Submission to the consultation on a new national Strategy for Science, Technology and Innovation

The Irish Research Council supports excellent research and recognises creative individuals with innovative ideas, thus enabling a vibrant research community which enriches Irish research, the economy and society.

Introduction

The Irish Research Council[1] welcomes the Government's consultation process to develop a new strategy for science, technology and innovation (SSTI) in Ireland. This is a crucial development in setting out a strategy for Ireland's future.

The Council welcomes the intention to develop a comprehensive whole-of-government strategy and that the scope of the strategy will encompass all disciplines and subjects. This approach will ensure that the benefits across all areas of excellent research can be acknowledged whether these are in education, culture, policy development, health, environment, society, the economy or indeed in contributing to the public good and the global knowledge pool.

Through the consultation process, Government will ensure that the broad needs of citizens are at the heart of the collective inputs and considerations in developing this new, shared strategy. Enhanced employment opportunities are clearly one component of the needs of citizens but so too is a fair and inclusive society, in which we strive to understand its complexities and challenges and how best to address them.[2]

After a difficult economic period, the timing of this new national strategy will provide the opportunity to articulate Ireland's view of itself as a research performer in a national, European and global context, state the vision for the future and set out how Ireland's research system will support the further development of our economy and society. It should provide the framework for 'future-proofing' the publicly funded research system and deliver an opportunity to set out longer term goals and objectives in terms of the development of both human capital and intellectual capital.

Societal challenges extend beyond those identified in a global and European context, and our national research strategy must be developed to reflect national challenges. In this regard we emphasise that the new strategy for science, technology and innovation is not for Government and its agencies alone, although the investment of Government will be necessary for its success. It can only be optimally delivered if the academic, business and civic communities in Ireland support and own it. Thus the strategy should reflect, and in of itself, command and stimulate widespread support for and understanding of research.

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[1] The Irish Research Council was established in 2012 under the Government's Public Sector Reform Programme and is a merger of two former Councils, the Irish Research Council for Humanities and Social Sciences (IRCHSS) and the Irish Research Council for Science, Engineering and Technology (IRCSET). It is an associated agency of the Department of Education and Skills (DES), and operates under the aegis of the Higher Education Authority (HEA).

[2] Complexities such as social inclusion, well-being, housing needs, families, transport, children, emigration, immigration, cultural diversity, youth, ageing, education, crime, environment, food provision, and so on.
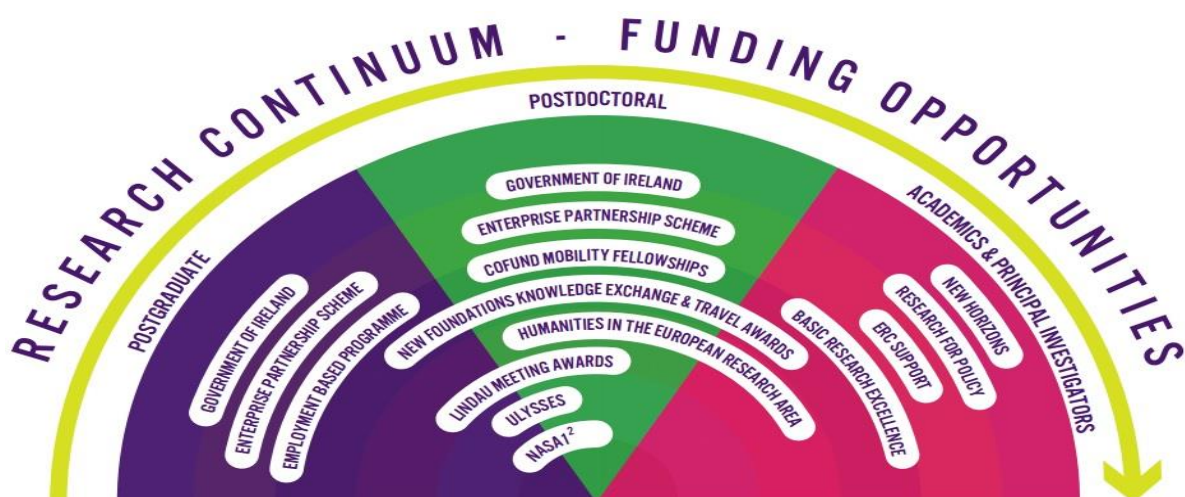
Irish Research Council Vision

The vision of the Irish Research Council (the Council) for the research ecosystem and the role of the Council in this context is[3] as follows:

'for a healthy research ecosystem in Ireland which provides a diversity of supports and opportunities and which enables the country to reap the full value and benefits of research. This balanced ecosystem will address the breadth of economic and societal needs and develop the knowledge, understanding and insights required by citizens, employers and government. The Council will provide opportunities for excellent researchers with excellent ideas, regardless of the discipline or research topic. Through its approach the Council will cultivate individual thinkers to question and research and in this way contribute to the development of the skills, competencies and expertise required for the future'.

The **mandate** of the Council, as set out in 2012, is aligned with delivering on this vision -

- To fund excellent research within, and between, all disciplines, and in doing so to enhance Ireland's international reputation as a centre for research and learning.
- To support the education and skills development of excellent individual early stage researchers and cultivate independent researchers and thinkers, whilst offering a range of opportunities which support diverse career paths.
- To enrich the pool of knowledge and expertise available for addressing Ireland's current and future challenges, whether societal, cultural or economic, and deliver for citizens through collaboration and knowledge exchange with government departments and agencies, enterprise and civic society.
- To provide policy advice on postgraduate education and on more general research matters to the HEA and other national and international bodies.

Figure I – Irish Research Council's Current Portfolio of Funding Programmes

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[3] Strategy Statement, Irish Research Council, www.research.ie

SNAPSHOT OF IRELAND'S RESEARCH PERFORMANCE

Ireland remains in the top 20 countries in the world in terms of its research impact, as the table below illustrates.

Disciplinary area	Research impact ranking in world - IRELAND
Immunology	1
Nanoscience/Nanotechnology	2
Computer Science	4
Materials Science	7
Neuroscience and Behaviour	7
Pharmacy and Toxicology	9
Biology and Biochemistry	11
Molecular Biology and Genetics	11
Chemistry	11
Psychiatry/Psychology	15
Physics	19

(Thomson Reuters InCites2, 2003-2013)

- *Furthermore...* Irish higher education institutions are (cumulatively) in the top 1% in the world in 19 of the 22 Essential Science Indicator (ESI) fields. Those fields align with those with which we rank highly for citation impact and also include Agricultural Science, Clinical Medicine, Economics & Business, Engineering, Environment/Ecology, Geosciences, Microbiology, Plant & Animal Science, and Social Sciences General.
- Whilst not included in the ESI, we are aware of the impact of the Arts and Humanities by virtue of their impact on institutional ranking*e.*g. TCD is ranked 63rd in the Arts and humanities in the QS World rankings (ranked 75th overall).

