promoting the commercialisation of HEI research into Irish-based enterprises and new spin out companies. EI through its Technology Transfer Strengthening initiative provided funding of €3m in 2008 for the TTOs to recruit professional staff.
3.4.2 Other policy measures aiming to promote public-private knowledge transfer

Irish policies in relation to public-private knowledge transfer are influenced by three major policy documents:

1. The *Strategy for Science, Technology and Innovation 2006-2013* (SSTI): The strategy seeks to make Ireland internationally renowned for the quality of its science base and an attractive place to do research. A key focus of the SSTI was to encourage the higher education sector to develop a “third mission” of commercialisation in addition to its traditional roles of teaching and research. The SSTI document sought to stimulate IP management and commercialisation from the HEIs to industry through a two-pronged approach involving strengthening the IP and commercialisation functions within the HEIs through a series of financial measures and supporting this, where relevant, with a central source of specialist expertise.

2. *Building Ireland’s Smart Economy* (2008): This document outlined the Government’s framework for sustainable economic renewal and, in relation to knowledge transfer, identified several high-level ambitions in terms of encouraging innovation, making Ireland an attractive home for innovative multinational corporations, stimulating an R&D-intensive indigenous enterprise sector, and generating a stock of highly skilled workers. Given Ireland’s relatively small scale, these goals were categorised under the auspices of an exemplary research, innovation and commercialisation ecosystem involving both HEIs and companies.

3. *Innovation Ireland*, the report of the Innovation Taskforce (March 2010): The taskforce acknowledged the key role that the HEIs play in developing research in identified areas of strategic priority and in strengthening the commercialisation function and generation of economic value from the intellectual property generated. It made a number of recommendations to strengthen the knowledge transfer process from the HEIs to other elements of the national innovation system, particularly industry and relevant Government agencies.

A number of national guidelines have been published in relation to knowledge transfer. These include the National Code of Practice for Managing and Commercialising IP from Public Funded Research (2004) and the National Code of Practice for Managing and Commercialising IP from Public-Private Collaborative Research (2005).

**Spin-offs**

The October 2009 update of the *National Reform Programme* notes the role of EI in the commercialisation of State-funded research and in particular on increasing the number of spin out companies in the economy. In 2008, 7 High Potential Start Ups were created through State-funded research initiatives and as of the end of June 2009, a further 7 spin out companies were created through State-funded research in HEIs in 2009. Additionally, Enterprise Ireland’s Campus Incubation programme provides a supportive environment on third level campuses where new companies can grow in their formative years. The programme is designed to foster entrepreneurship and drive campus company creation, to support balanced regional development and to help realise the commercial potential of Ireland’s research community. More than €50m has been invested under the Campus Incubation
programme over the last decade in the establishment of business incubation centres on the Institute of Technology campuses, as well as a mix of business and more specialised bio-incubation space in the universities. 20 centres are now operational and are home to over 230 companies employing over 1,000 people, over half of whom are based outside Dublin.

A review of IP supports by the DETI and Forfás indicate that research-funding agencies use different metrics for measuring the commercialisation of IP arising from HEI research. The report noted that a single academic might be in receipt of both SFI and EI funding and therefore be measured on the basis of creating both licences and spin-outs, as well as world class basic research.

**Inter-sectoral mobility**

Results from the 2007-2008 BERD Survey show a growing employment of PhD researchers by the business sector. The total number of researchers employed in business sector increased by 1,305 since 2001 to 8,242 in 2007, a 20% increase. In particular the number of PhD researchers trebled from 420 in 2001 to 1,179 in 2007 and 58% of additional researchers employed since 2001 were PhD qualified. ACSTI has stressed the need to identify ways of aligning PhD qualifications and skills with broader economic and social needs, and recommended the introduction of an Industrial PhD model. The industrial PhD programme, adapted from the Danish model, is a programme whereby an employee of enterprise earns their PhD based on research relevant to their company. ACSTI said that the objectives of the programme should be to upskill researchers working in R&D active enterprise (industry and services); build know-how, knowledge dissemination and interaction between academic and research institutions and enterprises and finally to ensure commercialisation of new know-how and research, including development of knowledge and technology based enterprises. In Denmark the Industrial PhD programmes accounts for 7% of all PhD graduates and the Council believed that similar targets should be set in Ireland.

