Science Foundation Ireland sfi For what's next

Promotion of Research and its economic impact in Ireland

HUCBMS 2019

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& Chief Scientific Adviser to the Government of Ireland

What Science Foundation Ireland Actually Does

- Makes **grants** to Higher Education Institutes (HEIs) in Ireland
- Based on competitive, international merit review for scientific **excellence** and **impact**
- Trains **people**
- Builds **infrastructure**
- Produces **scientific results** and technology (Research Output)
- Transfer of the **Research Output** to existing and new companies for **economic and societal impact**
- Supply of appropriately trained people along the entire **science and technology pipeline**
- **Significant industrial collaboration** attracting, anchoring and starting companies
- **Leverages** other research funding e.g. Industrial / EU / Charitable / Philanthropic / International
- Fosters high levels of **collaboration** between academia, industry, charity, disciplines, sectors, institutions, people and countries
- Operates in an **open**, **agile** and **engaged** mode with a willingness to **seize** new opportunities
- Engages the **public** to **grow scientific literacy** and citizenship

What Science Foundation Ireland delivers for its annual €188.25m budget

Research, development, innovation and a highly educated workforce will be key points of differentiation for Ireland and key drivers of our future economic success

A research engine of **4,924** people led by **500** leading scientists

16 world leading research centres spanning several HEIs and industry

750 Active Research Projects

Generating Annually

39,823 jobs in Ireland supported directly or indirectly

4,881 scientific publications

12 spin out companies formed

1,715 collaborations with industry (including 712 MNCs, 1,003 SMEs in all regions)

53 licensed technologies

80 patent filings, **51** patents awarded

€230m in leveraged non-SFI funding

2,715 international collaborations in 74 countries

1,600 Smart Futures volunteers provided STEM careers advice to over 120,000 students

641 primary schools received Discover Primary Science and Maths Awards

2 million people reached in over 1,400 events during Science Week

Ireland's Standing in Global Research & Innovation

Ireland 12th place in global rankings for the overall quality of scientific research

Field specific global excellence:

- 1st for **Immunology**
- 2nd for **Animal and Dairy**
- 3rd for **Nanotechnology**
- 5th for **Materials Sciences**
- 7th for **Microbiology**
- 8th for **Molecular Biology & Genetics**

8th for **Neuroscience and Behaviour**
9th for **Basic Medical Research**
11th for **Chemistry**

Ireland ranked 10th in the world by the Global Innovation Index 2018

% of publications in the top 1% as measured by citations

Country	Funder	# Documents in Web of Science	Documents in the Top 1%
Ireland	**All**	**181,071**	**1.71**
Ireland	Science Foundation Ireland	18,026	2.66
USA	All	9,659,152	1.78
USA	National Science Foundation	552,738	2.89
USA	National Institutes of Health	831,835	2.88
Switzerland	All	566,747	2.63
Denmark	All	313,829	2.47
Singapore	All	235,214	2.20
United Kingdom	All	2,682,452	1.83
Finland	All	245,252	1.78
New Zealand	All	175,858	1.76
Israel	All	288,086	1.65
China	All	4,002,157	1.06
EU	All	11,258,058	1.26
EU	European Research Council	72,787	4.82

IRELAND: From 1980 - 2002, for any funder, the % of publications in the top 1% is **1.02%.**

Therefore the overall system has improved – with a disproportionate impact from high quality SFI-funded publications

26 SFI funded researchers are in the 2018 list of highly cited researchers (top 1% in the world) produced by Clarivate Analytics – 10 in the SFI APC Research Centre

Source: Incites Thomson Reuters 2003 - 2018

Science Foundation Ireland Portfolio

16 SFI Research Centres

ADAPT	Centre for Global Digital Content and Engagement
AMBER	Advanced Materials and BioEngineering Research Centre
APC	APC Microbiome Institute
BEACON	Circular Bioeconomy Research Centre
CONNECT	Future Broadband, Cellular and Internet of Things networks
CONFIRM	Smart Manufacturing and Industrial Automation Research Centre
CÚRAM	Centre for Research in Medical Devices
Future Neuro	Neurological Diseases Research Centre
iCRAG	Irish Centre for Research in Applied Geosciences
I-Form	Advanced Manufacturing Research Centre
INSIGHT	Centre for Data Analytics
IPIC	Irish Photonic Integration Research Centre
LERO	Irish Software Research Centre
MaREI	Marine and Renewable Energy Ireland
SSPC	Synthesis & Solid State Pharmaceutical Centre
VistaMilk	Precision (Smart) Agriculture Research for Dairy

SFI Research Centres are the epitome of SFI's transformational effect on the national research system