Notwithstanding our strong performance in many areas, there are causes for concern in relation to recent trends in some metrics.[4] These trends include:

- In 2011-2012, for the first time in a decade, the increase in the number of documents published by Irish researchers stalled. A subsequent increase in 2012-2013 was proportionately lower than in previous years.
- Between 2011 and 2012, for the first time in over a decade, Ireland's percentage of world papers fell sharply and currently remains at that lower level (2012-2013).
- At the same time, Ireland's overall impact relative to the world declined.
- Based on year-by-year data, Ireland's impact relative to the world in certain leading subjects such as Neuroscience & Behaviour shows a decline during this period.
- A decline in impact similar to Ireland's is also seen in Greece and Portugal during the same period (2011-2013) but is not seen in France, Germany or the United Kingdom (or in selected comparator small countries i.e. Denmark, Finland, New Zealand, Israel and Singapore).

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[4] Official Thomson Reuters Official data due for release in April 2014.

Response of the Irish Research Council to the Strategy Pillars

The section following sets out, for each of the pillars in the consultation document, the views and perspectives of the Irish Research Council together with recommendations.

Pillar 1: Investment in STI/Goals and Targets

Optimising the impact of research investment for Ireland
The Council recognises that investment in research presents challenges for a small country. Knowledge does not advance in a linear fashion; thus research support must be extensive across disciplines and modes of research. At the same time, no small country can hope to support a policy of unfocused investment with the expectation of achieving critical mass across a broad spectrum. Yet a country must future-proof itself by having a strong, broad foundation for research which can respond to changing needs, and this is particularly so for a small 'open' economy and country.

Neither can a small country adopt a 'free rider' approach when it comes to investing in fundamental or basic research, as it will be continually characterised as a 'follower' and not a research leader.

It is therefore critically important that the appropriate balance is struck in the development of a new SSTI and this balance must be reflected in the distribution of funding by Government.

The central importance of human and intellectual capital
The higher education system plays a central role in Ireland's intellectual, cultural, economic and societal development through the development of people and skills, and the nurturing of excellent research, ideas and innovation for economic, cultural and societal benefit. The centrality of the higher education and research system reflects the policy decisions of successive governments who recognised that the research informed education of graduates was important and that, as stated consistently in reports such as 'The Wealth of Nations', 83% of Ireland's capital wealth is in its human and social capital.[5] Across national policy today, the importance of human capital is continually emphasised.[6]

HEA Block Grant forms the bedrock of the higher education and research system
For the higher education and research system, the HEA block grant forms the bedrock of funding. In the context of research, this means that the salaries of academics/principal investigators, including those involved in national competitive or Horizon 2020 programmes, are covered by this grant as are extensive indirect costs associated with the conduct of research, postgraduate research based education and supervision, and innovation activities. Regardless of the specific objectives and targets of a new SSTI, it is the strong view of the Council that the erosion of core funding into the higher education system (through the HEA Block Grant) must be reversed.

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[5] The Wealth of Nations, World Bank 2006
[6] IDA 2015-19 Winning; 'the availability of talent will be the key differentiator for locations to win FDI in future'

Gap analysis – informing future investments

Research prioritisation was formulated in response to unprecedented economic circumstances in Ireland. It has been implemented with great effectiveness and has had many successes, but it is the view of the Council that gaps have emerged during this recent challenging period that must be addressed if we are to compete at the level of our national ambitions.

<u>Decline in PhD enrolments (see Pillar 8 comments also)</u>
Most recent data demonstrates a decline in PhD enrolments (see Figure II below, source HEA). This decline, which must be a significant matter for concern, is happening at a time when DES, ESRI, and Solas[7] predict an increased demand for higher education due to the demographic profile of our population and a concomitant increase in the demand for highly skilled graduates. In order to take advantage of the demographic dividend[8], particularly in the context of the global 'war for talent', Ireland must increase investment in PhDs.

Furthermore, our pipeline of new PhD graduates is a contributing factor in our EU Innovation Scorecard Performance and this profile will have consequences for those metrics in addition to a range of other OECD indicators in the coming years.

Figure II
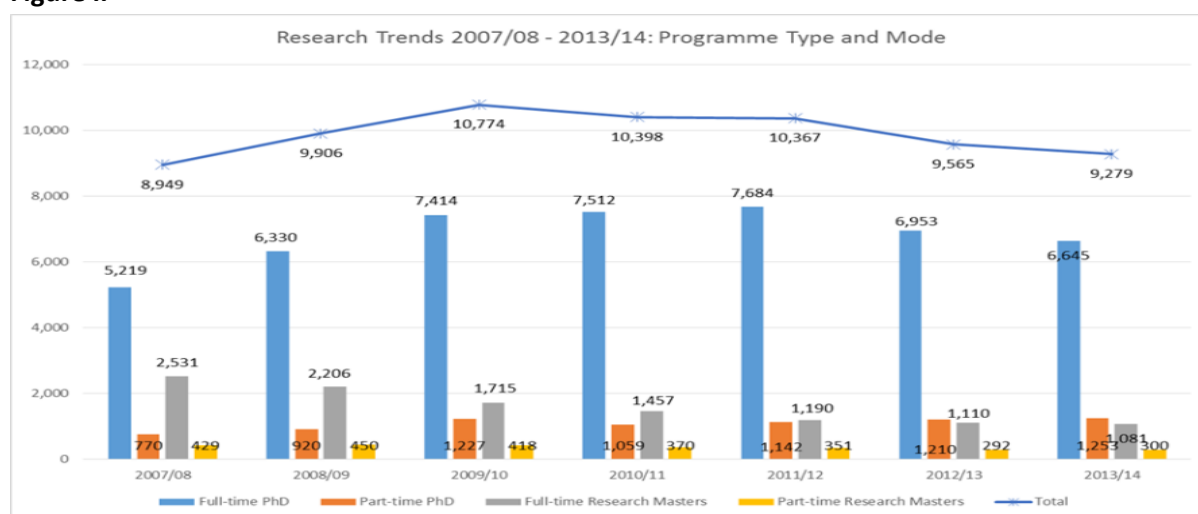
<u>Lack of opportunities for excellent researchers across all disciplines to develop independent researcher careers (also relevant to Pillar 8)</u>
In the past number of years there has been a reduction in opportunities for the development of independent careers for early stage researchers, and increasingly for mid-stage researchers, in the national ecosystem.[9]

In addition to impacting negatively on individual researchers, this diminishing pipeline of qualified independent researchers could ultimately result in the erosion of our expertise and knowledge base

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[7] DES, Projections of Demand for Full-time Third Level Education 2014-2028 (2014); SOLAS, Occupational Employment Projections 2020 (2014); ESRI, A Study of future demand for higher education in Ireland (2012)
[8] Ireland has the most youthful population in Europe, with 25% being 16 or under.
[9] The Council has launched a small New Horizons Starter Grant programme in 2015

nationally. More certainly, it will impair in the short to medium term on Ireland's performance in H2020 and other international funding streams (the European Research Council, in particular, where the demonstration of individual competitive track record whether in STEM or AHSS is critical).This latter point was driven home recently by the President of the European Research Council when he stated[10] the importance of 'opportunities to young researchers to establish themselves as independent actors with adequate means to develop their own project. We must make sure that the most original and high calibre young researchers see a future for themselves here in Europe'.

