Ireland's European Research Area Roadmap

May 2016

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Introduction

This National European Research Area (ERA) Roadmap sets out how Ireland will deepen its engagement with the ERA. It will do so as an inherent part of implementing its new strategy for research and development, science and technology "Innovation 2020" which was launched in December, 2015. The overall vision of *Innovation 2020* is that Ireland – currently classified in the Innovation Union Scoreboard as an innovation follower – will transition to becoming a Global Innovation Leader, driving a strong sustainable economy and a better society.

Innovation – the quest to find solutions that are original, more effective and deliver positive change – is at the heart of Government policies for enterprise, education, social and cultural development.

Innovation 2020 is our national roadmap for continuing progress towards our goal of becoming an innovation leader.

As a small, open economy Ireland relies on external demand and international markets for sustainable and continued growth. The market for research and innovation is global and international cooperation in research and innovation plays an important role in the development and sustainability of a world class research and innovation system.

In *Innovation 2020* we commit to continuing to facilitate, develop and exploit global research cooperation and collaboration. Our deepened commitment to the achievement of the ERA priorities is embedded right across the strategy. The detailed measures we will undertake, together with appropriate indicators, are set out in the following sections of our national ERA Roadmap, which elaborate our approach to addressing at national level each of the 6 ERA priorities in turn.

In our treatment of each ERA Priority, we outline where Ireland currently stands, and map our future commitments. The process of developing the commitments in *Innovation 2020* involved extensive stakeholder engagement across each area of the strategy.

The implementation process for *Innovation 2020* is led by a cross-Governmental Implementation Group, whose mandate is to ensure a coherent approach to its implementation. The *Innovation 2020* Implementation Group represents a streamlined grouping of 3 previous groupings and it meets regularly to drive implementation, and monitor and evaluate progress on, the implementation of the measures set out in the strategy.

Annex I to this Roadmap collates Ireland's commitments to progressing the ERA Priorities in terms of actions, actors, timelines, targets and indicators. Delivery on those of our commitments that require financial resources is subject to the availability of funding.

The 6 ERA Priorities

1. Effective National Research Systems

2.A Jointly Addressing Grand Challenges

2.B Make optimal use of public investments in research infrastructures

3. An Open Labour Market for Researchers

4. Gender Equality and Gender Mainstreaming in Research

5. Optimal Circulation and Transfer of Scientific Knowledge

(a) Knowledge Transfer Policies

(b) Promoting Open Access to Scientific Publications

6. International Cooperation

ERA Priority 1 – Effective National Research Systems

Strengthening the evaluation of research and innovation policies and seeking complementarities between, and rationalisation of, instruments at EU and national levels.

Member State Commitment at national level:

- Promote better alignment of national and European policies;
- Strengthen policy intelligence tools and procedures to provide relevant data to inform the national science and innovation reviews and evaluations aligned with the European Semester;
- Public bodies responsible for allocating research fund should apply the core principles of international peer review in all appropriate cases;
- Enhance competitive funding through calls for proposals and institutional assessments, respecting the need for a satisfactory balance between competitive and institutional funding
- Invest in wider education, research and innovation systems;
- Smart specialisation policies and mutual learning activities may be particularly relevant for some MSs;
- Make the most of EU, and, where relevant, OECD tools (such as the Policy Support Facility and the OECD Innovation Policy Platform); and
- Foresight activities are important, as is the work on developing indicators on the impact of knowledge transfer policies in Priority 5 (a).

European Commission Indicator: Revised version of JRC's Research Excellence Indicator[1]

The proposed indicator has 4 components:

- Highly cited publications (numerator: number of (top 10%) most highly-cited publications (Scopus data), denominator: total number of publications
- PCT patents (numerator: PCT patents, denominator: population)
- ERC grants (numerator: Value of ERC grants, denominator: GOVERD+HERD)
- Marie Skłodowska-Curie (MSCA) grants (numerator: number of MSCA fellows by country of host organisation, denominator: number of national MSCA fellows.

Ireland's position: Ireland is currently ranked 12th out of 31 countries.

1.1 Aligning Ireland's Innovation and Research System

Ireland has an established record of cross- Government commitment to the effective design and efficient functioning of its national research and innovation system and for alignment of priorities at both national and EU level.

This commitment was made concrete with the launch of the Programme for Research in Third Level Institutions (PRTLI) in 1998. PRTLI ensures a strategic approach to the allocation of capital and current funding on a competitive basis to Higher Education Institutions in order to build research infrastructure, develop postgraduate research education and develop sustainable, long-term research capability. In financial terms, Cycle 5 of PRTLI which commenced in 2010, represents the largest commitment thus far.

Government's focus on enhancing the effectiveness of the Irish research and innovation eco-system provided a driving force for the development of the first comprehensive Strategy for Science, Technology and Innovation 2006 -2013. The strategy highlighted our commitment to active participation in the open method of coordination of research policies at EU level. It provided a national framework to support the reduction of fragmentation and enhance the competitiveness of the European Research Area (ERA).

Recent years have seen a maturing of our national ambition. The report of the Research Prioritisation Steering Group in 2012 set out Ireland's smart specialisation strategy, recommending 14 areas of opportunity, as well as underpinning technologies and infrastructure, which should receive the majority of competitive public investment in Science, Technology and Innovation (STI) over the following five years. The report also spurred the implementation of a number of measures to improve the efficiency and effectiveness of the STI system and support the prioritisation approach. The identification of the 14 Priority Areas took account of, inter alia, the shape of the developing Framework Programme that became Horizon 2020.

1.2 Innovation 2020 – The Next Phase in the Development of Ireland's National Research System

In 2015, the Government launched *Innovation 2020,* Ireland's five year strategy for research and development, science and technology. The new strategy integrates with the Action Plan for Jobs (APJ) process[1], the National enterprise policy strategy *Enterprise 2025* and the National Skills Strategy 2025 to drive the whole of Government approach to achieving sustainable economic growth.

An in-depth public consultation process to inform the development of *Innovation 2020* was undertaken. The process involved the circulation to key stakeholders from industry, academia, the

[1] The Action Plan for Jobs is a multi-annual initiative which mobilises all Government Departments to work towards the objective of supporting job creation through the implementation of an agreed list of timetabled actions. Progress on implementation is reported on a quarterly basis.

public sector and civil society of a detailed consultation paper setting out key issues and questions that needed to be addressed. This process elicited responses from a wide range of stakeholders and 80 detailed submissions were received and analysed. In addition, a Consultative Forum was held involving key stakeholders and chaired by the Minister for Skills, Research and Innovation to address key issues emerging from the written consultation process - some 120 participants from industry, the public sector and academia attended. In parallel, best practice in comparable countries within the EU and the OECD were examined and bilateral discussions were held with the OECD throughout the process.

Innovation 2020 sets out the pathway to deliver on our vision of establishing Ireland as a global innovation leader by focusing on excellence, talent and impact. It details the Government's medium-term research, development and innovation (RDI) policy in relation to investment, human capital, enterprise, sectoral development, intellectual property (IP) and international engagement. Intrinsic to the strategy is the understanding that European-wide cooperation builds innovation capacity, facilitates researcher mobility and allows for greater economies of scale. *Innovation 2020* explicitly commits Ireland to progressing the implementation of the six ERA Priorities.

A key objective in the strategy is to increase public and private investment in research. A path is presented to obtaining an increase in public research investment and to leverage greater private investment in order to reach Ireland's research and development intensity target of 2.5 per cent of GNP by 2020.

To enhance policy alignment and maximise efficiency, the number of policy groups acting in this area have been streamlined into one coherent group – the *Innovation 2020* Implementation Group – which is chaired by the Department of Jobs, Enterprise and Innovation (DJEI). To maximise synergies and ensure coherent delivery of a whole-of-Government approach to science and innovation policy, representatives of governmental advisory groups with research remits are members of the *Innovation 2020* Implementation Group. A key formation of this group will discuss EU RDI policies, including Ireland's engagement in Framework Programmes.

Senior officials acting on these groups will continue to ensure representation for Ireland at EU fora such as the European Research Area and Innovation Committee (ERAC), ERAC Advisory Structure groups, the Joint Research Council (JRC) and the European Science Advisory Forum (ESAF). This strategic replication of representation will enable a strong feedback loop and enhance alignment between national and EU level STI policy and investment.

Measures

- Through *Innovation 2020*, the Irish Government has committed to continued and increased investment in people, infrastructure and associated facilities to build the education and research base; and support the enterprise and public sectors to build their capacity for research and development.

  (Action 1.1, Innovation 2020)
  (Timeline 2020)

- By 2020, Ireland aims to achieve Gross Expenditure on R&D (GERD) of 2.5% of GNP by:
  a) Increasing public investment in our research base;

b) Increasing investment in programmes that support enterprise RDI and improve the leverage of private investment;

c) Increasing the number of significant enterprise R&D performers by 15% to 1,200 and the number of larger performers from 170 to 200;

d) Doubling private funding of publicly performed R&D to €48m per annum; and

e) Securing €1.25bn from Horizon 2020

(Action 1.2, Innovation 2020)
(Timeline 2020)

- To maximise the efficient use of State resources in driving and overseeing implementation of *Innovation 2020*, a streamlined governance structure will underpin a whole of Government approach to its delivery.

(Action 7.1, Innovation 2020)
(Timeline 2016)

- Put in place informal reporting mechanisms between the *Innovation 2020* Implementation Group and other relevant groups to ensure coherence in development and delivery of policy across all relevant Government departments.

(Action 7.2, Innovation 2020)
(Timeline 2016-2020)

1.3 Measuring and evaluating our progress

Building on the work of the Research Prioritisation Action Group, which developed a framework for monitoring public investment in STI, a number of high-level national indicators with associated targets to 2020 have been selected to measure success in implementing the *Innovation 2020* strategy. The *Innovation 2020* Implementation Group will report annually to Government on progress towards high-level targets. Key actions will also be delivered through the annual APJ process with implementation updates reported to Government on a quarterly basis.

As part of this process, input from a broad range of stakeholders will be sought through a number of mechanisms such as fora to obtain regular feedback from industry, academia and civil society on the implementation of the strategy.

In addition, Ireland contributes to the OECD harmonised surveys of key RDI indicators. DJEI undertakes surveys of R&D in the Higher Education and Government sectors while the Central Statistics Office (CSO) does these in the Business and Community Innovation Sectors.

A mid-term evaluation of the implementation of the strategy will be undertaken in 2018 to ensure that we are on track for delivery and that any necessary adjustments can be made in a timely manner. A retrospective evaluation will also be carried out at the end of the strategy's term to inform the development of its successor.

In addition to the systematic tracking and evaluation of *Innovation 2020*, research funding Government Departments and Agencies will continue to engage in independent reviews of a range of STI programmes to assess their impact and strengthen subsequent initiatives. For example, in 2016 an independent ex-post evaluation of Ireland's participation in FP7 and an interim ex-ante evaluation of Horizon 2020 will be completed. The evaluations are concerned with Ireland's participation in these programmes in the context of achieving the broad European objectives as well as in assisting the development and advancement of Ireland's national innovation system. The evaluations place a priority on linking the lessons of FP7 with Horizon 2020 and how future

participation in Framework Programmes can be best aligned with national STI objectives, including maximising and increasing levels of participation, investment and scale. Additionally, we will undertake a systematic review of all RDI supports for enterprise and assess whether these supports are meeting the needs of the enterprise community.

Ireland's will continue to benefit from the valuable inputs and analysis of our RDI policy and systems provided by the European Union through the annual RIO reports, Innovation Union progress report and the European semester process.

Measures

- The *Innovation 2020* Implementation Group will report annually to Government on progress towards implementation of the strategy, with quarterly progress monitored through the Action Plan for Jobs process.

  (Action 7.4, Innovation 2020)
  (Timeline 2016-2020)

- A mid-term evaluation of *Innovation 2020* will be undertaken in 2018 so that relevant adjustment can be made in a timely manner to ensure successful delivery on the vision and objectives. A retrospective evaluation of the strategy will be carried out to inform the development of its successor.

  (Action 7.5, Innovation 2020)
  (Timelines 2018 and 2020)

- Independent evaluations of Ireland's participation in Framework Programmes to assess our performance and strengthen engagement in future programmes will continue to be carried out.

- The full range of State financial aid for RDI will be reviewed to ensure that the needs of small and young firms are being catered for as well as those of larger, established firm. The review will also assess the incentives available internationally to ensure that Ireland's offering remains competitive.