- **16 world-leading SFI Research Centres** of scale and excellenc
- SFI commitment **€434 million**
- Industry commitment **€235 million**
- EU funding target of >**€300 million**
- **19** Research Bodies
  - All universities
  - Tyndall, RCSI, NIBRT Teagasc, Marine Institute, IOTs
- **360** Companies – 167 MNCs, 193 SMEs (736 collaborative research agreements)
- **Collaboration** with
  - Higher education institutions,
  - Industry
  - National and international funders

SFI Research Centres performing well
Cumulative reporting of first 12 Centres up to Dec 2018

An economic impact report on the AMBER SFI Research Centre for Advanced Materials, led by TCD, found that for €108 million State investment

€505 million

was generated in gross national output

A '15 Years of Impact' report found that APC Microbiome Ireland SFI Research Centre helps to generate €1.2 million for the Irish economy

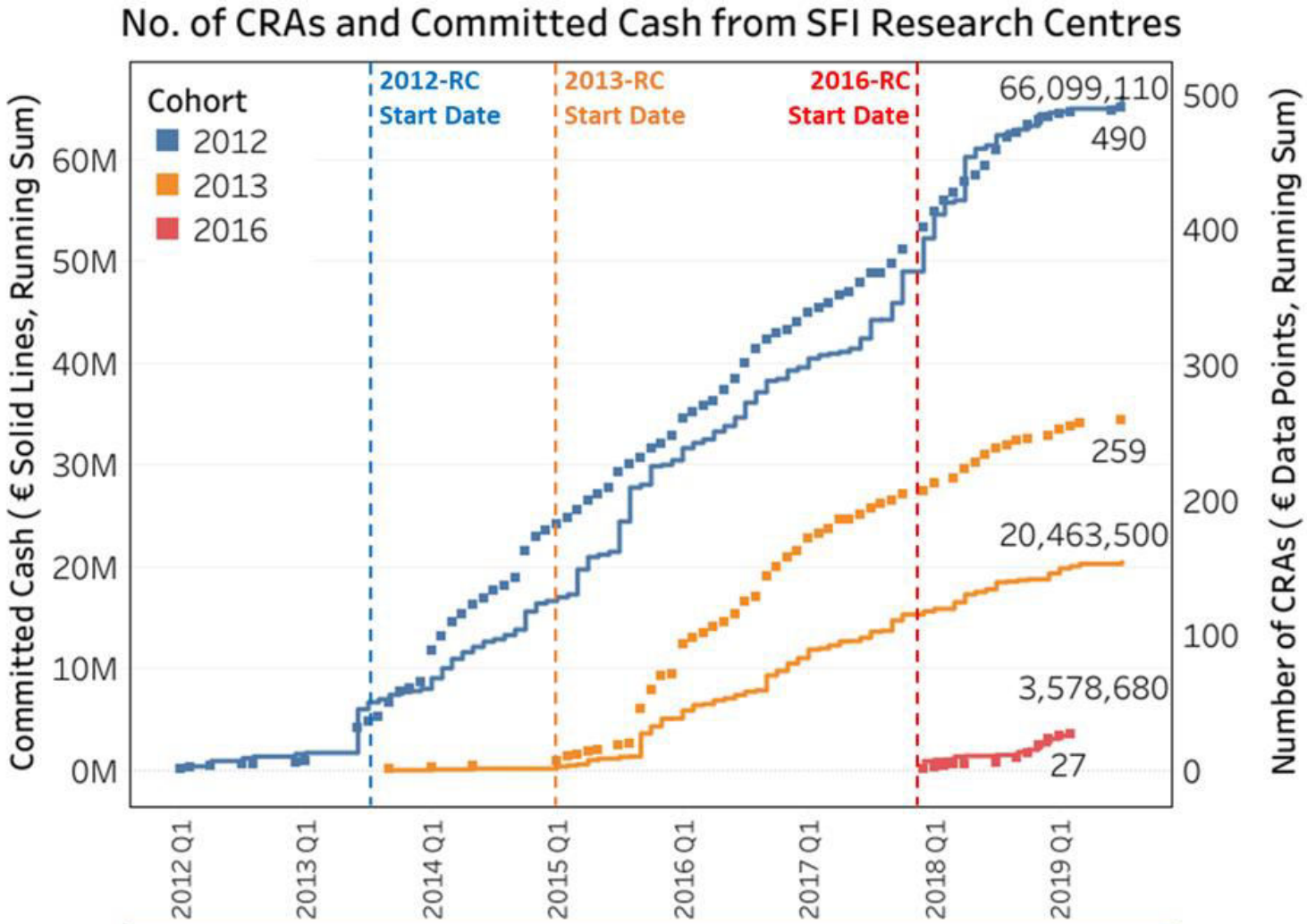
each week

including expenditure and taxation impact.