<u>Emergence of vulnerabilities in the foundation of our system (relevant also to Pillar 8)</u>
The Council is concerned that vulnerabilities are emerging that could potentially weaken the strong foundation reflected in our international performance across range of areas up to 2012 (see Snapshot of Ireland's Research Performance page 4). Crucially, these reputational indicators are key to positioning Ireland on the global stage. It is notable that there are 19 fields spanning both Science, Technology, Engineering, Maths and Medicine (STEMM) and Social Sciences (SS) for which Ireland's universities are in the top 1% of world research institutions in terms of research impact. Maintenance of these strengths makes Ireland attractive as an education and research hub. As we move to internationalise higher education and research, these performance indicators provide a 'shop-window' to the quality of our higher education and research system, and to the quality of our all-important human capital.

Basic research
In addition to a strong human capital base, a strong knowledge capital base in all disciplines must be maintained and developed, even in a situation where there is a special focus on areas that enhance short-term economic returns. This also means that support for excellence and basic research must be maintained, <u>both within and outside priority areas</u>. It is from basic research that truly novel ideas and concepts emerge. This theme was echoed by former EU Commissioner Ms. Maire Geoghegan-Quinn when she said that *"…intellectual inquiry is a valuable and worthwhile pursuit in itself. Science satisfies our need to understand the world around us, to understand the great variety of life on earth, and to understand ourselves."[11]* Examples in Irish history of the impact of basic research abound.[12] More recently, one can point to the growing presence of Irish researchers in such publications as Nature.[13]

Furthermore, the profile of projects based in Ireland funded by the European Research Council (ERC) demonstrate that basic research is not being ignored in the international context – 17% of the Horizon 2020 budget is being channelled to basic research.[14] As stated by the ERC President, 'The fundamental argument ….. has been that, in all research systems, it is essential that a significant proportion of

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[10] Professor Jean-Pierre Bourguignon, President of the ERC, RIA address, December 2014.
[11] Speech at RIA November 2012
[12] George Boole (father of computer science), William Rowan Hamilton (Quaternions), Jocelyn Bell Burnell (Pulsars), John Bell (Bell's Inequalities), Denis Burkitt (Burkitt's Lymphoma), Ernest Walton (Nobel Prize-winner); see How Irish Scientists changed the world, Sean Duke, Londubh Books, 2013
[13] In the Nature Publishing Index 2012, Ireland has risen from 30th in 2008 to 20th in 2012. Adjusted to reflect proportion of full-time researchers, Ireland ranks 8th.
[14] Examples would range from - Chronologicon Hibernicum – A Probabilistic Chronological Framework for Dating Early Irish Language Developments and Literature, *to* Multiscale Modelling of the Neuromuscular System for Closed Loop Deep Brain Stimulation, *to* Animal coloration through deep time: evolutionary novelty, homology and taphonomy. See list of projects and awardees www.research.ie

funding is designated to exploratory, curiosity-driven research, thus offering some prospective to their brightest talents.'[15]

Disciplines

It is of concern that funding for the arts, humanities and social sciences has dropped so dramatically in the 2008-2012 period.[16] A recent publication from the Council sets out the role of these disciplines in the cultural, policy, societal and economic domains.[17] Furthermore, the Council is concerned that other underpinning and fundamental disciplines in STEM are not receiving sufficient support nationally. These areas include pure mathematics, theoretical physics, basic biology e.g. genetics/heredity, mycology, microbiology, evolutionary biology, plant biology/botany, zoology, areas of chemistry, ecology, aspects of engineering (mechanical/civil), astronomy, space science, geography, atomic, molecular and other dimensions of physics. There are risks for our higher education and research performing system if deficiencies in funding continue.

Pillar 1: Recommendations

> ♦ *The new Strategy for Science, Technology and Innovation 2020 must (a) recognise the underpinning nature of the block grant from the HEA for all competitively funded research activity (whether SFI, HRB, Horizon 2020 etc.) and (b) call for a sustainable funding mechanism for the higher education system in Ireland. The Higher Education Funding Group has the responsibility of advising government by the end of 2015 on this matter.*
> ♦ *For Ireland to take its place among the leaders in research, and deliver on its ambitions, the Council supports the call for an upward trajectory of public investment in R&D between 2015 and 2020. GBOARD would at minimum move to above the EU average i.e. to above 0.64% from a current 0.49%; at a minimum the target of 2.5% of GNP for GERD should be maintained.*
> ♦ *There must be a focus on addressing the decline in PhD enrolments over the period 2015-2025.*
> ♦ *In parallel promote and implement the National Framework for Doctoral Education (HEA/QQI) to assure potential doctoral candidates in Ireland and further afield of the quality of the education experience and employers of the quality of doctoral graduates (see also Pillar 8)*
> ♦ *Enable independent career opportunities for PhDs, early stage career researchers, and for mid-career researchers. Programmes that align to the European Research Council programmes must be established. These programmes would reward excellence across all disciplines (see Pillar 8)*
> ♦ *Whilst we may continue to identify areas where Ireland can lead internationally and prioritise these, to future-proof our research base, to draw out the best of our talent and ideas, and to underpin an excellent higher education system, it is crucial for our long-term reputation and competitiveness that we maintain a strong portfolio of research in all its forms (whether basic, strategic or applied) across the STEM and AHSS disciplines. On average, most countries allocate 20% of their national funding to basic research and Ireland should target this level(see also Pillar 8)*

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[15] Professor Jean-Pierre Bourguignon, President of the ERC, RIA address, December 2014.
[16] HERD survey 2011; State Expenditure on R&D 2013
[17] Creating Ireland: The role of the Humanities and Social Sciences, Mark Duncan and Paul Rousse, published Irish Research Council (2015).