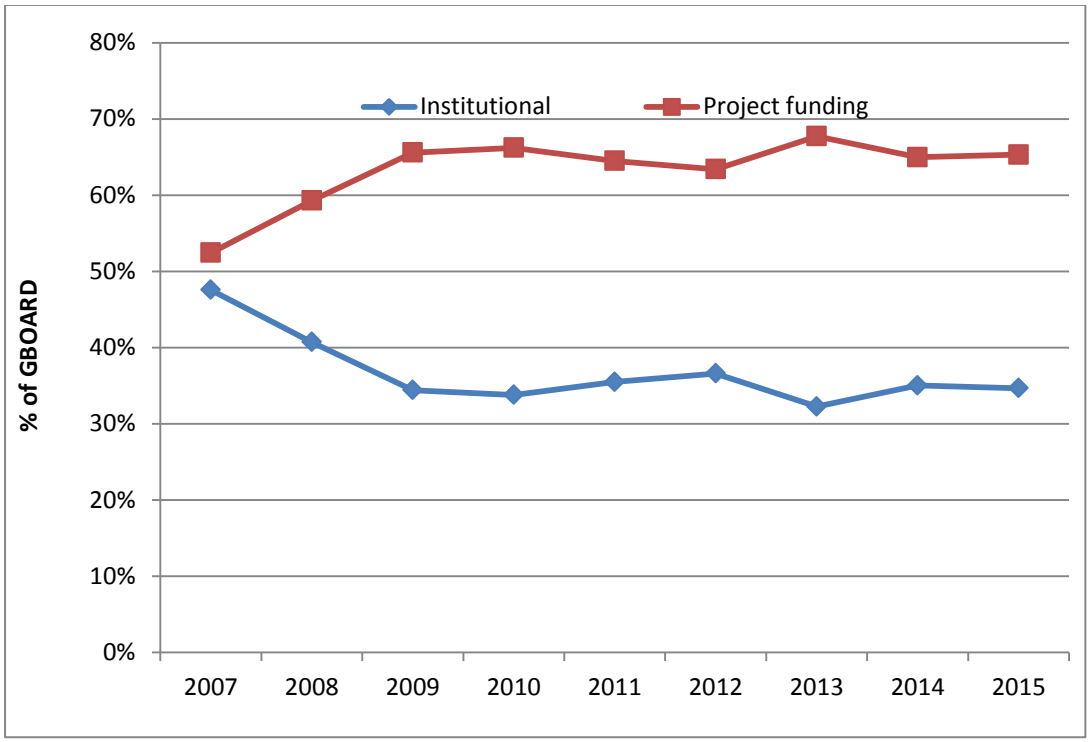
  (Action 2.4, Innovation 2020)
  (Timeline 2017)

- A review into the impacts to enterprise from publicly funded research will be undertaken.
  (Timeline 2016)

1.4 Driving research excellence through competition and rigorous international peer review systems; balance between competitive and institutional funding; smart specialisation

In 2007 the allocation of funding was evenly distributed between competitive funding (52%) and institutional funding (48%). Since then competitive funding has been prioritised, amounting to 65% of GBAORD spending in 2015. Competitively awarded funding has reduced by 12.9% since the peak, while institutional funding experienced a 32.7% drop during the same period.

Figure 1: Percentage of Total Annual GBAORD by Competitive (project) and Institutional Funding



Source: Eurostat, Total GBAORD by funding mode

As outlined above, a key commitment within *Innovation 2020* is to increase public investment in R&D to support achievement of the 2.5% GDP expenditure on R&D target. We are committed to optimising the allocation of public monies between institutional and competitive funding in order to maximise impact and achieve effective returns on investment.

As a small country, Ireland cannot be a leader in all areas of enterprise research and innovation. We must therefore target the majority of our investment at areas of commercial opportunity that are strategically important. This is the underpinning rationale for *Research Prioritisation* (RP), Ireland's Smart Specialisation Strategy, which was adopted by Government in 2012 as the guiding principle for competitive public investment in research in support of the enterprise sector. Government, in partnership with enterprise, identified 14 *Priority Areas* (see Fig 2.2) that presented particular market opportunities for Ireland. RP also identified the need to support relevant key enabling technologies (KETS) to underpin the priority areas and, equally importantly, provide the foundation on which to develop capacity in new, emerging areas of opportunity. Examples of KETs include Basic biomedical science, Nanotechnology, Advanced materials, Microelectronics, Photonics, Software engineering.

Figure 2.2: Positioning of priority areas

The current cycle of RP runs for the five-year period 2013 to 2017. While the rationale for focusing investment to support the enterprise sector will remain valid beyond this period, the specific areas of focus will need to be reviewed and refreshed in the light of changed circumstances.

PRTLI has been a core instrument in our research capability-building. Through the allocation of funds on a competitive basis, it has put in place research infrastructure, built basic research capability and helped drive a strategic approach to research activity in institutions.

International peer reviews and evaluations are a mainstay for the awarding of competitive funds across Ireland's main Research Funding Organisations (RFOs) including Science Foundation Ireland (SFI), Irish Research Council (IRC), the Health Research Board (HRB), the Environmental Protection Agency (EPA) and Teagasc.

In Ireland, SFI, the main funding agency for academic-led research, offers a range of funding schemes that support scientists and engineers to deliver both research excellence and impact. The most recent independent evaluation of SFI's peer review process and award decision procedure was completed in 2015. A number of the arising recommendations have already been adopted while further actions will be implemented during 2016.

The coherence of what is now a sophisticated and potentially complex public research landscape is a policy priority. RFOs have therefore been working closely together to ensure complementarity, address gaps and remove overlaps in the funding architecture. As noted in the First Progress Report (July 2014) on the National Research Prioritisation Exercise (NRPE), one of the most important impacts of the Exercise was the enhanced coordination and cooperation it has engendered between the State agencies and Government Departments funding research.

Measures

- The next cycle of PRTLI will be scoped out and developed to support new investment in research infrastructure in the wider research base and to allow for maintenance and upgrading of existing facilities and equipment.

(Action 3.16a, Innovation 2020)
(Timeline 2016)

- Public policy needs will be addressed and use of research will be optimised by evaluating all funding programmes to ensure continued relevance and clarity of purpose.
(Action 4.1b., Innovation 2020)
(Timeline 2016-2020)

1.5 Foresight activities

As far back as 1998, the Government of Ireland commissioned a Technology Foresight Exercise. As part of its response, Government initiated the Technology Foresight Fund and allocated a budget. SFI was established in 2000 to administer Ireland's Technology Foresight Fund. From its establishment as a separate legal entity in 2003, as an Agency of DJEI, SFI has developed to become Ireland's primary research funder.

Foresight exercises now routinely inform policy formulation in the RDI space in Ireland, both sectorally and nationally. A recent sectoral example is the Teagasc Technology Foresight 2035 Final Report, published March 2016 which identifies the technology areas which Teagasc will prioritise in its research programmes to support Ireland's agriculture and food sectors. DJEI will lead two national exercises, for which terms of reference have already been agreed. One will be a market-led horizon scanning exercise to identify strategic areas of commercial opportunity in global markets for Irish-based enterprises as the basis of the next cycle of research prioritisation. A Foresight Futures Study will be undertaken to provide an informed assessment of technologies that are or will be critical to Ireland's economic and social development and how they will evolve over a 20-year timeframe.

Measures

- A market-led horizon-scanning exercise will be undertaken to identify strategic areas of commercial opportunity in global markets for Irish-based enterprises as the basis for the next cycle of Research Prioritisation, due in 2018. The exercise will take into consideration, inter alia, recent and likely future advances in science and technology, as well as the dynamics of international markets and global supply chains and policy developments.
(Action 2.3, Innovation 2020)
(Timeline 2017)

Priority 2 (A): Jointly Addressing Grand Challenges

Improving alignment within and across the Joint Programming Process and the resulting initiatives (e.g. Joint Programming Initiatives) and speeding up their implementation.

Member States should ensure that at national level (but with an international perspective);

- Relevant Ministries and RFOs work more closely together so that national strategies are better aligned with the themes and priorities of the Scientific Research and Innovations Agenda (SRIAs) of the JPIs;
- RFOs develop enablers such as mutual recognition of evaluation procedures, interoperability of selection procedure, common terminology, and other rules and procedures for implementing R&I programmes; and
- Better integration of calls at national and transnational level would avoid duplication in submitting proposals and in funding, and would promote a more international perspective.

At national and European levels;

- Authorities should raise the profile of transnational cooperation initiatives with all relevant actors (including regional ones) and seek to raise their participation;
- Foresight exercises should be promoted to support the selection of topics for future joint initiatives.

European Commission Indicator: National GBARD[1] allocated to Europe-wide, bilateral or multilateral transnational public R&D programmes, per researcher in the public sector.

Ireland' position: Data from 2012 places Ireland 11th among a group of 29 countries.

Priority 2.A Jointly Addressing Grand Challenges

Horizon 2020 seeks to leverage the strength of the European research eco-system to address a number of major societal concerns faced by citizens of the twenty-first century. This challenge-based approach harnesses Europe's knowledge, skills and infrastructure to achieve a shared ambition of resolving global questions revolving around health, ageing, climate change and sustainability.

Ireland is committed to playing its part in developing effective solutions to global challenges. As detailed in *Innovation 2020*, we are committed to fostering a broad-based research capacity to support national and international policy goals, characterised by excellence in all areas and world-leading in a number of strategically important ones. These challenges are recognised in the selection of the 14 priority areas under research prioritisation. Interdisciplinary research is key to addressing such challenges, and incorporating the 'human factor' is also vital. Societal challenges are typically highly complex, and the engagement of researchers from both Arts, Humanities and Social Sciences, and Science, Technology, Engineering and Maths can often generate more innovative solutions and new ways of approaching and thinking about problems. Targeted initiatives of different scales are required to cultivate and grow quality interdisciplinary research that can deliver optimal impact.

Irish RFOs have been working closely together to ensure complementarity and the removal of overlaps and gaps in the funding architecture. This has been evident particularly in implementation of research prioritisation, and research funders are now working cohesively to support the 14 priority areas. We will continue to build the key components of a successful innovation ecosystem to ensure that interactions within the system are working effectively and efficiently.

Ireland's research funding organisations take measures to ensure in their funding calls that displacement, duplication and overlap are avoided and that complementarity is optimised between national and EU calls. This approach is manifested regularly in joint calls between research funders.

Ireland is an active supporter of the Joint Programming Initiatives (JPIs) as effective mechanisms for increasing the impact of public funding of research through international collaboration. We recognise that by jointly tackling societal challenges in this way, we leverage public investments in research and knowledge infrastructure, pool data and expertise and avoid duplication of effort.

Irish RFOs are engaged in seven of the ten JPIs currently in operation. Relevant RFOs maintain a watching brief on the other three JPIs that Ireland. The recent "Evaluation of Joint Programming to Address Societal Challenges"[2] found Ireland to be among the group of leaders in relation to JPI participation. Members of this group were characterised as "*participating in most of the JPIs and active in most of the joint calls with relatively high budgets... They may also make a relatively high in-*

European Commission, "Evaluation of Joint Programming to Address Societal Challenges – Final Report of the Expert Group", Brussels, 2016.

kind contribution to the leadership of JPIs (and/or the GPC) through providing management resource and/or participating in specific activities".

The JPIs have provided a catalyst for greater alignment of research both within the relevant research communities in Ireland and between them and the wider European research community. For example, the Department of Agriculture, Food and the Marine (DAFM) and Teagasc (the national agriculture and food development authority) are funding partners of the Agriculture, Food Security and Climate Change (FACCE) JPI and are represented on its Governing Board. The Strategic Research Agenda (SRA) of both FACCE and the Healthy Diet for a Healthy Life (HDHL) JPIs were a key input to the design of Ireland's strategic research and innovation agenda for the two food related NRPE priority areas - known as the 'Strategic Healthy Agri-Food Research Plan (SHARP)' - which is now used as a resource to strategically guide research funding decisions in this field by relevant Irish RFOs. The EPA is involved since the beginning of the Water JPI. The EPA Research programme 2014-2020 – Water Research Pillar has been strongly influence by & reflect the Water JPI SRIA. In addition, as an example of cross-agency and cross-JPIs linkages, the EPA is providing funding on behalf of the EPA DAFM (FACCE JPI) in the 2016 Water & FACCE JPIs Joint calls . This approach of utilising JPIs to inform the direction of national research programmes, underpinned by the national programme of research prioritisation, has been replicated across a number of research sectors in Ireland including water, climate change, neurodegenerative diseases, nutritional health and ocean research.