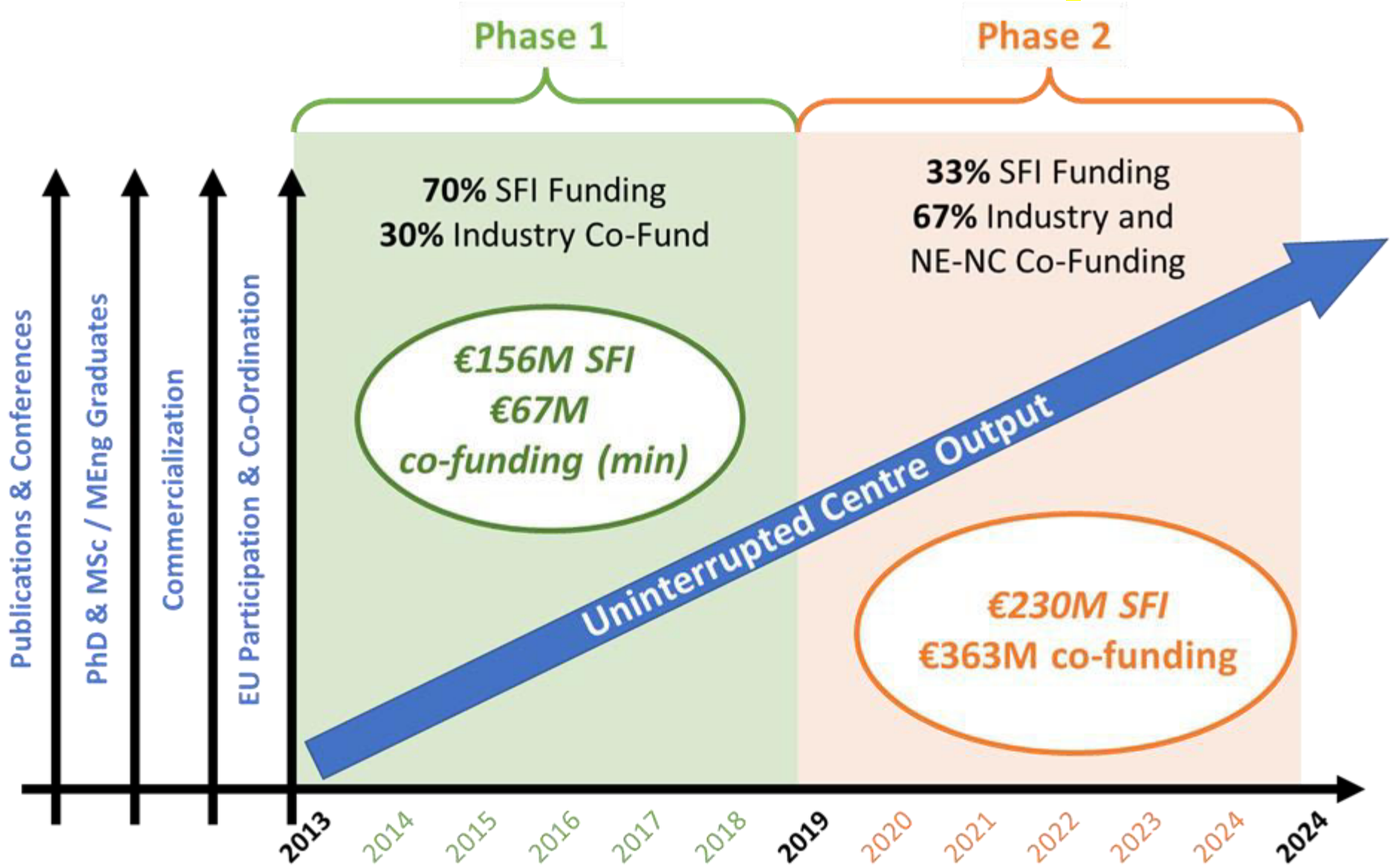
SFI Research Centre Outputs	Cumulative to DEC-2018		
	Target	Result	Performance against target
Journal publications	4,090	7,144	175%
Conference publications	3,306	4,212	127%
MSc/MEng graduates	163	118	72%
PhD graduates	484	854	176%
% Trainee departures with industry as first destination	28%	33%	118%
Participations in major EU initiatives	285	336	118%
Coordinations in major EU initiatives	88	84	95%
ERC awards granted	29	26	90%
Funding from non-exchequer, non-commercial sources	€196,726,732	€195,865,387	100%
Cash in bank (minimum target)	€35,042,853	€61,040,554	174%
% Industry cost share (cash)	9%	17%	184%
% Industry cost share (total)	29%	43%	147%
EI Commercialisation Awards	193	324	168%
Licence agreements	145	182	126%
Spin-out companies formed	31	27	89%