Pillar 2: Prioritised approach to public research funding

Addressing Societal Challenges and engaging in Responsible Research and Innovation (co-creation) (see also Pillar 7)

Internationally, the aim of achieving positive societal outcomes is increasingly being used to frame policy formulation in the research and innovation space, a clear example being H2020. Related to this, there is also growing national and international dialogue on a more comprehensive definition of innovation to incorporate social innovation in addition to technology or economic innovation. These approaches are sometimes characterised as Responsible Research and Innovation, i.e. societal actors (researchers, citizens, policy makers, business, third sector organisations, etc.) working together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs and expectations of society. Specific focus both in terms of targeted initiatives but also mainstreaming of this approach is required. As stated earlier, societal challenges go beyond those identified in the European or global context. The **Council's 'Engaging Civic Society' initiative in partnership with the Wheel**[18] has as an objective the stimulation of and support for the establishment of a 'Social Innovation Community' of researchers, social innovators, end-users (citizens) and policy-makers.

Furthermore, in addition to the approach of 'connecting communities – future opportunities', there is significant momentum behind the cultivation of interdisciplinary research (IDR) so as to address societal challenges. Incorporating the 'human factor' is vital in addressing societal challenges and the arts, humanities and social sciences must be embedded in the research. More innovative and creative ways are required to cultivate this type of research nationally.

Prioritising in the near and medium term – horizon scanning

It is noted that in the Action Plan for Jobs,[19] there are number of Actions that aim to utilise different methodologies to identify national economic and societal challenges. One Action is the launch of the **Research for Policy and Society initiative** by the Council. This specifically will channel funding for policy and societal research on behalf of a range of government departments and entities. In parallel, the Council has contacted public entities with a view to identifying policy research needs in advance of the 2016 call. Engagements with the Wheel and its members on foot of the strategic partnership announced in recent weeks will also feed into the shaping of the 2016 and subsequent calls. Later in 2015, SFI are to initiate a public consultation (as had been conducted in Denmark) to get a broader view of national economic and societal challenges. This exercise would inevitably feed into the work of a range of sectoral agencies, and the Council.

Beyond 2015, a more systematic horizon-scanning process is required which would engage the range of stakeholders. This could potentially form a component of the role of the Interdepartmental Committee going forward. More detailed foresight work would then be led by the relevant Government Department and its agencies.

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[18] http://research.ie/event/2015-03-12/researchers-granted-%E2%82%AC400000-over-40-community-projects-video-courtesy-silicon-repub
[19] Action Plan for Jobs 2015

Defining impact

Key to much of this work is the development of national comprehensive definition of impact to include economic and social dimensions. The Council understands impact to comprise all the following elements:

- The potential of the research to stimulate value creation in the public and/or private sectors
- The potential of the research to contribute to improvements in society.
- The expected contribution of the research to an improved knowledge base for policy decision-making and services.
- The expected contribution of the research to the expertise in defined research areas.
- The contribution of the research to master/PhD programmes and research training.
- The contribution of the research to raising the standard of education generally.
- The contribution of the research to international collaboration with strong research environments and increased recruitment of talented researchers from Ireland and abroad.
- The expected stimulatory impact of the research on innovation and hence its potential to increase the number of new knowledge-based enterprises.
- The potential of the research to promote growth, including in small and medium-sized enterprises

Development of coherent policies and policy implementation

The collection of good quality data will underpin the assessment of the performance of the higher education and research system and the development of coherent systemic policies. A national research resource to include all research outputs (books, chapters etc. in addition to peer-reviewed journals) should be developed, leveraging off existing systems. Furthermore, building on work conducted previously, a national research classification should be developed (based on OECD fields of Science mapped to Web of Science fields) and similar to that utilised in Australia, Brazil, China, Netherlands and UK.

Oversight, performance assessment and attainment of coherence within and across institutions and funders are critical for success in delivering on national objectives.

Pillar 2: Recommendations

♦ *To address national economic and societal challenges, a different methodology such as horizon scanning would be adopted. This methodology would generate themes which would accommodate research performers and all stakeholders (incl. enterprise and civic society). Innovation communities would be formed and leverage excellence based research.*

♦ *Enhanced funding for Responsible Research and Innovation (co-creation) and engaging with societal stakeholders including civic society would be made available.*

♦ *National comprehensive definition of Impact to include economic and social dimensions would be developed and utilised by all funders and performers.*

♦ *Develop a national research output infrastructure.*

♦ *Develop a national research classification for building into InCites to enable enhanced assessment of Ireland's research performance.*

♦ *A Funders Forum should be established to incorporate representation from the research performers.*

Pillar 3: Enterprise level R&D and Innovation performance

R&D and Innovation will be increasingly important to Irish enterprise in the context of a knowledge economy and as the pace of technological change increases. An open, flexible and responsive ecosystem is required for the development of new industry knowledge and the development of human capital that is skilled in the application of knowledge for commercial benefit and to enable participation in new markets. Central to a flexible ecosystem is a suite of clear, well-designed initiatives that meet the R&D and Innovation needs of enterprise at different stages of the company and product life-cycle.

Enhancing innovation capacity – Irish Research Council programmes
Key objectives in the Action Plan for Jobs 2015 are (i) enhancement of the innovation capacity of companies and in particular SMEs and (ii) increasing the numbers of researchers in companies. Within the Council portfolio there are a number of programmes which have a specific enterprise/employer focus with individual researchers in their formative years being co-funded by enterprise/employer partners. 25% of all Scholar awards made in 2014 were co-funded by an enterprise/employer partner. This was 40% for STEM Scholars.

These specific programmes are the Enterprise Partnership Scheme, where the student performs innovative research on an area informed by the enterprise, and the Employment Based Postgraduate Programme, a 'co-educational' initiative where the student becomes embedded in the company for the majority of the duration of their Masters or PhD. These demand-led programmes allow researchers to experience the realities of the workplace outside academia. In this way, diverse career opportunities for researchers are demonstrated. In the region of 300 companies have engaged with the Council on these initiatives which contribute to the Action Plan for Jobs. As the research is very much demand-led, this Programme is uniquely positioned to create employment opportunities in emerging and mature sectors. SMEs account for more than 70% of the Employment Partners engaging on the Employment- Based Programme, the remaining 22% being made up of MNCs, with a small proportion of non-governmental organisations (NGOs). The programme is expanding its regional reach. The Council partners with other national agencies, including Enterprise Ireland, the Department of Food and the Marine, Sustainable Energy Authority of Ireland, Science Foundation Ireland and the Marine Institute, in delivering on this novel initiative.

Identification of barriers to enhancing innovation capacity
Based on feedback from companies engaged with the Irish Research Council's Employment Based Postgraduate Programme, it is clear that for smaller companies, a low barrier to entry is required in terms of the flexibility of the programme vis a vis type of research (basic or applied), complexity of partnering arrangements and in terms of contribution required to engage in the programme.