**Promoting research institutions–SME interactions**

A key element of the Government’s strategy to promote public-private knowledge transfer is the Competence Centre support measure funded by Enterprise Ireland and IDA Ireland. Competence Centres are collaborative entities established and led by industry that are resourced by highly-qualified researchers associated with research institutions who are empowered to undertake market focused strategic R&D for the benefit of industry. Enterprise Ireland also funds the Innovation Partnership support measure which encourages Irish based companies to work with Irish HEIs to access their expertise and resources to develop new and improved products, processes, services, and generate new knowledge and know-how.

**3.5 Cooperation, coordination and opening up national research programmes within ERA**

The articulation between the R&D Framework Programmes, the Structural Funds and the Competitiveness and Innovation Programme is still underdeveloped in terms of coordination, synergies, efficiency and simplification. The policy fragmentation at EU and national level and between EU and national policies can hinder the build of critical masses of research excellence, leads to the duplication of efforts, sub-optimal impacts of the different instruments and unnecessary administrative overheads. Differences between research selection procedures and criteria can also be an
obstacle to the overall spread of excellence. This section assesses the effectiveness of national policy efforts aiming to improve the coordination of policies and policy instruments across the EU, all part of the drive to create an integrated ERA.

3.5.1 National participation in intergovernmental organisations and schemes

The SSTI identified active participation in FP7, on the part of both public research organisations and the private sector, as being key to the internationalisation of Ireland's research and, therefore, central to realising the vision on which the strategy is based. The Government has set a drawdown target of €600m for Irish participation in FP7.

To assist in the achievement of this target, a new National Support Network (NSN) was established in 2006, led by a National Director for FP7 heading a team based in Enterprise Ireland. The Network seeks to ensure that a coordinated and coherent approach is adopted towards FP7 across all of the government departments, agencies and other organisations involved. Through this support structure a mix of guidance, advice and financial assistance is available to encourage researchers and enterprises, where appropriate, to avail of the opportunities within FP7 and its constituent programmes. In addition, an FP7 Policy Forum, chaired by DETI, has been set up whose function is to identify and focus opportunities for enhanced strategic engagement in FP7 through leverage of the national investment in R&D.

Recent data on the total Irish FP7 drawdown during the period January 2007 to April 2010 is estimated at €213.5m. A total of 720 Irish-based organisations are participants in successful FP7 funding applications.

Forfás undertook an evaluation of Ireland's participation in Framework Programme 6, and the results of the study show that Ireland's FP6 participation was strong overall, and that its public and private research communities have played an active role in the Programme. Success rates within the competition were well above FP6 averages. The share of FP6 funding awarded to Irish participants was in line with Ireland's share of GDP. Its contribution to the EU budget was significantly above its share of GNP and was very high in relation to the size of its population. Funding allocations to Irish participants were above the average amounts awarded during FP6 as a whole.

ACSTI's 2008 report on Ireland's international engagement in STI 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.

This recommendation has resulted in a renewed focus on evaluating the benefits to Ireland of its membership of international STI organisations. Consequently, the Department of Enterprise, Trade and Innovation requested that Forfás carry out an evaluation of Ireland's membership of the European Molecular Biology Laboratory (EMBL). When Ireland joined EMBL in 2004, the institute was seen as a focal point for European aspirations in the biotechnology industry and which would enable Ireland to leverage its ongoing public and private investment in the development of both the research and industry bases in this country.