Co-Alignment is further supported through national steering groups that bring together local stakeholders from relevant Government departments, public bodies, research funders and performers to coordinate local action in specific JPIs. These steering groups provide fora to discuss developments within the JPIs, platforms for RFOs to discuss plans to participate in specific calls and opportunities to receive input and feedback from national stakeholders. Ireland's representation on the Groupe de Programmation Conjointe (GPC) – joint programming committee - provides an overarching perspective on how joint programming activities support the achievement of an enhanced European Research Area.

For example, the JPI HDHL agenda matches well with Ireland's expertise including the HRB's Health Research Centre, and two other major national projects (JINGO and ELDERMET) co-funded by HRB/DAFM as part of a wider €25m investment in Food and Health. HRB committed €0.75m for Irish researchers from 5 Irish institutions to engage in the JPI HDHL first joint action, the Knowledge Hub on the Determinants of Diet and Physical Activity (DEDIPAC KH) from Dec 2013-Dec 2016. A key component of this funding is that these groups work together at a national level to optimise their engagement in and knowledge gained/shared from DEDIPAC. As such Irish networks in Physical Activity and Health and in Food and Physical Activity operate in parallel to JPI HDHL activities.

Innovation 2020 recognised that there is scope for better coordination and more support at national level to enhance our engagement with these programmes. To strengthen national oversight of Ireland's participation in JPIs, a Joint Programming Oversight Group will convene regularly, chaired by DJEI with representatives from active Irish research funders. The objectives will be to share learnings between members, identify models of best practice and to develop plans to exploit synergies between the RFOs.

Measures:

- Government Departments and Agencies will explore the potential for competitive funding mechanism aimed at stimulating solutions-driven collaborations;

(Action 4.3, Innovation 2020)
(Timeline 2016-2020)

- The IRC and HRB will target supports to cultivate interdisciplinary research, increase the engagement of public entities and civic society in public policy and societal challenge-based research.

(Action 4.4, Innovation 2020)
(Timeline 2016-2020)

- Irish RFOs will continue to act as leaders with regards to participation, engagement and investment in relevant Joint Programming Initiatives (JPIs).
- The Strategic Research Agendas of the JPIs, developed with input from representatives of Irish RFOs, will continue to inform national research funding programmes which will in turn inform the review of national research prioritisation in 2017.
- RFOs will continue to operate national steering groups to ensure strong stakeholder engagement with the JPIs and enhanced co-ordination of national activity.
- Regular meetings of the national Joint Programming Oversight Group will be convened to bring together representatives from the network of JPI steering groups to ensure effective oversight.

(Action 6.6, Innovation 2020)
(Timeline 2016-2020)

- Relevant RFOs will develop further involvement in relevant JPI activities and ERA-Net initiatives.

(Action 6.7, Innovation 2020)
(Timeline 2016-2020)

Priority 2 (B): Make optimal use of Public Investment in Research Infrastructures

Making optimal use of public investment in RIs by setting national priorities compatible with the ESFRI priorities and criteria taking full account of long term sustainability.

At national level Member States should ensure that;

- the ESFRI Roadmap and their national RI roadmaps are compatible with each other;
- National RI Roadmaps should take account of directions agreed with ESFRI including the need for long term sustainability of facilities, smart specialisation and regular monitoring of feasibility, how they fit with their needs and their cost effectiveness;
- Facilitating access to RIs for Member States which are unable to invest in large infrastructure projects must be a priority.

At national and European levels there should be a careful examination of the planned financial contributions, both to proposed new ESFRI projects and to existing ones to ensure their sustainability.

European Commission Indicator: Availability of national research infrastructure roadmaps with data on national research infrastructures and corresponding investment needs along with identified ESFRI projects and data on national investment in non-ESFRI trans-national RIs (ex. international organisations such as CERN, ESRF, etc.). Table will visualise the degrees of elaboration of roadmaps with year of publication of roadmap on the X axis and the amount of budgetary information available in the roadmaps on the Y axis.

Note: of the 31 countries to be covered by this indicator 5 have no RI roadmap (Iceland, Latvia, Luxembourg, Malta and Slovak Republic). Of the 26 with roadmaps, Ireland's is the oldest (published in 2007), followed by Romania (published I 2008 but an update is currently being prepared).

Ireland's position: Ireland's first research infrastructure roadmap was published in 2007.

2B.1 Current Context

Ireland's publicly funded research infrastructure prior to 1998 suffered from under-investment and heavy reliance on European sources. By 2007, as a result of significant investment since 1998 via the PRTLI and the establishment in 2000 of SFI as the primary research funding agency of the State, Ireland's research infrastructure was in "impressive transition" [3].

Ireland's Strategy for Science, Technology and Innovation 2006-2013 acknowledged the contribution of PRTLI to addressing historic deficits in research infrastructure while recognising continuing shortcomings. The Key Actions of the Strategy were to:

- strengthen and complement the national research infrastructure through linking the research system to centres of excellence internationally and foster partnerships through involvement in international research teams
- increase collaboration between enterprise and research centres in relevant sectors worldwide.

The Strategy also identified the increasing importance of Irish engagement in ESFRI and the value of enhanced engagement in ERANETs.

The 2007 international steering committee review recommended restructuring PRTLI to accommodate support for new proposals and for existing investments on an open competitive basis; re-instatement of a mechanism for replacing, updating and renewing research equipment; development of proposals for future rounds of infrastructure development; establishment of systemic and periodic process for infrastructure reviews in the future.

The detailed findings and recommendations of the 2007 review effectively provided a roadmap for the further development of Ireland's research infrastructure which informed policy on investment in research infrastructure subsequently.

The Higher Education Authority (HEA) also completed a national inventory of all significant publicly-funded research infrastructure and equipment. A database of Large Items of Research Equipment (LIRE) has been developed and is accessible through a searchable, online portal. This database will be further developed in the future to expand the range of research infrastructure available through it and increase its accessibility. In parallel with compiling this national inventory, the HEA developed guidelines for the Higher Education Institutions (HEIs) on providing access to users from the institutions and enterprise. The key principle embodied in the guidelines is that, by default, all publicly funded equipment should be available to users from other HEIs and from enterprise.

2B.2 Further development of Ireland's research infrastructure

In the context of developing the successor to the 2006-2013 strategy – *Innovation 2020* - an independent review of Ireland's Future Research Infrastructure Needs was completed in 2015[4]. This study took stock of public investment in research infrastructure in the context of national STI

[3] Research Infrastructure in Ireland – Building for Tomorrow (Higher Education Authority, Forfás)
[4] Technopolis: Ireland's future research infrastructure needs – July 2015

priorities and identified future investment needs that may be strategically required for the achievement of the said priorities, acknowledging that those priorities would be set in Innovation 2020

Innovation 2020 commits to the further development of Ireland's research infrastructure. The following guiding principles will apply to this work:

- the core funding driver will be excellence with impact and funding will be awarded via a competitive process with potential for co-funding with industry and other private sources
- there will be coherent campus development so that research investment and facilities are aligned with Ireland's talent development at higher education level and synergies are identified and realised
- in the context of addressing global challenges, and the need to be competitive, the infrastructural needs of the wider research base will be recognised, and the increasing importance of big data, data analytics and e-infrastructures will be acknowledged
- the funding of large scale infrastructures will explicitly recognise the importance of international links such as ESFRI
- there will be long-term commitment to funding the maintenance, operational and upgrade costs of facilities to ensure their future viability and national funders of research will implement access charges for all large pieces of research infrastructure
- system efficiencies will be sought on a continuous basis through inter- and intra-institutional collaboration for shared access to equipment and promotion of access by industry.

Effectively, the next cycle of PRTLI will be our national roadmap for our research infrastructure. This will be developed over the course of 2016 and will fully take account of the guidelines set out in *Innovation 2020* as well as the principles set out in the ESFRI Roadmap.

Measure

- Ensure a strategic approach to the development of existing and new research infrastructure programmes by (a) scoping out and developing a successor to PRTLI to support new investment in research infrastructure in the wider research base and to allow for maintenance and upgrading of existing facilities and equipment and (b) reviewing and optimising the roll out of policies for accessing research infrastructure including maximising enterprise use of, and partnerships in , research infrastructure.

(Action 3.16 – Innovation 2020)
(Timeline (a) 2016 (b) 2016-2020)

2B.3 Facilitating access by other Member States to our larger research infrastructures

As shown in 2B.2, Action 3.16 in *Innovation 2020* commits to Ireland reviewing and optimising our policies for accessing our research infrastructure over the lifetime of the strategy. In reviewing the current access charge model used by SFI, our primary Research Funding Organisation, regard will be

had to facilitation of access by other Member States who are not in a position to invest in large scale infrastructure themselves.

2B.4 International Research Organisations (IROs)

Ireland is currently a member of the following IROs:

COST Networking Programme of European Research activities.
Eureka industry focused inter-Governmental RDI programme
EMBL European Molecular Biology Laboratory
EMBC/EMBO European Molecular Biology Conference/Organisation
ESA European Space Agency

One of the series of studies commissioned as part of the development of *Innovation 2020* looked at Ireland's current and potential membership of IROs[5]. For those IROs of which Ireland is not currently a member, potential benefits were identified for Ireland's participation in:

Elixir European network of bioinformatic facilities
CERN European Centre for Nuclear Research
ESO European Southern Observatory
LoFAR Low Frequency Array

Measures
The process of joining Elixir is already underway and following construction of an Irish node for LoFAR, full membership of that organisation will be pursued.

Concerning CERN and ESO, the commitments in *Innovation 2020* are as follows:

- Initiate negotiations with CERN for Ireland's membership options (this process has now begun)

(Action 6.12, Innovation 2020)
(Timeline 2016)

- Initiate negotiations with ESO for Ireland's membership options.

(Action 6.13, Innovation 2020)
(Timeline 2018)

Innovation 2020 also commits to a regular process of review of Ireland's membership of IROs at intervals of (at least) every five years (previously these took place on a more ad hoc basis):

- Formally review membership of IROs at least every five years by undertaking a review of the costs and benefits of existing and potential IRO memberships on the basis of scientific and industry benefits relative to full cost of memberships.

(Action 6.15, Innovation 2020)
(Timeline – 1st review 2020)

[5] Ireland's Membership of International Research Organisations – The CIRCA Group Europe Limited and Fraunhofer ISI - https://www.djei.ie/en/Publications/Publication-files/Review-Irish-Membership-IRO-part-1-of-2.pdf

Priority 3: An Open Labour Market for Researchers

Using open, transparent and merit based recruitment practices with regard to research positions.

At national level;

- Government and relevant stakeholders should consider how the rules for national funding schemes could better promote the uptake and effective implementation by RPOs of the principles of openness, transparency and merit-based recruitment as articulated in the Researcher's Charter and the Code of Conduct for Recruitment of Researchers; and
- RPO should be encouraged to participate in the Human Resources Strategy for Researchers and to review their current recruitment processes in a reflective and self-critical way, amending them where necessary to improve their openness and transparency as benchmarked against the Charter and the Code.

At European and national level authorities should encourage openness and the circulation of international talent by reinforcing a welcoming culture for EU and third-country researchers and reducing obstacles to mobility.

European Commission Indicator: Researcher posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector per year.

Ireland's position: Based on 2013 data Ireland is ranked 6th out of 32 countries. Ireland's performance improved from 100 jobs advertised per thousand public sector researchers in 2012 to 105 in 2013.

Priority 3: An Open Labour Market for Researchers

Innovation 2020 commits Ireland to ensuring that research is an attractive career option, that Ireland is an open, welcoming and appealing prospect for overseas researchers and that the quality of Ireland's research system further enhances the reputation and demand for Irish researchers in the private sector and overseas.

3.1 Laying the foundations for developing innovative researchers

Innovation 2020 notes that talent development for innovation starts a long time before people start looking for jobs. It therefore takes a lifecycle approach to ensuring researchers are properly equipped with flexible skills matching current and future needs.