> *Pillar 3: Recommendations*
> ♦ *There are a number of potential barriers that need to be overcome and which demand the development of a portfolio of funding mechanisms that are appropriate for companies at different stages in the evolution cycle and with different TRLs.*
> ♦ *A clearer map of supports for enterprise would be developed and communicated consistently by all agencies engaging with enterprise and employers. All agencies would promote these*

> *programmes to their client base and networks. A mechanism for companies to get advice on what programme os most suitable for their needs would be established.*
> - *A specific initiative to encourage collaboration between AHSS researchers and SMEs would be established.*
> - *In the context of developing research careers outside academia, and enhancing the skills sets of Masters and PhD students, increased funding would be allocated to the employer facing research programmes.*

Pillar 4: International Collaboration and Engagement

International engagement for global benefit
In considering the context for international collaboration and engagement the national strategy should include an objective for Irish research to contribute to addressing global economic, social and environmental issues. Successor goals to the Millennium Goals are being set for post 2015[20]. Irish policy currently focuses on the reduction of hunger, sustainable development including economic growth, and better governance and human rights.

Engaging in Europe
Ireland is currently very focused on enhancing opportunities for researchers through European and international engagements. The specific role of the Irish Research Council in this context for H2020 very much aligns national objectives and with our mission, and an Action Plan has been developed.[21]

Underpinning engagement with Horizon 2020
A key differentiating factor in what the Council does to support European and H2020 engagement is the focus on enabling individuals or small teams in the community. The partnerships that the Council enables through its enterprise focused programmes form a strong launching pad for co-created proposals to H2020. Our funding programmes to support potential applications to H2020 also adopt the strategy of supporting the individual in their endeavours e.g. the Irish Research Council New Horizons Programme.

Leading a European consortium
The Irish Research Council is a lead partner the Humanities in the European Research Area (HERA) initiative. The Council manages a €18m Joint Research Programme fund on behalf of this pan-European collaboration of humanities funding research agencies and the Commission. The agencies are the primary funders of HERA.

Directly support career development opportunities in the international arena
 A key feature of Irish Research Council programmes has been to offer, where possible, experience in the international arena in particular to postdoctoral researchers. Awards secured by the Council(s)

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[20] https://www.irishaid.ie/news-publications/publications/publicationsarchive/2013/may/one-world-one-future-irelands-policy/
[21] http://www.research.ie/Horizon2020

have enabled researcher career development through researcher mobility, and one of these programmes, the IRC International Career Development Fellowship (ELEVATE), is still in train at the Council and further applications are planned.

Pan-European infrastructures- current investments

The Irish Government through the Department of Education and Skills is a member of two pan-European (ESFRI) research infrastructures, specifically DARIAH (Digital Research infrastructure for the Arts and Humanities) and the ESS (European Social Survey). These are the only two infrastructures where Ireland is a FULL member and the Council is the DES nominee.

Pillar 4: Recommendations:
- ♦ *Funding programmes which are aligned for application to H2020 must be established.*
- ♦ *Enhanced engagement with mobility instruments in H2020 and internationally would be targeted by agencies.*
- ♦ *The DES H2020 Working Group (of which IRC is a member) has identified a range of performance factors that will influence Ireland's success over the lifetime of H2020. These include:*
- - *Researcher capacity,*
- - *Enterprise R&D activity, partnership and leadership*
- - *Research support office capacity*
- - *Institute of Technology sectoral capacity*
- - *Growing focus on interdisciplinarity and continuing importance of AHSS*
- - *Domestic investment required to participate in larger-scale initiatives*
- - *Maintaining momentum and motivation*

A number of these have been specifically focused on in this submission.

Pillar 5: <u>Organisational/ Institutional Arrangements to Enhance Research Excellence and Deliver Jobs</u>

Role of the agencies of the Department of Education and Skills (DES)

In order to provide a full picture of all policy implementers in the research domain, information on the relevant agencies of the DES will be included in this section.

Irish Research Council

The Council was established and mandated to -

I.   Fund excellent research within, and between, all disciplines, and in doing so to enhance Ireland's international reputation as a centre for research and learning.

II.   Support the education and skills development of excellent individual early stage researchers and cultivate agile independent researchers and thinkers, whilst offering a range of opportunities which support diverse career paths.

III.   Enrich the pool of knowledge and expertise available for addressing Ireland's current and future challenges, whether societal, cultural or economic and enhance accessibility by collaborating and enabling knowledge exchange with the range of societal stakeholders.

IV. Provide policy advice on graduate education and research nationally and internationally. In giving the Council this role, the Minister for Research and Innovation requested that particular attention be given to the arts, humanities and social sciences (AHSS).

The Council's **activity profile** aligns with its vision, mission and mandate, in summary as follows:

- The Irish Research Council currently supports around 1,500 top early-stage researchers and Principal Investigators who are contributing to Ireland's research performance and to the internationalisation of Irish research.
- In 2014 the Council's overall expenditure was €33.5m[22] (€31.4m core funding from Government; remainder from Employers and EU).
- The Council supports excellent researchers in all disciplines from Arts to Zoology (72 disciplines and the interactions between them). We are unique in the Irish research funding ecosystem in having the mandate to do so.
- The current suite of funding instruments to develop independent researcher careers at all stages are presented in Figure I, page 3.
- Diverse career opportunities are enabled through a suite of programmes which partner with industry and employers.
- Research projects with a cultural, policy and societal focus are also supported and include partnerships across government and civic society.
- The Council leads Ireland's engagement with the societal challenge to develop an inclusive, innovative and reflective society in Europe. The Irish Research Council funded National Marie Sklodowska Curie Office based at the IUA provides support to researchers from all disciplines and all domains of research, public or private. The Council is the national contact point (AHSS) and expert to the ERC, and a national expert to the Marie Sklodowska Curie programme.

In delivering on its mandate, the Council's core value is *Excellence*, determined on the basis of independent peer review, in an open, objective, transparent and trusted way.

Higher Education Authority
At a strategic level, the HEA is currently engaged in a major reform of the higher education system. This involves making the system more coherent (mergers, consolidations) and also developing regional clusters that will jointly better address regional challenges and support regional development. The HEA is also overseeing the potential emergence of technological universities which could create better institutional arrangements for the delivery of national research and innovation objectives.

As part of this systemic change, the HEA fosters and oversees the strategic development of the higher education sector through the implementation of the Higher Education System Performance Framework 2014-16. The Framework identifies seven key objectives for the system over this period, including:

1. To meet Ireland's human capital needs across the spectrum of skills by engaged institutions through a diverse mix of provision across the system and through both core funding and specifically targeted initiatives;

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[22] Actual Expenditure, HEA Accounts 2014

2. To promote access for disadvantaged groups and to put in place coherent pathways from second level education, from further education and other non-traditional entry routes;
3. To promote excellence in teaching and learning to underpin a high quality student experience;
4. To maintain an open and excellent public research system focused on the Government's priority areas and the achievement of other societal objectives and to maximise research collaborations and knowledge exchange between and among public and private sector research actors;
5. To ensure that Ireland's higher education institutions will be globally competitive and internationally oriented, and Ireland will be a world-class centre of international education;
6. To reform practices and restructure the system for quality and diversity;
7. To increase accountability of autonomous institutions for public funding and against national priorities.