The Forfás review (published in March 2010) recommended that the Irish research community in relevant disciplines needed to be more pro-active in identifying and taking up, where appropriate, opportunities to use EMBL facilities and services in carrying out their research programmes and projects.
The report also recommended that funding agencies and HEIs needed to be more proactive in promoting EMBL programmes and opportunities to the relevant researchers in Ireland and that Science Foundation Ireland (SFI), taking into account their current available resources, should consider a number of actions to promote awareness and use of EMBL.

Another Forfás recommendation was that SFI should consider supporting the establishment of an EMBL alumni association in Ireland and the provision of appropriate administrative supports to facilitate the use of this pool of knowledge as a resource for Irish researchers.

3.5.2 Bi- and multilateral agreements with other ERA countries

ACSTI’s report on Ireland’s international STI engagement noted that the European Research Area was designed to address the fragmentation of the European research system by introducing a range of mechanisms (linked to and/or in addition to the EU Framework Programme) to encourage member states to open up (and possibly even merge) national research programmes, share research infrastructure, adopt common codes of practice around intellectual property rights and other areas impacting of the research environment and, in general terms, create a “common market” for researchers in Europe.

The Council stated, however, that there were challenges for Ireland in terms of adopting a truly strategic approach to the European Research Area. While the ERA should be complementary to the national strategy for science, technology and innovation, ACSTI said it meant that countries have to operate in a more complex and inter-dependent system, and this often gave rise to co-ordination challenges at both the policy level and for individual research institutions and enterprises.

The report noted that the EU Framework Programme has become the principal vehicle for co-operation within ERA. Ireland is examining the potential of leveraging ERA-NETs and other joint programming initiatives as mechanisms for developing STI collaborations with specific EU Member States, especially in particular scientific and technological domains with a particular focus on meeting societal needs and the needs of the enterprise sector.

3.5.3 Other instruments of cooperation and coordination between national R&D programmes

Ireland continues to engage in initiatives coordinated and facilitated by the European Commission to encourage greater coordination of national research programmes and to encourage joint approaches to the implementation of research programmes targeting specific technological and/or societal objectives.

Ireland agrees in broad terms with the analysis put forward in the original 2000 ERA communication and re-echoed in the Green Paper regarding the fragmentation of Europe’s research effort. The European research system is relatively complex and, in certain areas, this may result in sub-optimal performance and act as a barrier for researchers and enterprises, especially those who are coming from countries outside Europe with more straightforward system of research funding.

Irish policy-makers support the view that optimisation in relation to enhanced levels of co-operation and co-ordination of research activities does not relate solely to the pooling of resources into common pots or “virtual common pots”. They note that the Green Paper recognises the value of other forms of coordination and integration (e.g.
joint foresight exercises, shared principles for the management of research programmes etc.). For many areas, they believe it is probably more important that there is a sharing of ideas and optimisation of approaches regarding research priorities and other aspects of programme evaluation and monitoring as opposed to the administration of research funds.

The October 2009 update of the National Reform Programme states that Ireland is participating in the High Level Group (GPC) that is examining proposals for JPIs. The Department of Enterprise, Trade and Innovation, supported by Forfás, has ensured appropriate stakeholder engagement on joint programming within Ireland. A second of a series of consultation events involving all of the relevant Government Departments and funding agencies took place in 2009. Stakeholders were provided with information on the steps involved for Irish funding agencies to propose topics for joint programming and mechanisms for supporting initiatives being proposed by other member states.

At the GPC workshop held in September 2009, Ireland put forward two preliminary proposals for JP themes on (i) Resolving Chronic Inflammatory Disorders and (ii) Zero Tolerance of Road Fatalities and Injuries).

The NRP update document also indicated that a review of Ireland’s involvement in ERA-NETs, technology platforms and other instruments put in place in recent years to help give effect to the European Research Area has been carried out by Forfás. Irish funding agencies and other organisations participated in 23 of the 71 ERA-NETs established under FP6. The NRP noted that this study of Irish engagement in these initiatives provided a useful inventory to be shared across the research funding agencies in Ireland and with other actors and is part of the effort to move towards a more strategic and proactive approach to the ERA. It also said that Irish companies were also engaging in the technology platforms and Joint Technology Initiatives launched under FP7.