Science has been compulsory at primary level in Ireland since 1999, and we have been working to improve teaching and learning in mathematics. At second level, a new Junior Cycle has been designed with the objective of enabling students to use and analyse information in new and creative ways and to apply their learning to new challenges. To ensure the continued relevance of our further education and training system new apprenticeships and traineeships are being developed in partnership with industry, and will ensure that the further education and training system plays an enhanced role in the achievement of Ireland's goals for research and innovation.

There remains a need to focus on growing the numbers and diversity of people pursuing Science, Technology, Engineering. Mathematics (STEM) studies and careers. This requires expansion of the initiatives to raise awareness and interest in STEM among the public and families in Ireland, which directly affect the attitudes of young people. In particular, informed by the SFI *Science in Ireland Barometer,* SFI public engagement funding will seek to influence the attitudes of families of girls and those from lower socio-economic backgrounds. The Smart Futures programme, coordinated and managed by SFI in partnership with Engineers Ireland, is aimed at promoting STEM careers to second-level students. The programme will continue to expand its number and range of industry partnerships and its reach nationally.

National policy priorities for higher education are reflected in the *National Strategy for Higher Education to 2030* through which major system reforms are being progressed. In 2016, the Department of Education & Skills will work with HEA on updating the Higher Education System Performance Framework for the 2017-19 period while the outputs of the Expert Group on the Future Funding of Higher Education will shape the future direction of institutional funding in Ireland.

The quality of postgraduate education delivered by our HEIs is critical to Ireland's research system and our ability to contribute to achieving the ERA objectives. Postgraduate researcher education drives participants to develop their own research skills that can be applied in a range of environments, in academia or industry, at home or abroad. Following a period of declining enrolment, we will increase the numbers of students participating in post-graduate and doctoral programmes in Ireland.

Measures

- Students will continue to be provided with a wide range of STEM and related skills, supported by a programme of continuing professional development for science teachers at first and second level.

  (Action 3.1, Innovation 2020)
  (Timeline 2016-2020)

- Further initiatives will be scaled to encourage young people and the wider population to participate in STEM disciplines and engage the broader Irish public in STEM. To this end, we will –

  a) Increase support for the Smart Futures and SFI Discover programmes and build on success of initiatives including Student Enterprise Awards, CoderDojo, Science Week Ireland, BT Young Scientist;

  b) Increase Irish public awareness of STEM from 49% to 60% of the population (350,000 additional people); and

  c) Increase the level of uptake of STEM at second level.

  (Action 3.2, Innovation 2020)
  (Timeline (a) 2016-2020; (b) 2020; (c) 2020)

- A range of new apprenticeships and traineeships will be launched to meet the needs of our most innovation-intensive sectors.

  (Action 3.3, Innovation 2020)
  (Timeline 2016-2020)

- Through the implementation of the National Framework for Doctoral Education, incorporating modules on entrepreneurship, IP management etc., ensure that world-class standards apply to the quality of postgraduate researcher education and training.

  (Action 3.4, Innovation 2020)
  (Timeline 2016-2020)

- The Strategy for Higher Education-Enterprise Engagement will be implemented. It includes enhanced communications and comprehensive employer access to skills and research development opportunities in Higher Education and Training, and the embedding of entrepreneurship as a core feature of Higher Education and Training.

  (Action 48, Action Plan for Jobs 2016)

- The National Plan for Equity of Access to Higher Education 2015-19 will be implemented, including funding and actions targeting increased access and participation in higher education by mature and part-time students.

  (Action 65, Action Plan for Jobs 2016)

- Irish RFOs will increase research masters and Ph.D. enrolments from 1,750 in 2015 to 2,250 and deliver a 30% increase in the number of funded post-doctoral places in order to support the generation of future research talent and to maximise the take-up by industry of qualified researchers from the HE sector

(Action 3.5, Innovation 2020)
(Timeline 2020)

3.2 Supporting the career development of researchers

As stated in *Innovation 2020*, clear career pathways for researchers help them to maximise their personal potential and, as a consequence, help to maximise the return on Ireland's investment in innovation and research. They will lead to a variety of destinations both here and overseas – in academia, in existing industry, in entrepreneurial endeavours or in public service provision, such as health. They can help researchers to combine their research focus with their contribution to education and external engagement.

Effective structured career progression will add up to more than the sum of its parts, with people being encouraged to grow their leadership as well as their research capabilities, and as they are given increased autonomy allied with increased responsibility for the delivery of outcomes. We will develop a coherent national policy on structured progression for researchers.

The sustainable advancement of national and European-wide research and innovation systems requires investment across all stages of researcher development. Striking this balance will enable people to progress from learners to leaders, branching out into new fields of research and as yet unforeseen opportunities for innovation.

Measures

- Impediments to career progression and mobility of trained researchers and innovators in the publicly funded research system will be identified and tackled by developing a coherent national policy on structured progression for researchers.

(Action 3.10, Innovation 2020)
(Timeline 2016-2020)

- Career support will be provided to PhDs and Post-docs though detailed advice, mentoring, internships and placements to ensure that the full spectrum of career possibilities – industry, academia, public service – is known from an early stage.

(Action 3.11, Innovation 2020)
(Timeline 2016-2020)

- Continued opportunities will be ensured for researcher career development in areas of strategic importance – (a) the number of awards (Starting Investigator Research Grant and Career Development Award) will be doubled and (b) metrics will be developed for scoring applicants who have successful industry linkages but lower numbers of publications/ citations than candidates with a purely academic track record.

(Action 3.7, Innovation 2020)
(Timeline 2017)

3.3 Enhancing researcher mobility

Innovation 2020 acknowledges that mobility is a vital element of a researcher's development. As well as international mobility between research institutions, inter-sectoral mobility between industry and academia forges important linkages between research and innovation performers. In order to encourage cutting edge research, there must be strategic links between Europe's research community and industry base. Inter-sectoral mobility provides researchers with the opportunity to gain first-hand experience in a commercial research environment while also providing industry with access to highly specialised trained researchers from the academic institutions. We will expand existing schemes to facilitate mobility and knowledge transfer in order to increase the number of researchers from public research programmes being placed in industry.

Ireland is recognised as having a very open and transparent system for recruiting researchers. All seven Irish universities, six Institutes of Technology (IoTs) and several other RPOs have voluntarily signed up to the European Researcher's Charter and Code of Conduct for Recruitment of Researchers.

The IRC and the Irish Universities Association (IUA) are leading an initiative to have the recruitment policies and working conditions for researchers of each of the Irish HEIs endorsed by the European Commission through accredited attainment of the "HR Excellence in Research" label. In Ireland, nine HEIs have gained the "HR Excellence in Research" badge to date[6] and several more are in the process of completing their action plans for submission.

We recognise the need to ensure a continued flow of top research talent and attract and retain leading Principal Investigators from overseas, as well as from within our indigenous community, particularly in areas where we need to develop research capacity. This will help our international research success, our attractiveness and relevance to industry, and our national collaborative capability. It will also inspire future researchers to undertake research – and to do so in Ireland.

Ireland was one of the early implementers of Council Directive 2005/71/EC (the Admission of Third Country Researchers Directive). The Euraxess Office in Ireland, which is hosted by the IUA, processes Hosting Agreements on behalf of DJEI which enables non-EEA researchers to work in Ireland without recourse to work permits or Green Cards.

There are 54 accredited Hosting Agreement institutions including all seven universities and 13 IoTs along with 10 research institutions and 24 companies. Recent statistics from the Irish Euraxess Office indicate that there has been an increase in the number of third country researchers entering Ireland under the Hosting Agreement scheme. In 2008, there were 276 researchers registered under the Hosting Agreement scheme but by 2015 this had more than doubled to 630.

All publicly funded and research-active organisations are encouraged to advertise research positions on the EURAXESS Ireland portal (www.euraxess.ie) and can request access to the national and EU researcher CV database. Information on entry conditions, transfer of social security and pension contributions, accommodation and administrative assistance is available at EURAXESS Ireland. EURAXESS Ireland provides a range of information services for researchers and their families wishing to enter the country or to go abroad.

[6] NUIG, UCC, DCU, UCD, UL, AIT, DKIT, WIT and RCSI.

Measures

- The mobility of researchers between academia and industry will be ensured through;
    a) enhancement of existing support for the bilateral flow of researchers between academia and industry by increasing awards including under the SFI Industry Fellowship Programme, the IRC Employment-based Postgraduate Programme and the IRC Enterprise Partnership Programme;
    b) increasing the share of PhD researchers transferring from SFI research teams to industry from 25% in 2014 to 35% by 2020; and
    c) through the establishment by HEA of an improved system-wide tracking of researcher mobility into industry.

    (Action 3.12, Innovation 2020)
    (Timeline 2016-2020)
- A new initiative will be established to encourage a culture change and enable the structured progression of early-career stage researchers to careers in entrepreneurship.

    (Action 3.13, Innovation 2020)
    (Timeline 2017)
- Barriers to pension portability that can restrict researcher mobility will be addressed – the potential of RESAVER will be explored.

    (Action 3.14, Innovation 2020)
    (Timeline 2016)
- To ensure Ireland remains an open and attractive prospect for foreign researchers and to encourage Irish researchers to gain overseas experience, ongoing support will be provided for the EURAXESS Ireland Office and the promotion of its activities to relevant stakeholders.

    (Action 3.12d, Innovation 2020)
    (Timeline 2016-2020)
- To ensure world leading research professors and future research leaders are attracted to Ireland:
    a) Both the Research Professor and Future Research Leaders awards will be scaled up to ensure Ireland remains an attractive prospect for highly skilled, in-demand mobile talent.
    b) The Irish embassy network will be engaged to promote the SFI Research Professorship awards and more generally to promote Ireland as a destination for a research career.

    (Action 3.9, Innovation 2020)
    (Timeline (a) 2020 (b) 2016-2020)

Priority 4: Gender Equality and Gender Mainstreaming in Research

Translating national equality legislation into effective action to address gender imbalances in research institutions and decision making bodies and integrating the gender dimension better into R&D policies, programmes and projects.

At national level;

- Member States should develop policies on gender equality in RPOs and regularly monitor their effectiveness and adjusting measures as necessary;
- RPOs should review and enhance their policies for gender equality in research and ensure their implementation. Special attention should be paid to areas where women are underrepresented (for instance in senior position and in research management) and to the funding schemes and disciplines where the imbalances are greatest.

Member States should work with the EC to identify good practices which could be incorporated into their national systems. Gaps in crosscutting gender equality legislation at EU and national levels should also be addressed.

European Commission Indicator: Proportion of women A grade in Higher Education Sector (HES)

This indicator measures the proportion of women at senior level positions in universities and higher education institutions.

Ireland's position: 6th place of EU28 in % of women at Grade A level in 2013

Priority 4 – Gender Equality and Gender Mainstreaming in Research

4.1 Current position

Innovation 2020 identifies that Ireland has the opportunity to build its international reputation for gender equality through improved participation of women in research and innovation activities. A number of specific initiatives are currently underway.

The IRC, which supports excellent research in all disciplines, in its Gender Strategy and Action Plan 2013-2020 seeks to address the issues of under-representation, by gender, of highly talented researchers and also the gender dimension of research projects. This strategy and action plan sets out to eliminate barriers to participation in research that are due to gender and it has relevance for research areas and projects in which women are under-represented. The action plan of the strategy sets out the IRC's commitments to support gender equality in researcher careers; the integration of sex/gender analysis in research content; and to ensure internal gender proofing in policies, processes, training measures, assessment procedures; to aim for balance on assessment, advisory, management boards, committees, workshops, focus groups etc.; to produce annual gender disaggregated statistics; to monitor and analyse the patterns of awards; and to consult with national and international groups working to advance gender equality.

As the IRC funds mainly early stage researchers, its gender strategy therefore impacts researchers from early in their careers. Since the gender strategy was launched in 2013, all applications for funding to the IRC have been required to be "gender blind". There has since been a significant improvement in the numbers of female applicants and awardees within STEM disciplines at post-doctoral level. The IRC, in addition to producing guidelines and a checklist on the gender dimension in research, works with university research officers in the delivery of gender related training and workshops and are active in provision of guidelines and training for assessors of funding applications to ensure gender integration in applications and that scoring is both qualitative and quantitative. Given the competitive nature of funding, applicants must address the gender dimension thoroughly in their proposals if they are to succeed.

SFI, Ireland's main public funder of research has a number of policies[7] to support development and retention of women researchers from early to more advanced career stage through supports for maternity leave and supports for researchers returning to active academic research after a prolonged absence.