Based on these, the HEA has entered a mission-based performance compact with each higher education institution (http://www.hea.ie/en/policy/national-strategy/higher-education-system-performance-2014-16). These are reviewed through a Strategic Dialogue process with the institutions. The first System Performance Progress Report (July 2014),[23] while fully recognising the potential still to be realised and issues to be addressed, recognises the progress that is being made. It provides a solid basis for advancing and implementing national research objectives through the funding of higher education. It gives greater clarity of purpose and visibility of performance across all Government priorities, including – yet not limited to - research, knowledge exchange and innovation.

At an operational level, the HEA provides core funding to the higher education institutions. This delivers the national platform support for all education and research activity in Ireland's higher education institutions. As part of this:
-   It funds the salaries of the academics who are therefore in a position to apply for competitive funding from international programmes such as Horizon2020 and from national agencies such as SFI.
-   The core grant also covers the supervision of Masters and PhD students, i.e. Ireland's pipeline of researchers.
-   Thirdly, it empowers each institution to support the highly interconnected education-research nexus as befits its particular strategic environment and operational priorities.

The HEA also manages Springboard, the PRTLI and a number of other strategic national initiatives on behalf of DES and other government departments.

Future approaches nationally to infrastructures
For infrastructure development, the priorities nationally for infrastructure should be (i) the establishment of a national mechanism to support the sustainability of current infrastructures, and (ii) enhanced access and utilisation of existing infrastructures in line with the HEA Access policy guidelines.

A national roadmap encompassing identified specialised infrastructure needs and stating Ireland's commitment to a range of ESFRI infrastructures should be developed. It is the view of the Council, as

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[23] http://www.hea.ie/en/policy/national-strategy/higher-education-system-performance-2014-16

it holds the joint delegate with SFI for ESFRI, that a national process is required to re-examine which ESFRI infrastructures Ireland should become members of, whether full members or associated members. This process could take place on publication of the new ESFRI Roadmap in early 2016.

Ensuring maintenance of the intrinsic link between higher education and research activities

An innovative society and economy needs people who are creative, questioning, innovative, and who have good judgement and are capable of responding constructively to change. Furthermore, preparation for knowledge-intensive employment means that graduates at all levels must understand the fundamentals of core disciplines, work on state-of-the-art equipment, appreciate the relevance of the leading edge of technology, have the capacity for creative approaches to advanced problems and be trained in particular modes of analysis and thought. It is the view of the Irish Research Council that that the education and training for postgraduate research students in the Irish system must continue to evolve as a key imperative and adhere to the National Framework for Doctoral Education (as developed by the HEA and the QQI). For these reasons, the Irish Research Council would not accept a narrow mechanistic view, which sees research as a separate activity and domain to education and learning. Co-location of research and education activities is critical in order to ensure the mutual benefits between research and education. This is also why the Council believes it would be detrimental to establish market-driven research centres, separate to the higher education system.

Pillar 5: Recommendations:

♦ *More generally for infrastructure development, the priorities nationally for infrastructure should be (i) the establishment of a national mechanism to support the sustainability of current infrastructures across AHSS and STEM, and (ii) enhanced access and utilisation of existing infrastructures in line with the HEA Access policy guidelines*

♦ *A national roadmap encompassing identified specialised infrastructure needs and stating Ireland's commitment to a range of ESFRI infrastructures should be developed.*

♦ *As a principle and to avoid damaging the higher education system and our long term competitiveness, the intrinsic link between higher education and research activities would be maintained.*

Pillar 6: <u>World-class IP Regime and Dynamic Systems to Transfer Knowledge and Technology into Jobs</u>

National performance

The move of Ireland up to 9th place in the European Innovation Scorecard among 28 member states must be noted and, in particular, the key role of human resources factors in this performance. Ireland particularly ranked well on:

- strong in Human Resources (includes new doctoral graduates), ranked 3rd behind Finland and Sweden;
- strong in Economic Effects (outputs), Ireland overall leader followed by Denmark, Finland and Germany;
- relative weakness: community designs and non-R&D innovation expenditures

Furthermore, between 2005 and 2012, the average number of licences, option or assignment agreements (LOAs) executed each year by higher education institutions with companies was up seven-fold to 85 and the number of spin-put companies created each year was averaging 22: an increase of nearly 450%.

Structures and policy

In the recent past, Knowledge Transfer Ireland (KTI) has been established as joint venture between the Irish Universities Association (IUA) and Enterprise Ireland as a resource for the system. The Irish Research Council welcomes the establishment of KTI and its role as a 'capstone' to the activities of the higher education institutions.

The Irish Research Council is committed to the implementation of the National IP Protocol.

The Council is also committed to the implementation of the National Open Access Guidelines.

Pillar 6: Recommendations:

- ♦ *A review of the infrastructures available and implementation of the Open Access policy would be timely.*
- ♦ *Consideration is also required nationally as to the approach and implementation of Open Access to data (as distinct from publications).*

Pillar 7: Government-wide Goals on Innovation in Key Sectors for Job Creation and Societal Benefit

The Council has a specific role within its mandate which contributes to the delivery of this theme. The Council's mission is:

- to enrich the pool of knowledge and expertise available for addressing Ireland's current and future challenges, whether societal, cultural or economic and deliver for citizens through collaboration and knowledge exchange with government departments and agencies, enterprise and civic society.

Recap of growing focus on working with range of societal stakeholders and co-creation of research questions

As part of the National Strategy for Higher Education, engagement between higher education institutions and broader society is identified alongside Teaching & Learning, and Research as a key pillar of activity. At its core, this pillar recognises that higher education and research can support the range of societal stakeholders, including citizens, to progress and address challenges.

We have referenced earlier the growing international focus on centrality of societal outcomes and that innovation is about more than technology, and the concept of Responsible Research and Innovation, and the concept of co-creation. We have also outlined earlier the growing importance of social innovation in the context of jobs and social progress.

Increased focus on interdisciplinary research

National policy has identified the need for greater interdisciplinary research in Ireland, where researchers in both AHSS and STEM disciplines collaborate on themes of mutual interest and benefit. This approach is predicated on the recognition that societal challenges are typically highly complex, and the engagement of researchers from both AHSS and STEM can often generate more innovative solutions and new ways of approaching and thinking about problems. Evidence available internationally[24] supports the view that greater collaboration across the traditional AHSS-STEM boundary line leads to higher quality outcomes and helps to support the development of research excellence. Ireland's Horizon 2020 Strategy[25] commits to taking steps to encourage and stimulate greater inter-disciplinary research over the coming years and to enabling researchers develop track record. The Irish Research Council has been specifically charged with supporting the delivery of this objective, in particular as it pertains to cultivating and enabling the engagement of AHSS researchers in interdisciplinary research.