3.5.4 Opening up of national R&D programmes

Irish funding programmes have traditionally been open to non-nationals; various national STI strategy documents have recognised the need to attract world-class researchers to Ireland. The majority of SFI funding programmes are open to researchers from outside Ireland and some (the ETS Walton Visitor Award) are targeted specifically at non-nationals.

Up until recently, non-national researchers in receipt of SFI funding had to carry out the research in Ireland. However, changes in SFI’s legal structure now permit it to fund research that it is carried out in the researcher’s own country.

3.6 International science & technology cooperation

In 2008, the European Commission proposed the Strategic European Framework for International Science and Technology Cooperation to strengthen science and technology cooperation with non-EU countries. The strategy identifies general principles which should underpin European cooperation with the rest of the world and proposed specific orientations for action to: 1) strengthen the international dimension of ERA through FPs and to foster strategic cooperation with key third countries through geographic and thematic targeting; 2) improve the framework conditions for international cooperation in S&T and for the promotion of European technologies
Having in view these aspects, the following section analyses how national policy measures reflect the need to strengthen the international cooperation in S&T.

### 3.6.1 International cooperation strategies

International cooperation is an increasingly fashionable topic and a survey by a CREST (now ERAC) working group found that Ireland was part of a group of 12 Member States that said they were in the process of developing an international S&T strategy.

An audit by ACSTI of international STI agreements and partnership that are sponsored by Irish Government Departments (ministries) and their agencies has indicated that the vast bulk were focused on Europe. Fourteen of the agreements/activities impacted on the United States and most of these were small scale in nature, focused on relatively narrow fields and/or are at a very early stage of development. A small number of activities/partnerships were focused on China, India and other emerging players.

The audit found that issues arose, in particular, where there are no counterpart equivalents within Ireland to match the international partner. ACSTI noted that engagement was most effective when both parties to the engagement believe they are engaging with a partner of equal or similar stature. The underperformance of the initial Ireland-China S&T agreement, for example, was attributed in part to the fact that the representative agencies on either side were markedly different.

The ACSTI report argued that Ireland should adopt a new and more strategic approach to bilateral STI agreements so that any new agreements are driven by STI needs and priorities and not by other considerations. It said that STI priorities should drive a search for global “hot spots” where enterprise and academic partnerships should be strengthened. Research should then be undertaken to explore the mechanisms required to facilitate linkages that will help to achieve the policy goals. While formal country-to-country agreements may be required in certain circumstances, there should be a selective approach to establishing new bilateral agreements.

ACSTI recommended that Ireland should adopt a new and more strategic approach to bilateral STI agreements so that any new agreements are driven by specific and clearly stated STI needs. The Council stated that Ireland’s participation in future agreements should only be agreed when a number of critical success factors are in place or have been guaranteed (e.g. high-level steering group, preparatory actions to identify areas for meaningful cooperation, commitment to funding for joint projects and/or researcher mobility, mechanisms for joint evaluation etc).

Although there is no specific national policy on the internationalisation of universities, individual higher education institutions such as Dublin City University (DCU) have given prominence to the development of international linkages in their organisational strategies; as an example, DCU has developed a strategic alliance with Arizona State University. In 2010, the University of Limerick and the National University of Ireland Galway announced a strategic alliance between their two institutions that also involves a link up with Georgia Institute of Technology.

### 3.6.2 Mobility schemes for researchers from third countries

Policy-makers have recognised that attracting PhD students from outside the EU plays an important part in the Irish innovation ecosystem by building the base of high
quality researchers who will in turn facilitate knowledge transfer into industry and commercialisation of research.