The PRTLI, which provides public funds for creation and maintenance of research infrastructure in Ireland and support for postgraduate research, education and research capability across all disciplines, requires the gender proofing of all research projects.

[7] SFI Women in Science Early Career Initiative; SFI Advance Award for Women in Science; SFI Maternity/Adoptive Policy; SFI flexible eligibility criteria

HEIs have diversity policies in order to ensure their compliance with statutory obligations with respect to equality – these of course apply to all staff in the institutions, not just researchers.

Individual HEIs run researcher-specific initiatives within their institutions. An example is WiSER in Trinity College which works to **'recruit, retain, return and advance'** women in academic science, engineering & technology (SET).

A number of other initiatives are under way nationally. These include the Aurora women-only Leadership Development Programme in which a number of HEIs are sponsoring female participation; Project Juno sponsored by the Institute of Physics which recognises and rewards departments that can demonstrate they have taken action to address the under-representation of women in university physics and to encourages better practice for both women and men; the Athena Swan Charter in Ireland which awards academic institutions and departments for cultural and systemic changes to address gender inequality, particularly in STEM and medicine, but this will be extended to all disciplines in the future.

Notwithstanding the positive impact of these initiatives, there remains a gender imbalance in staffing of HEIs, particularly at the senior levels.

<u>HEA National Review of Gender Equality in Higher Education</u>

The HEA has a statutory responsibility, at central government level, for the effective governance and regulation of higher education institutions and the higher education system. Since 2000, the HEA has actively promoted equality in higher education through a range of initiatives. As part of its work to promote equality of opportunity for staff, the HEA publishes data on the gender breakdown of academic and senior academic staff annually.

The HEA initiated a review of gender equality in Irish HEIs in 2015. A review panel, chaired by former EU Commissioner for Research and Innovation Ms Máire Geoghegan-Quinn, conducted a system-wide review of gender profiles and gender equality policies in all HEIs in receipt of block-grant funding from the HEA. The review took as its starting point an analysis of the status quo on gender equality in higher education in Ireland. It is examining the reasons for continuing gender inequality across the sector and will make recommendations to ameliorate these. The panel is expected to report in July 2016.

4.2 Existing data on gender in Grade A posts

Gender data on academic positions in higher education institutions are collected quarterly by the HEA.

The proportion of women at Full Professor level in Irish universities in the period 2013-2015 is shown at Table 1 below. Having remained static at 19% for 2013 and 2014, a 10% increase is shown for 2015.

Table 1: HEA gender data 2013-2015 – Full Professor Level - Universities

Year	% Male	% Female
2015	79	21
2014	81	19
2013	81	19

Source: HEA

The most recently published SHE figures[8] show that the proportion of women in Grade A posts in 2013 varies widely across countries – ranging from 11% to 67%. The average shown for the EU28 is 20.9%, an improvement of 7% on 2010 (19.5%).

Ireland's position as shown in the SHE data does not correspond with the HEA data, reflecting different data collection methodologies employed.

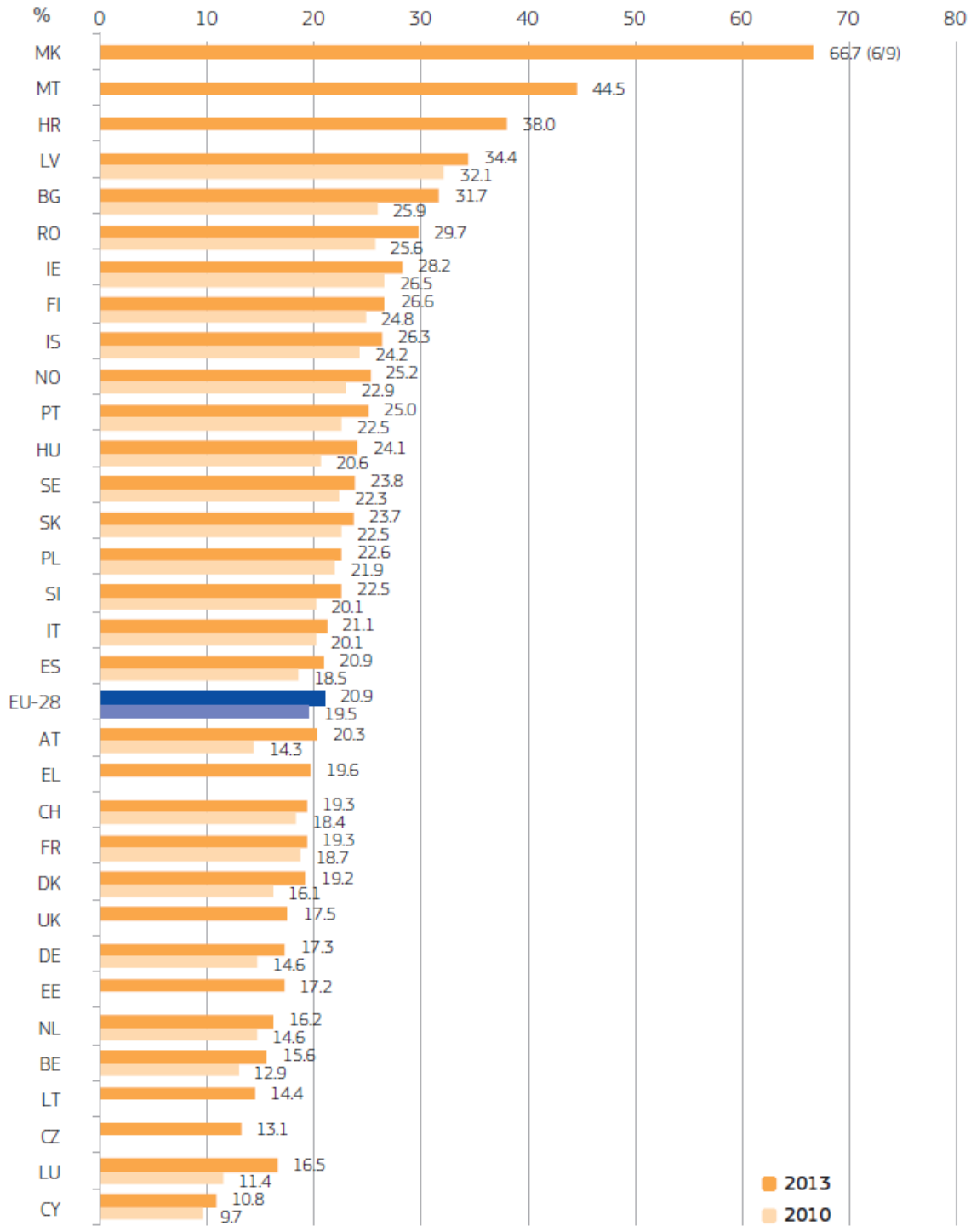
In the SHE data, Ireland ranked 6th of the EU 28 in terms of % of women at Grade A level in 2013. See Table 2 below.

With 28.2% of Grade A posts held by women in 2013, this shows Ireland as significantly above the average for the EU28 (20.9%). While giving no grounds for complacency, this appears to signal nevertheless that Ireland is further along the road in terms of representation of women in Grade A positions than a number of other Member States. We recognise the need to do more and in this context and when the findings of the HEA Review are available, we will work with key stakeholders to encourage active participation by all RPOs to activate policies that will implement the relevant recommendations of the HEA review and put active monitoring measures in place. Attention will be focused in particular on areas where women are under-represented (eg. in senior positions and in research management) and to the funding schemes and disciplines where imbalances are greatest. Full and successful engagement with the Athena Swan Initiative will be also be encouraged.

[8] SHE FIGURES 2015 I Gender in Research and Innovation

Table 2 – SHE figures 2015

Figure 6.3. Evolution of the proportion of women in grade A positions, 2010 and 2013



Notes: Exceptions to the reference years: AT: 2006–2011; BE (FL), FI, NL, NO, SE: 2011–2013; CY, IE, IS, PT: 2010–2012; EL: 2012; LU: 2009–2013; FR: 2009 (She Figures 2012) and 2012; MK: 2012; MT: 2015; PL, SK: 2012-2013; HR: 2014; SI: 2010 (She Figures 2012) and 2013; UK: 2006 (She Figures 2012); EE: 2004 (She Figures 2012); LT: 2007 (She Figures 2012); CZ: 2008; Data unavailable for: LI, ME, AL, RS, TR, IL, FO, MD;
Others: When the population size is very small, the actual numerator and denominator are presented in parentheses next to the proportion in the chart to highlight results that are more prone to yearly fluctuations.

Source: Women in Science database, DG Research and Innovation

4.3 Commitment in Innovation 2020

Innovation 2020 commits to promoting gender equality in researcher careers and improving participation of women in research and innovation activities.

Measure

- Address gender issues relating to career progression in research and innovation through engaging fully with the Athena Swan initiative and implementing the relevant recommendations emerging from the HEA National Review of Gender Equality in Irish Higher Education.

(Action 3.15, Innovation 2020)
(Timeline 2016-2020)

Priority 5: Optimal Circulation and Transfer of Scientific Knowledge

(a) *Fully implanting knowledge transfer policies at national level in order to maximise the dissemination, uptake and exploitation of scientific results. RPOs and RFOs should make knowledge transfer second nature by integrating it in their everyday work.*

At national level;

- Member States should promote effective knowledge transfer mechanisms in their RPOs with suitable supporting measures to encourage this. RPOs should be motivated to establish policies and procedures for the management of Intellectual Property
- Member States should develop indicators to quantify the economic and social impact of knowledge transfer policies.

European Commission Indicator: Percentage of product or process innovation firms collaborating with higher education institutions or with public research institutions for their innovation activities

Ireland's position: Ireland is ranked 16th among the 30 benchmarked countries (2010-2012 data). This is slightly below the EU 28 average.

5.1 Current situation

In the context of the size of the Irish public research system, which is comparatively small, policymakers are focussed on ensuring optimal collaboration within the public research system; and between enterprise and the public research system. Concerning the former, considerable progress has been made in consolidating the network of centres and the priority now is to build critical mass around a smaller number of centres of scale. The scope for building on the consolidation to exploit synergies created by collaboration between centres with complementary research agendas is well recognised. For full value of investment in the public research system to be realised, fruitful collaboration between the enterprise sector and the public research system is also essential.

Significant work has already been undertaken to increase knowledge transfer capacity across the research and innovation system and improve the environment for exploitation of IP. This will be further built on in the context of the commitments in *Innovation 2020*.

5.2 Technology/knowledge transfer

Through the first and second Technology Transfer Strengthening Initiative programmes (TTSI1 – 2007-2013; TTSI2 2013-2016), €52m was invested, via Ireland's enterprise and innovation agency Enterprise Ireland (EI) , in the creation and development of Technology Transfer Offices (TTOs) and consortia across the universities and IoTs in Ireland. A central office with responsibility for technology/knowledge transfer was established jointly by EI and the IUA in 2013, arising from a recommendation from a Government-led task force that reviewed the state of business-research base engagement in 2012. This launched as Knowledge Transfer Ireland (KTI) in 2014 which focuses on providing a streamlined, predictable process that delivers effective commercialisation of research.

KTI takes a national perspective on the knowledge transfer (KT) system in Ireland. It works with business, investors, universities, IoTs, State research organisations, research funders and government agencies to maximise State funded technology, ideas and expertise getting into the hands of business to drive innovation. In the short time since its creation, data shows that KTI has had a significant impact. With its focus on making it simpler for business and investors to benefit from publicly funded research, KTI reaches out to a broad audience that ranges from small, local companies to large multinationals. KTI also support the commercialisation offices in the RPOs so that they can work effectively with businesses and investors to develop Ireland's R&D capability, innovation and growth.

KTI provides a variety of resources through its website such as practical guides and model agreements to cover various research collaboration and licensing scenarios. KTI also organises a series of events for RPOs, TTOs and the business community at which topical issues are discussed and best practice shared. KTI delivers the annual Impact Awards which recognise notable knowledge

transfer success in Ireland. KTI is instrumental in fostering and growing the research commercialisation profession in Ireland.

To assist in promoting the accessibility of RDI supports, a Directory[9] of enterprise supports and programmes has been developed and disseminated .

National IP Protocol

The IP Protocol, first developed in 2012, described Ireland's policy and established the framework for enterprise engaging with the publicly funded research base. It was revised by KTI, in consultation with stakeholders, in 2015 to take account of practical experiences since the publication of the first protocol. The new version of the protocol is designed to make the process of engagement between business and RPOs simple to understand. It provides a framework of best practice, guiding companies and RPOs on the expected norms for research-related agreements. The practical resources now developed by KTI underpin the IP Protocol.