Therefore, building on recent initiatives taken by the Council through its New Foundations programme and through a pilot interdisciplinary project initiative in 2013, a number of new targeted actions are being taken by the Irish Research Council in 2015. These are (a) the New Horizons Interdisciplinary Programme for AHSS led research projects and (b) the partnership with the SFI Investigator Programme on STEM led interdisciplinary research. Further stimulator initiatives are also being undertaken by the Council.

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[24] Catherine Lyall; University of Edinburgh: Experiments in Interdisciplinary Capacity Building
http://spp.oxfordjournals.org/content/40/1/1.full.pdf+html
[25] EU Framework Programme for Research & Innovation 2014-2020 Irish National Strategy
http://www.djei.ie/science/technology/strategypaper.pdf

Ongoing research for policy and new targeted initiatives: 'Engaging Civic Society' and 'Research for Policy and Society'

The Irish Research Council is currently, and has historically, engaged extensively in policy for research.[26] The majority of social policy research has emerged historically through the Council's 'bottom-up' programmes but increasingly emerges due to specific calls in partnership with government departments and agencies who are committed to evidence informed policy and programme interventions. The range of outputs across all programmes is exemplified by the following recent examples:

I.   'The publication of an independent study of recommendations from Inquiries into events in families and their interactions with State services, and their impact on policy and practice ', (**Department of Children and Youth Affairs and Irish Research Council, Government Publications 2013).**

II. Research on Past and Potential role of the Organisation for Security and Co-operation in Europe (OSCE) and the EU in the post-Soviet region – in preparation for Ireland's chairing of the OSCE 2012/hosting of EU Presidency 2013 **(Department of Foreign Affairs and Irish Research Council).**

III. ÉMIGRÉ – Emigration in an Age of Austerity (UCC 2013) – funded by **Irish Research Council.**

IV. An Examination of Concepts of School Readiness among Parents and Educators in Ireland - Research Report commissioned by the **Department of Children and Youth Affair**s through the Council - completed 2014.

More recently the Council has announced its Engaging Civic Society initiative with The Wheel and its Research for Policy and Society Programme which will launch in April (see Pillar 2). This programme will build on the Council's existing partnerships with government departments and entities and its purpose is to provide peer-reviewed research that will underpin policy decisions. These initiatives provide a platform for future growth of research for societal benefit.

Of concern in this context is the proposed EU Data Regulation which has the potential to prevent vital social and economic research, in addition to medical research.[27]

Pillar 7: Recommendations:
♦ *Enhanced funding for Responsible Research and Innovation (co-creation) to enhance social and economic innovation would be made available.*
♦ *Increased funding and a focus on cultivating interdisciplinary research and targeted at addressing national societal challenges and European Societal challenges.*
♦ *More innovative approaches to cultivating interdisciplinarity should be explored e.g. the growing international interest in the concept of STEAM – which blends STEM with Arts.*
♦ *In Pillar 2 specific recommendations are set out on increased priority being given to social innovation, research for policy and society. We also recommend a broad cross-government approach to horizon scanning for the identification of future economic and societal priorities.*

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[26] Disadvantage, poverty reduction, youth welfare, social welfare practice, digital rights, education, new Irish families etc
[27] http://www.scienceeurope.org/uploads/PublicDocumentsAndSpeeches/EU_Data_Protection_Social_science_allFIN.pdf

Pillar 8 – Research for knowledge and developing human capital

The Council has two specific roles within its mandate related to this theme:
- To fund excellent research within, and between, all disciplines, and in doing so to enhance Ireland's international reputation as a centre for research and learning.
- To support the education and skills development of excellent individual early stage researchers and cultivate independent researchers and thinkers, whilst offering a range of opportunities which support diverse career paths.

Research for knowledge
Professor Helga Notowny, former President of the European Research Council, stated in 2013; *'There is excellent research. There is no such thing as useless excellent research, only research that we do not yet know how to utilise'.*

See also Pillar 1 page 7. Excellence in basic research is an important and prestigious label, at both the individual and national level. Sustaining and further developing our track record in basic research will open up new collaborative and networking opportunities internationally for the research community and new benefits and 'wins' for Ireland. We have already emphasised that Ireland should not adopt a 'free rider' strategy towards basic research in particular. We would lose the important embedded knowledge that enhances our education and associated graduate output at all levels, and we would be kept outside the international knowledge networks, where those who have nothing to offer would not be involved. The impact of such a development on the quality and on the reputation of Irish research would be very detrimental when one considers the global nature of research and higher education.

Development of human capital
See also Pillar 1 (pages 6-8) which identified a decline in PhD enrolments and a lack of funding opportunities for career progression for early and mid-stage career researchers. Increased emphasis is required on the training experience of early stage career researchers and in addition to provision of opportunities through specific funding mechanisms, the career progression of researchers in the context of employment in academia. The IUA and IOTI have been developing common approaches in this regard. However, a National Framework Statement – akin to the National Framework for Doctoral Education - would be a welcome development in the system. An additional consideration in this area is the context of multi- and interdisciplinary research and the suitability of career progression criteria for those who engage in this activity. This is an international issue and concern.

Quantum of PhD output
Recent data shows that there is a high rate of transfer from undergraduate STEM to PhD level (see Figure III below, source HEA). In the context of increasing STEM PhDs, the barrier may be at the level of undergraduate students enrolling in these disciplines. However, STEM has had an increase in enrolments since 2009/10 and, based on CAO numbers 2014, this trend will continue.