As noted above, considerable progress has been made in simplifying immigration and work permit requirements for overseas researchers in both HEIs and industry, most recently through the Hosting Agreement Initiative. The Innovation Taskforce (March 2010) warned that however, in order to remain attractive, Ireland needs to go further to ensure that PhD students and PhD graduates from overseas do not face difficulties in obtaining residency status. Data published by the Irish University Association which supervises the Hosting Agreement Initiative indicate that there are considerable numbers of researchers from third countries working in Ireland, specifically China, India and the US.

The Taskforce also stressed that it was important that highly-qualified students were incentivised to remain in Ireland and that they should be facilitated either in seeking employment in Ireland, or in working towards establishment of their own company.

An ACSTI study on Ireland’s international STI engagement found that there was a specific issue relating to funding anomalies and inconsistencies across funding agencies in terms of attracting non-EU doctoral students.

4 Conclusions

4.1 Effectiveness of the knowledge triangle

The Government has endorsed the report of the Innovation Taskforce, Innovation Ireland, which recommended the development of integrated innovation policies that position Ireland as an innovation hub for Europe. New administrative structures were established to put the Taskforce's recommendations into effect. These structures are separate from those set up to oversee the implementation of the Strategy for Science, Technology and Innovation 2006-2013 and raise potential issues in terms of lack of co-ordination between the two policy fields.

The impact of the economic crisis has resulted in reduced public funding for research. The resource allocation for research originally envisaged under the SSTI has been scaled back. Ireland's GERD performance as a percentage of GDP which had been improving vis-à-vis the EU-27 average has been showing signs of levelling off.

Recent policy emphasis has focused on attracting mobile R&D investment and developing greater linkages between industry and academia in order to leverage the significant investment made in HEI research.
Table 11: Effectiveness of knowledge triangle policies

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<tr>
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<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
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<tbody>
<tr>
<td>Research policy</td>
<td>• Reduced government funding for R&amp;D</td>
<td>• Cuts in government funding for R&amp;D may hamper Ireland’s ambition to become a leading knowledge economy</td>
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<tr>
<td></td>
<td>• Increased supports for enterprise R&amp;D</td>
<td>• Emphasis on innovation policies address weakness in Ireland’s STI system</td>
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<td></td>
<td>• Transfer of responsibility for the Programme for Research in Third Level Institutions (PRTLI) from the Department of Education and Skills to the Department of Enterprise, Trade and Innovation</td>
<td>• Lack of co-ordination between research and innovation governance systems</td>
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<td></td>
<td>• New review of research funding priorities</td>
<td></td>
</tr>
<tr>
<td>Innovation policy</td>
<td>• Funding priorities favour HEI-industry linkages</td>
<td>• Potential to build on Ireland’s research strengths in key sectors (immunology and materials science)</td>
</tr>
<tr>
<td></td>
<td>• Emphasis on commercialisation of publicly-funded research</td>
<td>• Indigenous enterprises have weak linkages with HEI; long time-line before spill-overs from public R&amp;D are realised</td>
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<td></td>
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<td>• Universities’ third mission has a low priority</td>
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<td></td>
<td></td>
<td>• R&amp;D funding priorities do not correlate with Ireland’s strengths in internationally traded services</td>
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<td></td>
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<td>• Limited use of public procurement as a driver for innovation</td>
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<td>Education policy</td>
<td>• Development of structured PhD courses</td>
<td>• Danger that funding cuts will lead to fall in international rankings of Irish universities</td>
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<td></td>
<td></td>
<td>• Mismatch between university graduate skills output and needs of industry</td>
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<tr>
<td>Other policies</td>
<td>• FDI policies now increasingly focused on attracting mobile R&amp;D investment</td>
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</table>

4.2 ERA 2020 objectives — a summary

Ireland endorses the Lisbon Agenda and the European Research Area with which Irish socio-economic policies are closely aligned. The National Reform Programme document reports that Ireland has earmarked 83% of its expenditure on actions that support and promote the Lisbon Agenda. The influence of the Lisbon Agenda/ERA on Irish research policies can be seen in relation to research infrastructures and the mobility of researchers. The funding provided under the current Cycle 5 of the PRTLI was significantly guided by the ESFRI roadmap process. Ireland has fully implemented the Third Country Researchers Directive.