5.3 Changes in IP legislation

A number of aspects of patents and trademarks legislation, notably exempting from patent infringement activities in the area of clinical tests and trials to secure regulatory approval for new or generic versions of products for medical or veterinary purposes, were updated through the Intellectual Property (Miscellaneous Provisions) Act 2014.

5.4 Commitments in Innovation 2020

Innovation 2020 recognises the crucial role of intellectual property and access to the breadth of knowledge and expertise in Ireland's research base in driving innovation to enhance GDP and employment growth. One of its 7 chapters consequently identifies the priorities in this domain and sets out a number of measures to strengthen knowledge transfer for innovation, encourage engagement with the research base, promote more extensive commercialisation of the outcome of public research, improve the exploitation of IP by Irish enterprises, and improve the IP framework.

Of the suite of studies commissioned as part of the development of *Innovation 2020* looked at enhancing the IP activities in the enterprise base[10].

The report found that patent activity was concentrated primarily in the pharmaceutical, medical devices and ICT sectors and that a small number of firms were responsible for the vast majority of patent applications in the period of 1999-2013. These sectors are primarily associated with foreign-owned multi-national companies. In the indigenous sector, a perceived barrier to engaging in formal IP protection - particularly in small and micro enterprises - was the cost of protecting IP. The report made a number of recommendations to address the issues identified and *Innovation 2020* commits to a series of actions to enhance the IP regime in Ireland.

[9] Directory of Innovation Supports, Research Centres and Technology Centres 2016 – DJEI - https://www.djei.ie/en/Publications/Directory-of-Innovation-Supports-Research-Centres-and-Technology-Centres-2016.html

[10] Enhancing the intellectual property activities in the firm base in Ireland – Technopolis (2015)

Over the lifetime of the strategy, the focus will shift increasingly to the outcomes of engagement with the research base, whether this be through accessing expertise or commercialisation of IP. Measures of progress will extend to include more impact driven considerations such as the longer term benefits to enterprise and the economic impact of knowledge transfer.

Measures

To strengthen knowledge transfer for innovation

- Publish a revised IP protocol to ensure that the Irish protocol remains "best in class", which incorporates feedback from industry and other stakeholders on issues identified in the operation of the current protocol.

  (Action 5.1, Innovation 2020)
  (Timeline 2016)

- Provide additional resources and tools to improve industry-academic collaboration, including expanded resources and tools to facilitate enterprise (i) engagement with the public research system and (ii) access to IP. Such resources and tools to include model agreements, practical guidelines, improved information on expertise within the public research system.

  (Action 5.2, Innovation 2020)
  (Timeline 2016)

To promote more extensive commercialisation of public research

- Encourage commercialisation of publicly-funded research by requiring all public research funders to increase the commercialisation of the research they support, using the available commercialisation and technology transfer programmes, to ensure the efficient transfer of economically valuable research outputs to enterprise. In this context targets have been set in the areas of (a) commercially relevant technologies (licences, options, assignments: 175; (b) Spinouts: 40; (c) High Potential Start Ups (HPSUs) from Spinouts: 16; (d) collaborative research projects between enterprise and the public research system: 920.

  (Action 5.3, Innovation 2020)
  Timeline 2016-2020)

- Set new targets for the commercialisation of research by developing new impact metrics for commercialisation of publicly funded research and set targets for both outputs and impacts commensurate with increased public investment.

  (Action 5.4, Innovation 2020)
  (Timeline 2017)

- Implement a successor to the current Technology Transfer Strengthening Initiative by launching TTSI3 to embed knowledge transfer within the public research system and review the operations and funding of Knowledge Transfer Ireland (KTI).

  (Action 5.5, Innovation 2020)
  (Timeline 2017)

To improve IP exploitation by Irish enterprises

- Raise IP awareness of the opportunities for firms to engage in IP activity.

  (Action 5.6, Innovation 2020)
  (Timeline 2016-2020)

- Build IP capability and resilience at enterprise level by focusing on Ireland-based R&D-active and export-oriented client base and establishing an inter-agency group to develop a roadmap for building IP capability and resilience at enterprise level.

  (Action 5.7, Innovation 2020)
  (Timeline 2016-2020)

- Invest in widespread IP education for example through including modules on IP management in relevant courses in higher education.

  (Action 5.8, Innovation 2020)
  (Timeline 2017)

- Measure progress of IP activity in firms by developing an approach to monitoring and measuring progress of IP activity in the enterprise base.

  (Action 5.9, Innovation 2020)
  (Timeline 2017)

<u>To position Ireland's IP framework to encourage innovation</u>

- Introduce legislative changes relating to copyright, to implement reforms recommended by the Copyright Review Committee aimed specifically at exploring greater use of certain copyright exceptions to promote innovation.

  (Action 5.10, Innovation 2020)
  (Timeline 2016-2020)

- Improve patenting options for business by implementing the European unitary patent system and, working with stakeholders, make the case for approval by referendum of the Unified Patent Court with presence in Ireland.

  (Action 5.11, Innovation 2020)
  (Timeline 2016-2020)

- Address cost issues for IP enforcement by facilitating enforcement of lower value claims through lower courts.

  (Action 5.12, Innovation 2020)
  (Timeline 2016-2020)

- Support development of the Knowledge Development Box by developing an outline scheme and appropriate legislation to support the KDB for qualifying IP assets.

  (Action 5.13, Innovation 2020)
  (Timeline 2016)

Priority 5: Optimal Circulation and Transfer of Scientific Knowledge

(b) *Promote open access to scientific publications*

At national level Member States should:

- Promote Gold and/or Green Open Access in line with the Commission's 2012 Recommendation on access to and preservation of scientific information[1];
- Ensure the further implementation to open access to scientific publications by the most appropriate means in their own research environment;
- Encourage RFOs to exchange information and good practices during the transition to open access;
- Consider aligning and coordinating their negotiations with scientific publishers on reasonable subscription fees and Article Process Charges (APCs) to support a transition to a new and more balanced business models;
- Facilitate the development of certified repositories for Green Open Access and stimulate self-archiving; and
- Should foster synergies with the fora and working of other multilateral organisations such as the OECD, G8, UN and UNESCO in order to advance the implementation of open access in the international environment

At national and European levels the Commission and Member States should consider adopting the Open Science approach on selected common societal challenges under Horizon 2020.

In order to further both *a* and *b,* the Commission and Member states should;

- Work together to discuss the recommendations relating to Open Science identified by the Working Group on Knowledge Transfer and Open Innovation and identify whether their implementation is adequate within the ERA roadmap; and
- Explore the conditions under which open access to publicly funded research data is appropriate and might be promoted and the tools and pilot actions which may be helpful.

European Commission Indicator: proportion of Open Access paper (Gold and Green OA only) per country.

Ireland's position: Ireland is ranked 8th out of the 40 benchmarked countries according to 2008-2013 data.

5(b).1 Current context

Ireland published a National Statement on Principles of Open Access in 2012. The statement was developed by a national steering committee representative of research funders, HEIs, public research bodies, digital repository and digital resources organisations, librarian groups etc. and launched by the Minister for Skills, Research and Development in 2013.

The National Statement sets out:

- principles on deposition of published research outputs in Open Access repository
- requirements for infrastructure and sustainability of open access repositories
- advocacy and coordination in the implementation of the Principles on Open Access

In Ireland, the current preferred form is Green Open Access, meaning that research articles are published in the first place to online open access repositories, on a self-archived basis. An embargo period may apply before they can be published in open access journals.

Since the launch of the National Statement, the National Steering Group has focused on its implementation, appropriate training provision, networking and building collaboration between data holders. The group continues to work on aspects of Open Access.

A number of large Research Funding Organisations[11] have updated or published their own policy statements on Open Access, based on the national principles. One of these – the Health Service Executive (HSE) – has introduced and awards scheme[12] which recognises the contribution to open access of researchers in the healthcare system, including healthcare professionals.

One of Ireland's largest research centres - the SFI-funded Insight Centre for Data Analytics - developed a paper called "Towards a Magna Carta for Data", suggesting ways in which barriers to open access stemming from concerns about data protection/privacy could be addressed, as a contribution of EU policy development in this area.

5(b).2 – Commitment to Open Access in Innovation 2020

Innovation 2020 acknowledges that open access to scientific publications adds value to research, to the economy and to society. It states that the outputs of publicly funded research should be publicly available to researchers, and also to potential users in the education, business, charitable and public sectors, and to the general public. The strategy highlights the need to ensure that peer reviewed journal articles and other research outputs resulting from partially or wholly publicly funded research should be deposited in an open access repository and made publicly discoverable, accessible and re-usable as soon as possible and on an ongoing basis. Innovation 2020 also flags that

[11] Health Research Board, Irish Research Council, Health Service Executive, Science Foundation Ireland, Department of Agriculture, Food and the Marine

[12] HSE Open Access Awards

research data should also be deposited where this is feasible, linked to associated publications where appropriate.

The web-based portal RIAN, which is the Irish word for path, collects the contents of repositories of the universities and public research bodies such as Teagasc[13] and the Marine Institute. Rian has been in place since 2010 and is the primary source for Irish Open Access publications. In addition, the EPA research archive established in 2007 houses over 3,700 files on environmental monitoring data which are available for further research

Innovation 2020 commits to supporting, over its lifetime 2016-202, the integration of open access repositories as well as supporting national and European open access policies and principles. Of course open access aspects of Council Conclusions will be embraced by this commitment.

Measure

- Support national and European open access policies and principles by integrating and supporting opening access repositories.

(Action 4.7, Innovation 2020)
(Timeline 2016-2020)

[13] Irish Agriculture and Food Development Authority

Priority 6: International Cooperation

Develop and implement appropriate joint strategic approaches and actions for international STI cooperation on the basis of Member States' national priorities.

At national level, Member States should;

- Define national strategies for internationalisation to foster stronger cooperating with key third countries, reinforcing multilateral STI cooperation approaches in order to build critical mass and maximise impact, for example in tackling grand societal challenges.

Between Member States, Associated Countries and the EU there should be;

- Better coordination of the objectives and activities of the EU, Member States and Associated Countries towards Third Countries and International Organisations (through SFIC);
- Active participation in the further development of Multi-Annual Roadmaps for international cooperation to support coherent priority setting; and
- Better uptake of the results of multilateral EU and intergovernmental initiatives and better use of bi and multilateral agreements between EU Member States and international partner countries.

European Commission Indicator: International scientific co-publications per thousand researchers (FTE) in the public sector.

Ireland is ranked second out of 28 countries. Cyprus tops the rankings. The ERAC opinion paper noted that smaller countries will have a tendency to do better than larger countries out of the necessity to engage in collaborations outside of their borders.

Ireland's position: Ireland is ranked second out of 28 countries.

6.1 Current context

A key plank of Ireland's international engagement is participation by our researchers and enterprises in EU Framework Programmes. Successful participation not only supplements State investment in the RDI system but by affording the opportunity for our talented researchers to collaborate with the best and brightest in Europe raises the excellence of the national and European research systems and lays the basis for future and even more significant collaborations.

Our national strategy for participation in Horizon 2020 sets an ambitious target – double that achieved under Framework Programme 7. This ambition is founded in the significant development of our national research system which has been facilitated by considerable investment from national and EU sources.

As part of our national strategy for engagement in Framework Programmes, there is an All Island dimension in which North-South research links are actively encouraged between the Republic of Ireland and Northern Ireland and there is a discrete target for North-South collaborations in Horizon 2020. North-Couth collaboration is also strengthened through the collaborative agreement entered into by SFI with Government Departments and funding agencies North and South.

Ireland fully supports the priorities of the European Research Area.

Ireland's main research funder, SFI, supports linkages and joint activities between Irish researchers and those from Brazil, China, India and Japan.

Ireland participates in the Small Advanced Economies Initiative (SAEI) together with Denmark, Finland, Israel, New Zealand, Singapore and Switzerland. The current work programme of the SAEI includes a focus on science and innovation.

In the context of the scale of our research system, Ireland's engagement with Third Countries is based primarily on cooperation in areas which accord with our strategic priorities in RDI. Ireland currently has bilateral agreements with China, India, and Japan and in addition participates in Joint Economic Commissions (JECs) with Russia, South Korea and Saudi Arabia.