Figure III

Field of Study: Research and Undergraduate Graduates 2012
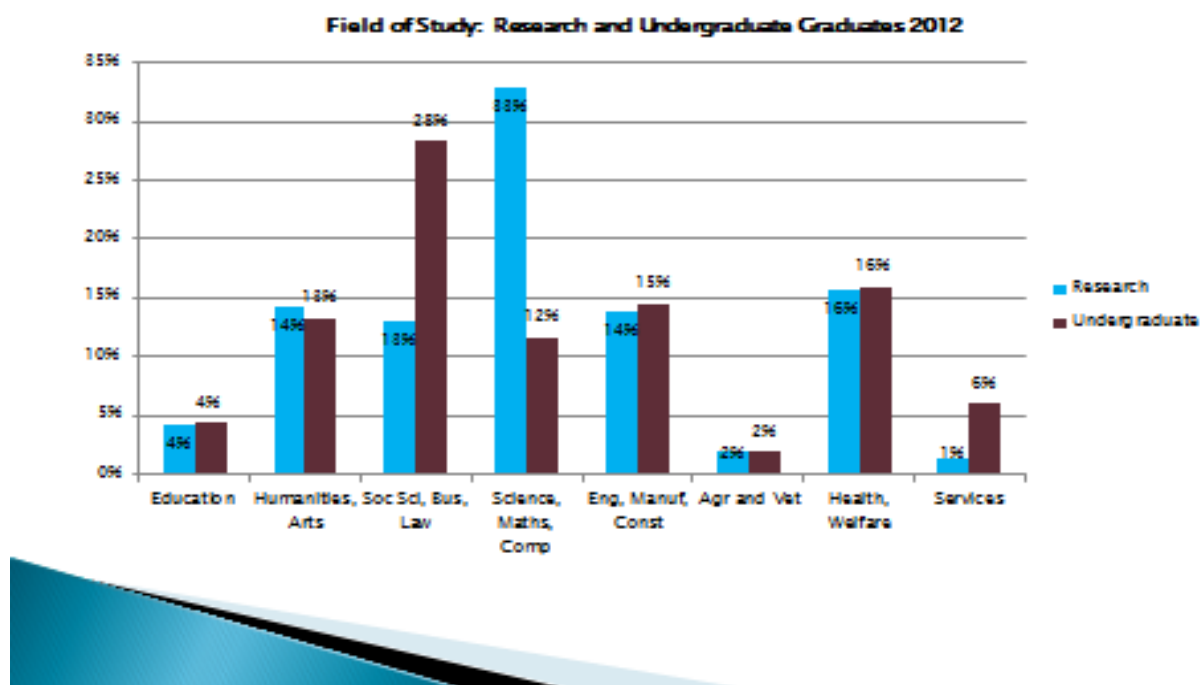
Enhancement of gender equality in publicly funded research activity

Due to under-representation by gender, Ireland, like other countries, is currently underutilising a significant population of highly talented researchers who could be vital assets in maximising collective research intelligence and optimising creativity and innovation potential. Studies have demonstrated that collective intelligence increases when there is a balance with neither women nor men in the majority.[28] [29]

There is also a gender dimension to the definition of research projects. While there are research projects in which sex and/or gender may not be relevant in terms of the research content, it is well established that, where relevant, not integrating sex and gender analysis into the design, implementation, evaluation and dissemination of the research can lead to poor results and missed opportunities.

The Council has published a Gender Strategy and Action Plan[30] and is systematically and consciously working to address gender challenges by:

- encouraging more equal gender representation in the research population, for example by showcasing relevant role models;

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[28] Woolley Anita W. et al., *Science,* Vol. 330, pp. 686-688, 2010

[29] Currently, Council awardees, 47% of Scholars are male and 53% female and, for Fellows 55% are male and 45% are female.

[30] www.research.ie/publications

- acknowledging unconscious gender bias may exist and has taken steps to limit any effect on internal processes and procedures to deliver an level playing field for all applicants;[31]
- supported the development of national initiatives to remove gender related structural constraints and barriers in the recruitment, advancement, retention and mobility of all researchers in the Irish research system:[32]
- increased awareness of the need to consider whether a potential sex and/or gender dimension is relevant in a research proposal and, where relevant, requiring integration of sex/gender analysis into the design, implementation, evaluation and dissemination of the research. [33]

There has already been much work focusing on these issues internationally, with the European context of most relevance to Ireland. The GenderNet ERA-NET project[34] (of which the Irish Research Council is a partner) has a particular focus on utilising lessons learned and best practise internationally in regard to the integration of the sex/gender dimension in research programmes and contents. An output of the project will be the development of tools to enable research organisations to do this more effectively.

Pillar 8: Recommendations:

♦ *There must be a focus on addressing the decline in PhD enrolments over the period 2015-2025.*

♦ *In parallel promote and implement the National Framework for Doctoral Education (HEA/QQI) to assure potential doctoral candidates in Ireland and further afield of the quality of the education experience and employers of the quality of doctoral graduates*

♦ *Programmes that align to the European Research Council programmes must be established so as to enable independent career opportunities for PhDs, early stage career researchers, and for mid-career researchers. These programmes would reward excellence across all disciplines (see also Pillar 1)*

♦ *In order to achieve a sustainable research capacity, work to develop high-level targets must align with that to be considered as part of the National Skills Strategy and both strategies must synergise with each other.*

♦ *In order to have an attractive environment for researchers, the concept of a national career framework would be revisited.*

♦ *The latter framework would include elements such as best practice in those instances where researchers engage extensively in interdisciplinary research.*

♦ *Nationally adopt a gender dimension to the definition of research projects.*

♦ *Adoption nationally of best international practice in removing gender-related structural constraints and barriers in the recruitment, advancement, retention and mobility of all researchers in the Irish research system.*

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[31] GOI Postdoctoral Fellowship Terms and Conditions

[32] The Athena Swan initiative has been brought into Ireland in 2014.

[33] In this latter area, the Council was the first national agency in Europe to formally adopt this approach

[34] 'Promoting gender equality in research institutions and the integration of the gender dimension in research contents', *Grant Agreement n°618124 – GENDER-NET*, FP7-ERANET 2013-RTD, SiS-2013-2.1.1-2

Conclusion

The Irish Research Council is building on the work and success of the former Councils, IRCSET and IRCHSS. The Council has successfully completed the merger and in the past three years consolidated and developed its mission. Reflecting our distinctive role in the research ecosystem, we work to ensure that the best researchers and scholars are properly nurtured and supported throughout their research careers. We also, through our emphasis on developing the skills of the individual, are cultivating creative and innovative people who can translate new ideas and knowledge into benefits for the economy and for society, both in Ireland and globally.

In making this submission, the Council would draw particular attention to the following recommendations which it believes are critical for the future:

Key Recommendations:

♦ *To retain the pipeline of highly educated human capital for both academia and enterprise, new initiatives and investment should be channelled over the period 2015-2025 to reverse the current decline in PhD enrolments*

♦ *To sustain and build our knowledge capital base, greater research career opportunities across a broad disciplinary spectrum must be enabled, including for PhD holders, and both early and mid-career researchers.*

♦ *Horizon scanning for society and the Responsible Research and Innovation approach would be embedded in the process of determining national priorities for social and economic innovation, with investment to follow.*

♦ *Increased focus on and investment in cultivating interdisciplinary research and targeted at addressing national societal challenges, and contributing to addressing European and global challenges.*

♦ *Most importantly, whilst we may continue to identify areas where Ireland can lead internationally and prioritise these, to future-proof our research base, to draw out the best of our talent and ideas, and to underpin an excellent higher education system, it is crucial for our long-term reputation and competitiveness that we maintain and invest in a strong portfolio of research in all its forms (whether basic, strategic or applied) across the STEM and AHSS disciplines.*

The Irish Research Council is agile and is continually scanning our environment and being responsive to it. We are ambitious for Ireland and have the scope to develop our programmes and portfolio of activities in the national interest. We look forward to playing a key role working with the research community, other funders and societal stakeholders to implementing our new inclusive and forward looking national strategy for research.

ENDS