The government has set ambitious targets for Irish drawdown of €600m in FP7; an evaluation of Irish participation in FP6 was positive with Irish success rates being above FP6 averages.

The collapse in the government finances may curtail Ireland’s involvement in research infrastructures or in ERA-NETS and technology platforms.
A report by ACSTI noted that there were challenges for Ireland in terms of adopting a truly strategic approach to ERA. It pointed out that while the ERA should be complementary to the national strategy for science, technology and innovation, this meant that countries had to operate in a more complex and inter-dependent system, and this often gave rise to co-ordination challenges at both the policy level and for individual research institutions and enterprises.

Table 12: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main policy changes</th>
<th>Assessment of national strengths and weaknesses with regard the specific ERA objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td>• Ireland has transposed the Third Country Directive for Admission of Researchers. Additionally, policy attention is focusing on the implementation of a framework for researcher careers.</td>
<td>• Research funding cuts may reduce the attractiveness of Ireland as a destination for international researchers</td>
</tr>
<tr>
<td>2 Increase public support for research</td>
<td>• Government commitment to increased STI funding outlined in new Infrastructure Investment Priorities 2010-2014 document</td>
<td>• Funding cuts may negatively impact on the achievement of 3% investment in R&amp;D targets</td>
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<tr>
<td>3 Increase European coordination and integration of research funding</td>
<td>• The Government has set a drawdown target of €600m for Irish participation in FP7</td>
<td>• Renewed Irish interest in FP7 is actively supported by network of national contact points</td>
</tr>
<tr>
<td>4 Enhance research capacity across Europe</td>
<td>• Cycle 5 of the Programme for Research in Third Level Institutions aims to further develop Irish research capability</td>
<td>• Government’s Smart Economy Statement places investment in the STI agenda at the core of national policy for economic renewal</td>
</tr>
<tr>
<td>5 Develop world-class research infrastructures (including e-infrastructures) and ensure access to them</td>
<td>• Ireland is committed to ESRI Road-map and this is reflected in the selection of investment priorities for PRTLI Cycle 5 funding</td>
<td>• Government funding constraints may thwart Irish ambitions to develop world-class research infrastructures</td>
</tr>
<tr>
<td>6 Strengthen research institutions, including notably universities</td>
<td>• Increased focus on strengthening the third mission within the HEIs • Emphasis on the development of structured PhD training • ACSTI report on The Role of PhDs in the Smart Economy</td>
<td>• New funding arrangements will assist university autonomy</td>
</tr>
<tr>
<td>ERA objectives</td>
<td>Main policy changes</td>
<td>Assessment of national strengths and weaknesses with regard to the specific ERA objective</td>
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</table>
| 7 Improve framework conditions for private investment in R&D                  | • Increased funding for industry-led research collaboration with HEIs through the Competence Centres initiative  
• Recent budgets have focused on improving taxation incentives for RDI  
• ACSTI Report on Maximising the environment for Company R&D                                                                               | • Difficult economic factors are impacting negatively on business sector R&D                                                                                               |
| 8 Promote public-private cooperation and knowledge transfer                    | • Major review of supports for the exploitation of intellectual property emanating from publicly-funded research in the higher level sector  
• Current policy focuses heavily on commercialisation of research outputs and transforming the enterprise base to drive economic renewal | • Third mission not yet a high priority for Irish universities  
• Austerity measures may curtail budget for industry-HEI collaboration support measures                                                                                   |
| 9 Enhance knowledge circulation across Europe and beyond                        | • Majority of Irish funding programmes are open to international researchers                                                                                                                                          | • Science Foundation Ireland’s funding programmes now empowered to non-national researchers to undertake research in their home countries will increase attractiveness |
| 10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world | • Proposal to develop a more strategic approach to Ireland’s international co-operation  
• Ireland is committed to the ESFRI process and Irish research infrastructure investment policies continues to be framed within the context of wider European and global strategies  
• Ireland is a regular participant at SFIC, the EU Strategic Forum on International Co-operation                                                                 | • Challenges of managing policies in the context of a more complex and interdependent system, both nationally and in ERA                                                                                                               |
<p>| 11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle | • Ireland is a regular participant at ERAC, formerly CREST, and related fora                                                                                                                                            | • Difficulty of co-ordinating national innovation and research governance structures                                                                                           |
| 12 Develop and sustain excellence and overall quality of European research      | • Renewed focus on funding world class research projects and on attracting high quality international researchers                                                                                                       | • Focus on development of structured PhD training will lead to cadre of researchers with soft and hard skills                                                                 |</p>
<table>
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<tr>
<th>ERA objectives</th>
<th>Main policy changes</th>
<th>Assessment of national strengths and weaknesses with regard the specific ERA objective</th>
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<tbody>
<tr>
<td>13 Promote structural change and specialisation towards a more knowledge -</td>
<td>• New government capital investment document prioritises STI funding</td>
<td>• Increased STI investment planned for 2010-2016 represents a strong signal of intent; however, amount allocated represents reduction on original SSTI plans</td>
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<td>intensive economy</td>
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<td>14 Mobilise research to address major societal challenges and contribute to</td>
<td>• Government has initiated a prioritisation exercise to inform research priority</td>
<td>• Concern that over-emphasis on increasing the number of PhDs in the Strategy for</td>
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<td>sustainable development</td>
<td>areas and future focus of publicly funded STI investment</td>
<td>Science, Technology and Innovation has been misplaced</td>
</tr>
<tr>
<td>15 Build mutual trust between science and society and strengthen scientific</td>
<td>• Detailed assessment of the economic impact of State investment in R&amp;D being</td>
<td>• Declining numbers of students opting for science, technology, engineering and</td>
</tr>
<tr>
<td>evidence for policy making</td>
<td>undertaken</td>
<td>mathematics</td>
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List of Abbreviations