6.2 Innovation 2020 and international cooperation

As noted in *Innovation 2020*, international cooperation maximises the impact of national and international investment in research and innovation. This is true globally but is particularly important for Ireland in the context of our being a small, open economy. *Innovation 2020* sets out our ambition for greater international engagement in the future, across the different platforms outlined at 6.1 above.

Horizon 2020

Ireland sees significant advantages for the development of its international collaboration by focusing on the different aspects of engaging with the EU. In terms of Horizon 2020, the ambition set out in our national strategy for H2020 is recommitted to and elaborated in *Innovation 2020*.

Measures

- Secure €1.25 billion in funding from Horizon 2020 by optimising sectoral engagement (higher education sector, industry, publicly funded research bodies).

  (Action 6.1, Innovation 2020)
  (Timeline – over lifetime of H2020)

- Catalyse the creation of and participation in consortia to bid for large-scale opportunities in Horizon 2020 by analysing relevant opportunities, facilitating linkages between potential Irish leads and consortia partners, providing support and co-funding for large Irish-led proposal.

  (Action 6.2, Innovation 2020)
  (Timeline – over lifetime of H2020)

- Influence EU Commission by representing Irish interests when Horizon 2020 work programmes are being formulated.

  (Action 6.3, Innovation 2020)
  (Timeline – over lifetime of H2020)

ERA

In *Innovation 2020*, Ireland commits to optimising its engagement in the ERA and to continuing to progress the 6 priorities of the ERA. The ways in which we plan to do this have been outlined throughout this national ERA roadmap.

Northern Ireland, UK, Third Countries

Innovation 2020 also sets out a series of measures to deepen our bilateral engagements with Northern Ireland directly and in the forum of the US-Ireland R&D partnership; with our near neighbour the UK, and with those third countries with whom we have already developed cooperation in the R&D area.

Measures

- Enhance collaboration with the UK via (i) co-fund with the Wellcome Trust for biomedical and clinical research in Ireland (ii) together with the Royal Society supporting University Research Fellowship Scheme for early stage researchers to carry out research in Ireland; (iii) supporting collaborative research in key areas between Irish and UK researchers ; (iv) exploring options for further collaboration through for example, Horizon 2020, NCP networks, the European Institute of Innovation and Technology (EIT); with UK Environment agencies support collaborative research for evidence to underpin environmental regulation.

  (Action 6.8, Innovation 2020)
  (Timeline 2016-2020)

- Explore future joint funding opportunities with Northern Ireland by exploring mechanisms under research infrastructure, research cooperation and researcher exchange.

(Action 6.9, Innovation 2020)
(Timeline 2016-2020)

- Deepen collaboration through the US-Ireland R&D Partnership through expanding the remit of the Partnership in areas of mutual interest to US, Ireland and Northern Ireland and through supporting the US National Science Foundation (NSF) Programme for NSF Graduate Fellows to carry out research visits in Ireland. This action to be achieved over the lifetime of the strategy 2016-2020.

(Action 6.10, Innovation 2020)
(Timeline 2016-2020)

- Develop follow-up initiatives to the Science Foundation Ireland International Strategic Cooperation Award (ISCA) programme by developing funding partnerships with international funders in Brazil, China, India and Japan to support international collaborative research projects. This action to be achieved over the lifetime of the strategy 2016-2020.

(Action 6.11, Innovation 2020)
(Timeline 2016-2020)

<u>International benchmarking and best practice</u>

Ireland is interested in ensuring that we adopt best practices and hold an objective perspective on the performance of our research system.

Measure

- Retain membership of international research funding organisations; benchmark Ireland and adopt best practices – in particular benchmark Ireland against large, small and EU countries and learn from and adopt best practices, policies and initiatives. This action to be achieved over the lifetime of the strategy 2016-2020.

(Action 6.16, Innovation 2020)
(Timeline 2016-2020)

ANNEX I

ERA Priority 1 – Effective National Research Systems				
Innovation 2020 Ref.	**Actions**	**Actors**	**Timelines**	**Indicators**
1.1	Continue and increase investment in people, infrastructure and associated facilities to build the education and research base; and support the enterprise and public sectors to build their capacity for research and development.	Government	2020	N/A
1.2	Reach R&D intensity target of 2.5% of GDP	Industry, Government, Research funders, SFI, EI, IDA, HEIs, Horizon 2020 National Support Network	2020	• Increase number of significant enterprise R&D performers by 15% to 1,200 and the number of larger performers from 170 to 200; • Double private funding of publicly performed R&D to €48m/year • Secure €1.25bn funding from Horizon 2020
7.1	Establish the Innovation 2020 Implementation Group to ensure a coherent approach to driving the implementation of *Innovation 2020*	DJEI	2016	Group has been established and is meeting regularly
7.2	Put in place informal reporting mechanisms between the Innovation 2020 Implementation Group and other relevant groups to ensure coherence in development and delivery of policy across all relevant Government departments.	All relevant Government Departments	2016-2020	N/A
7.4	The *Innovation 2020* Implementation Group will report annually to Government on progress towards implementation of the strategy, with quarterly progress monitored through the Action Plan for Jobs process.	Innovation 2020 Implementation Group	2016-2020	Annual Report to Government and quarterly Action Plan for Jobs progress reports delivered
7.5	A mid-term evaluation of *Innovation 2020* will be undertaken in 2018 so that relevant adjustment can be made in a timely manner to ensure successful delivery on the vision and objectives. A retrospective evaluation of the strategy will be carried out to inform the development of its successor.	Innovation 2020 Implementation Group	2018 and 2020	Mid-term evaluation undertaken

Innovation 2020 Ref.	Actions	Actors	Timelines	Indicators
N/A	Independent evaluations of Ireland's participation in Framework Programmes to assess our performance and strengthen engagement in future programmes will continue to be carried out.	DJEI	As appropriate	Evaluations carried out.
2.4	The full range of State financial aid for RDI will be reviewed to ensure that the needs of small and young firms are being catered for as well as those of larger, established firm. The review will also assess the incentives available internationally to ensure that Ireland's offering remains competitive.	DJEI, EI, IDA Ireland and other relevant funders	2017	Review carried out.
N/A	A review into the impacts to enterprise from publicly funded research will be undertaken.	DJEI	2016	Review carried out.
3.16a	A successor to PRTLI will be scoped out and developed to support new investment in research infrastructure in the wider research base and to allow for maintenance and upgrading of existing facilities and equipment.	DJEI, DES, SFI, HEA with other departments and funders, HEIs, enterprise agencies and other stakeholders	2016	Successor developed.
4.1b	Public policy needs will be addressed and use of research will be optimised by evaluating all funding programmes to ensure continued relevance and clarity of purpose.	All Government Departments	2016-2020	Programmes evaluated.
2.3	A market-led horizon-scanning exercise will be undertaken to identify strategic areas of commercial opportunity in global markets for Irish-based enterprises as the basis for the next cycle of Research Prioritisation, due in 2018. The exercise will take into consideration, inter alia, recent and likely future advances in science and technology, as well as the dynamics of international markets and global supply chains and policy developments.	DJEI, research funders, enterprise development agencies, key stakeholders	2017	Exercise undertaken.

ERA Priority 2 (A) – Jointly Addressing Grand Challenges				
Innovation 2020 Ref.	**Actions**	**Actors**	**Timelines**	**Indicators**
4.3	The potential for competitive funding mechanism aimed at stimulating solutions-driven collaborations will be explored.	All Government Departments and Agencies	2016-2020	Potential explored.
4.4	Strengthen public policy and societal impact by targeting supports to cultivate inter-disciplinary research and increase engagement of public entities and civic society in public policy and societal challenge-based research	IRC, HRB	2016-2020	Inter-disciplinary research supported.
N/A	Continue to act as leaders with regard to participation, engagement and investment in relevant Joint Programming Initiatives (JPIs).	RFOs	2016-2020	Participation in JPIs.
N/A	The Strategic Research Agendas of relevant JPIs, developed with input from representatives of Irish RFOs, will continue to inform national research funding programmes which will in turn inform the review of national research prioritisation in 2017.	RFOs, DJEI	2016-2020	Relevant aspects of SRAs reflected in national research funding programmes
N/A	Continue to operate national steering groups to ensure strong stakeholder engagement with the JPIs and enhanced co-ordination of national activity.	Relevant RFOs	2016-2020	Steering groups convened.
6.6	Convene regular meetings of the national Joint Programming Oversight Group to bring together representatives from the network of JPI steering groups to ensure effective oversight.	DJEI	2016-2020	Oversight group convened.
6.7	Develop further involvement in relevant JPI activities and ERA-NET initiatives	Relevant RFOs	2016-2020	Participation as appropriate.

Priority 2 (B): Make optimal use of Public Investment in Research Infrastructures				
Innovation 2020 Ref.	**Actions**	**Actors**	**Timelines**	**Indicators**
3.16	Ensure a strategic approach to the development of existing and new research infrastructure programmes by (a) scoping out and developing a successor to PRTLI to support new investment in research infrastructure in the wider research base and to allow for maintenance and upgrading of existing facilities and equipment and (b) reviewing and optimising the roll out of policies for accessing research infrastructure including maximising enterprise use of, and partnerships in , research infrastructure.	DJEI, DES, SFI, HEA with other departments and funders, HEIs, enterprise agencies and other stakeholders	(a) 2016 (b) 2016-2020	Successor to PRTLI scoped out and access policies in place.
6.12	Initiate negotiations with CERN for Ireland's membership options	DJEI	2016	Membership options clarified and next moves determined.
6.13	Initiate negotiations with ESO for Ireland's membership options.	DJEI	2018	Membership options clarified and next moves determined.
6.15	Formally review membership of IROs at least every five years by undertaking a review of the costs and benefits of existing and potential IRO memberships on the basis of scientific and industry benefits relative to full cost of memberships.	DJEI	2020	Review undertaken.

Priority 3: An Open Labour Market for Researchers				
Innovation 2020 Ref.	**Actions**	**Actors**	**Timelines**	**Indicators**
3.1	Students will continue to be provided with a wide range of STEM and related skills, supported by a programme of continuing professional development for science teachers at first and second level.	DES	2016-2020	Programmes rolled out.
3.2	Further initiatives will be scaled to encourage young people and the wider population to participate in STEM disciplines and engage the broader Irish public in STEM. To this end, we will – a) Increase support for the Smart Futures and SFI Discover programmes and build on success of initiatives including Student Enterprise Awards, CoderDojo, Science Week Ireland, BT Young Scientist; b) Increase Irish public awareness of STEM c) Increase the level of uptake of STEM at second level.	SFI, DES, HEA with other funders, stakeholders and co-sponsors	a) 2016-2020 b) 2020 c) 2020	a. Programme activity expanded. b. Increase STEM awareness from 49% to 60% of the population (350,000 additional people) c. STEM awareness raised in second-level students and STEM uptake increased.
3.3	A range of new apprenticeships and traineeships will be launched to meet the needs of our most innovation-intensive sectors.	DES, SOLAS, Skillnets with industry	2016-2020	Apprenticeships and traineeships launched.
3.4	Through the implementation of the National Framework for Doctoral Education, incorporating modules on entrepreneurship, IP management etc., ensure that world-class standards apply to the quality of postgraduate researcher education and training.	HEA & QQI with HEIs	2016-2020	Framework implemented.

N/A	The Strategy for Higher Education-Enterprise Engagement will be implemented. It includes enhanced communications and comprehensive employer access to skills and research development opportunities in Higher Education and Training, and the embedding of entrepreneurship as a core feature of Higher Education and Training. **(Action 48, Action Plan for Jobs 2016)**	DES, HEA, HEIs	2016	Strategy implemented.