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<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACSTI</td>
<td>Advisory Council for Science, Technology and Innovation</td>
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<td>BERD</td>
<td>Business Expenditure on Research and Development</td>
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<td>BMW</td>
<td>Border, Midland and Western Region</td>
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<td>CSF</td>
<td>Community Support Framework</td>
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<td>CSO</td>
<td>Central Statistics Office</td>
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<td>DES</td>
<td>Department of Education and Skills</td>
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<td>DETI</td>
<td>Department of Enterprise, Trade and Innovation</td>
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<td>EFG</td>
<td>Enterprise Feedback Group</td>
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<td>EI</td>
<td>Enterprise Ireland</td>
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<td>ERA</td>
<td>European Research Area</td>
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<td>ERDF</td>
<td>European Regional Development Fund</td>
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<td>ESF</td>
<td>European Social Fund</td>
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<td>FAS</td>
<td>Foras Aiseanna Saothair (Training and Employment Authority)</td>
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<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
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<tr>
<td>FP</td>
<td>European Framework Programme for Research and Technology Development</td>
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<td>FTE</td>
<td>Full Time Equivalent</td>
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</table>
COUNTRY REPORTS 2010: IRELAND

GBAORD Government Budget Outlays or Appropriations of R&D
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
JPI Joint Programming Initiative
NDP National Development Plan
NESDO National Economic and Social Development Office
NRP National Reform Programme
OP Operational Programme
OSTI Office of Science, Technology and Innovation
PRO Public Research Organisations
PRTLI Programme for Research in Third-Level Institutions
R&D Research and Development
RDI Research, Development and Innovation
RTDI Research, Technological Development and Innovation
S&E Southern and Eastern Region
S&T Science and technology
SF Structural Funds
SFI Science Foundation Ireland
TTO Technology Transfer Office