Innovation 2020 Ref.	Actions	Actors	Timelines	Indicators
N/A	The National Plan for Equity of Access to Higher Education 2015-19 will be implemented, including funding and actions targeting increased access and participation in higher education by mature and part-time students **(Action 65, Action Plan for Jobs 2016)**		2016	National Plan implemented.
3.5	Research masters and PhD enrolments will be increased and the number of funded post-doctoral places will be increased in order to support the generation of future research talent and to maximise the take-up by industry of qualified researchers from the HE sector	RFOs	2020	Increase research masters and PhD enrolments from 1,750 in 2015 to 2,250 and deliver a 30% increase in the number of funded post-doctoral places
3.10	Develop a coherent national policy on structured progression for researchers to identify and tackle impediments to career progression and mobility of trained researchers and innovators in the publicly funded research system	DES with DJEI and relevant stakeholders	2016-2020	National policy developed.
3.11	Ensure career support for PhDs and post-docs through providing detailed advice, mentoring, internships and placements to ensure that the full spectrum of career possibilities – industry, academia, public service – is known from an early stage	HEA, IRC, SFI and all research funders	2016-2020	Career support provided.
3.7	Ensure continued opportunities for researcher career development in areas of strategic importance in terms of (a) the number of awards available and (b) developing metrics for scoring applicants who have successful industry linkages.	(a) SFI (b) DES, HEIs, HEA	2020 2017	(a) Double number of early- and mid-career awards (Starting Investigator Research Grant and Career Development Award) form 20 to 40 per annum (b) Develop metrics for scoring applicants who have successful industry linkages but lower numbers of publications/citations than candidates with a purely academic track record

Innovation 2020 Ref.	Actions	Actors	Timelines	Indicators
3.12	Ensure the mobility of researchers between academia and industry through: a) enhancement of existing support for the bilateral flow of researchers between academia and industry by increasing awards including under the SFI Industry Fellowship Programme, the IRC Employment-based Postgraduate; Programme and the IRC Enterprise Partnership Programme; b) increasing the share of PhD researchers transferring from SFI research teams to industry; and c) through the establishment by HEA of an improved system-wide tracking of researcher mobility into industry.	(a) SFI, IRC, other funders (b) SFI (c) HEA, research funders (d) DJEI, EURAXESS	2016-2020	a)Grow total number of Industry Fellows to 80 (Action Plan for Jobs Action 2016, Action 107) and increase uptake of IRC Employment-based Postgraduate and Enterprise Partnership Programmes. b) increase share of PhD researchers transferring from SFI research teams to industry from 25% in 2014 6o 35% by 2020
3.13	A new initiative will be established to encourage a culture change and enable the structured progression of early-career stage researchers to careers in entrepreneurship.	SFI, EI	2017	Initiative launched.
3.14	Barriers to pension portability that can restrict researcher mobility will be addressed – the potential of RESAVER will be explored.	DES, HEA, HEIs, RPOs	2016	Potential of RESAVER explored.
3.12d	To ensure Ireland remains an open and attractive prospect for foreign researchers and to encourage Irish researchers to gain overseas experience, ongoing support will be provided for the EURAXESS Ireland Office and the promotion of its activities to relevant stakeholders.	DJEI, IUA	2016-2020	Ongoing support provided.
3.9	To ensure world leading research professors and future research leaders are attracted to Ireland: a) Both the Research Professor and Future Research Leaders awards will be scaled up to ensure Ireland remains an attractive prospect for highly skilled, in-demand mobile talent. b) The Irish embassy network will be engaged to promote the SFI Research Professorship awards and more generally to promote Ireland as a destination for a research career.	a) SFI, HEIs b) DFAT, SFI	2020 2016-2020	a) Double the number of awards to 10 per year. b) Engagement with Irish embassy network.

Priority 4: Gender Equality and Gender Mainstreaming in Research				
Innovation 2020 Ref.	**Actions**	**Actors**	**Timelines**	**Indicators**
3.15	Address gender issues relating to career progression in research and innovation through engaging fully with the Athena Swan initiative and implementing the relevant recommendations emerging from the HEA National Review of Gender Equality in Irish Higher Education.	DES, HEA, Funding agencies	2016-2020	Relevant recommendations implemented.

Priority 5: Optimal Circulation and Transfer of Scientific Knowledge

(a) Fully implanting knowledge transfer policies at national level I order to maximise the dissemination, uptake and exploitation of scientific results. RPOs and RFOs should make knowledge transfer second nature by integrating it in their everyday work.

Innovation 2020 Ref.	Actions	Actors	Timelines	Indicators
5.1	Publish a revised IP protocol to ensure that the Irish protocol remains "best in class", which incorporates feedback from industry and other stakeholders on issues identified in the operation of the current protocol.	DJEI, KTI	2016	Revised IP Protocol published in 2016
5.2	Provide additional resources and tools to improve industry-academic collaboration, including expanded resources and tools to facilitate enterprise (i) engagement with the public research system and (ii) access to IP. Such resources and tools to include model agreements, practical guidelines, improved information on expertise within the public research system.	KTI	2016	Specified resources and tools available in 2016
5.3	Encourage commercialisation of publicly-funded research by requiring all public research funders to increase the commercialisation of the research they support, using the available commercialisation and technology transfer programmes, to ensure the efficient transfer of economically valuable research outputs to enterprise.	All research funders	2016-2020	Targets are: (a) commercially relevant technologies (licences, options, assignments): 175; (b) Spinouts: 40; (c) High Potential Start Ups (HPSUs) from Spinouts: 16; (d) collaborative research projects between enterprise and the public research system: 920.
5.4	Set new targets for the commercialisation of research by developing new impact metrics for commercialisation of publicly funded research and set targets for both outputs and impacts commensurate with increased public investment.	DJEI, EI	2017	New targets set in 2017
5.5	Implement a successor to the current Technology Transfer Strengthening Initiative by launching TTSI3 to embed knowledge transfer within the public research system and review the operations and funding of Knowledge Transfer Ireland (KTI).	DJEI, EI with IUA	2017	TTSI3 launched in 2017

Innovation 2020 Ref.	Actions	Actors	Timelines	Indicators
5.6	Raise IP awareness of the opportunities for firms to engage in IP activity.	DJEI, Patents Office, EI and LEOs	2016-2020	IP awareness raised.
5.7	Build IP capability and resilience at enterprise level by focusing on Ireland-based R&D-active and export-oriented client base and establishing an inter-agency group to develop a roadmap for building IP capability and resilience at enterprise level.	EI, DJEI with relevant agencies	2016-2020	Inter-agency group established.
5.8	Invest in widespread IP education for example through including modules on IP management in relevant courses in higher education.	HEA, DES	2017	Module introduced into relevant programmes.
5.9	Measure progress of IP activity in firms by developing an approach to monitoring and measuring progress of IP activity in the enterprise base.	EI, DJEI with relevant agencies	2017	IP activity measured.
5.10	Introduce legislative changes relating to copyright, to implement reforms recommended by the Copyright Review Committee aimed specifically at exploring greater use of certain copyright exceptions to promote innovation.	DJEI	2016-2020	Legislative changes introduced.
5.11	Improve patenting options for business by implementing the European unitary patent system and, working with stakeholders, make the case for approval by referendum of the Unified Patent Court with presence in Ireland.	DJEI	2016-2017	Referendum held.
5.12	Address cost issues for IP enforcement by facilitating enforcement of lower value claims through lower courts.	DJEI, DJE	2016-2020	Rules of lower courts amended.
5.13	Support development of the Knowledge Development Box by developing an outline scheme and appropriate legislation to support the KDB for qualifying IP assets.	DJEI, Patents Office	2016	KDB introduced.

Priority 5: Optimal Circulation and Transfer of Scientific Knowledge

(a) *Promote open access to scientific publications*

Innovation 2020 Ref.	Actions	Actors	Timelines	Indicators
4.7	Support national and European open access policies and principles by integrating and supporting opening access repositories.	HEA, KTI, SFI, HRB, DRI	2016-2020	Open access repositories integrated and supported.

Priority 6: International Cooperation				
Innovation 2020 Ref.	**Actions**	**Actors**	**Timelines**	**Indicators**
6.1	Secure funding from Horizon 2020 by optimising sectoral engagement (higher education sector, industry, publicly funded research bodies).	High Level Group, Horizon 2020 National Support Network	Throughout lifetime of Horizon 2020	Target of €1.25 billion achieved
6.2	Catalyse the creation of and participation in consortia to bid for large-scale opportunities in Horizon 2020 by analysing relevant opportunities, facilitating linkages between potential Irish leads and consortia partners, providing support for large Irish-led proposal.	Strategic Research Proposals Group reporting to High Level Group, Horizon 2020 National Support Network, Research funders	Throughout lifetime of Horizon 2020	
6.3	Influence EU Commission by representing Irish interests when Horizon 2020 work programmes are being formulated.	Horizon 2020 National Support Network, Irish Permanent Representation Brussels, Irish research community	Throughout lifetime of Horizon 2020	N/A
6.8	Enhance collaboration with the UK via (i) co-fund with the Wellcome Trust for biomedical and clinical research in Ireland (ii) together with the Royal Society supporting University Research Fellowship Scheme for early stage researchers to carry out research in Ireland; (iii) supporting collaborative research in key areas between Irish and UK researchers ; (iv) exploring options for further collaboration through for example, Horizon 2020, NCP networks, the European Institute of Innovation and Technology (EIT); with UK Environment agencies support collaborative research for evidence to underpin environmental regulation.	(i) SFI, HRB (ii)SFI (iii)SFI, DAFM (iv) DJEI (v) EPA	2016-2020	Enhanced collaboration with UK.

Innovation 2020 Ref.	Actions	Actors	Timelines	Indicators
6.9	Explore future joint funding opportunities with Northern Ireland by exploring mechanisms under research infrastructure, research cooperation and researcher exchange.	SFI, DAFM	2016-2020	Opportunities explored.
6.10	Deepen collaboration through the US-Ireland R&D Partnership through expanding the remit of the Partnership in areas of mutual interest to US, Ireland and Northern Ireland and through supporting the US National Science Foundation (NSF) Programme for NSF Graduate Fellows to carry out research visits in Ireland. This action to be achieved over the lifetime of the strategy 2016-2020.	DJEI, ITI, SFI	2016-2020	Increased number and value of collaborations (Demand led. Baseline 2016 + 30 projects, value of €52m.)
6.11	Develop follow-up initiatives to the Science Foundation Ireland International Strategic Cooperation Award (ISCA) programme by developing funding partnerships with international funders in Brazil, China, India and Japan to support international collaborative research projects. This action to be achieved over the lifetime of the strategy 2016-2020.	SFI	2016-2020	Follow-up initiative developed.
6.16	Retain membership of international research funding organisations; benchmark Ireland and adopt best practices – in particular benchmark Ireland against large, small and EU countries and learn from and adopt best practices, policies and initiatives. This action to be achieved over the lifetime of the strategy 2016-2020.	Relevant Research funders	2016-2020	Membership retained, Ireland benchmarked, best practices adopted.

GLOSSARY

AIT Athlone Institute of Technology
APJ Action Plan for Jobs
CSO Central Statistics Office
DES Department of Education and Skills
DAFM Department of Agriculture, Food and the Marine
DCU Dublin City University
DFAT Department of Foreign Affairs and Trade
DJE Department of Justice and Equality
DJEI Department of Jobs, Enterprise and Innovation
DKIT Dundalk Institute of Technology
DRI Digital Repository Ireland
EI Enterprise Ireland
EPA Environmental Protection Agency
HEA Higher Education Authority
HEI Higher Education Institute
HPSUs High Potential Start Ups
HRB Health Research Board
HSE Health Service Executive
IDA Industrial Development Authority
IoT Institute of Technology
IP Intellectual Property
IRC Irish Research Council
ITI InterTradeIreland
IUA Irish Universities Association
JEC Joint Economic Commission
JPI Joint Programming Initiative
KT Knowledge Transfer
KDB Knowledge Development Box
KETs Key Enabling Technologies
KTI Knowledge Transfer Ireland
LEOs Local Enterprise Offices
LIRE Large Items of Research Equipment database
NRPE National Research Prioritisation Exercise
NUIG National University of Ireland Galway
PRTLI Programme of Research in Third Level Institutions
QQI Quality and Qualifications Ireland
RCSI Royal College of Surgeons in Ireland
RDI Research, Development and Innovation
RFO Research Funding Organisation
RP Research Prioritisation
RPO Research Performing Organisation
SAEI Small Advanced Economies Initiative
SET Science Engineering and Technology
SOLAS State Organisation with responsibility for funding, planning and coordinating further Education and Training in Ireland
SRA Strategic Research Agenda
SRIA Strategic Research and Innovation Agenda
STEM Science, Technology, Engineering and Mathematics
STI Science, Technology and Innovation
Teagasc the national agriculture and food development authority
TTO Technology Transfer Office
TTSI Technology Transfer Strengthening Initiative
UCC University College Cork
UCD University College Dublin
UL University of Limerick
WIT Waterford Institute of Technology