Funding Input: 1/3 SFI, 1/3 Industry, 1/3 EU. Productivity: for €1 Euro invested, €5 returned to economy

Collaborations with Industry (legal contracts)



Research Centres Growth in Phase 2 (6 of 7 RC



Spoke and Partnership awards with Industry

Examples

Smart Cities - ENABLE

Connect communities to smart urban environments through the Internet of Things – involves 3 SFI Research Centres (Lero, Adapt, Insight), Dublin City Council and 25 companies including large MNC's, e.g. Intel, Huawei, and SME's e.g. Accuflow

Value €14.5 million

Artificial Intelligence & Machine Learning for the Dairy Industry

Dairymaster and Lero (SFI Software Research Centre) Intelligent autonomous systems and Internet of Things technology for farms - to boost farm productivity, milk quality and animal health

Value € 2 million

U-Flyte Flight Control for Drones

Tackle global management of increased drone operation. Maynooth University with aviation industry partners Airbus, Irelandia Aviation, Ryanair, Intel and 15 other companies, including testbed facilities at Waterford Airport

Value €6.3 million

Shire / I-Path

Develop personalised treatment approaches for patients with haemophilia Partnership between the National Coagulation Centre, St James Hospital, Our Lady's Children's Hospital in Crumlin, the Irish Haemophilia Society, RCSI, TCD and Shire

Value €4 million

SFI Industry Fellowships

- Movement of researchers between industry & academia
- Focus on *collaborative research*
- Must be a *research-active* company
- Maximum budget of €100,000 - SFI provides salary and travel support & the company supports research costs
- Up to 12 months full-time or 24 months part-time
- Work on company research project
- Can be a company anywhere in the world
- No restrictions at the end e.g. Company can hire the Fellow, Fellow can stay overseas, Fellow can return to university etc

SFI Industry Fellowship Group https://www.linkedin.com/groups/8201626

SFI Industry Fellowships

SFI Research Professors

Attracting 'star' global research talent

- €5M research funding from SFI for 5 year
- University pays the salary – up to €250K pa
- In strategically-important research areas for Ireland

Quantum Materials / Quantum Technology
Prof. Séamus Davis
University College Cork (UCC)/ University of Oxford
Moved to Ireland from USA

Infectious Diseases
Prof John Dalton
National University of Ireland Galway
Moved to Ireland from Queen's University Belfast.

Chemistry (pharma/energy)
Prof. Mike Zaworotko
University of Limerick (UL)
Moved to Ireland from the U.S.

Biophotonics / Med devices
Prof. Stefan Andersson-Engels
University College Cork (UCC)/ Tyndall
Moved to Ireland from Sweden

Mining and Mineral Resources
Prof Murray Hitzman – iCRAG/UCD
Moved to Ireland from USA (Associate Director for Energy & Minerals, US Geological Survey)

Electrical Eng. / Internet of Things
Prof. Bogdan Staszewski
University College Dublin (UCD)
Moved to Ireland from the Netherlands

Manufacturing
Prof. Fengzhou Fang
University College Dublin (UCD)
Moved to Ireland from China

Manufacturing
Prof. Paul Michael Weaver
University of Limerick (UL)
Moved to Ireland from the U.K.

Medical devices / Clinical trials
Prof. William Wijns
National University of Ireland, Galway (NUIG)
Moved to Ireland from Belgium

Digital Platforms and Content
Prof. Dr. Aljoša Smolić
Trinity College Dublin (TCD)
Moved to Ireland from Switzerland

Energy Technologies
Prof. Piet Lens
National University of Ireland, Galway (NUIG)
Moved to Ireland from the Netherlands

SFI Centres for Research Training (CRT)

- €100M investment in training of approx. 700 postgraduate research students to create **talent pipeline for the research and innovation sector** in Ireland
- Thematic area: **Data, Digital and ICT Skills for the Future**
- 6 new **Centres for Research Training** will build on research excellence to train **cohorts of future research leaders** with the skills and knowledge required to address the challenges of an ever-changing work environment
- **Cohort based** involving collaboration across all HEI's in Ireland and international partners
- **Enterprise engagement** in design and delivery of training programmes (over 100 companies signed up to date)
- **World-class training programmes** will include enterprise-relevant discipline-specific and transversal skills
- **Student co-supervision and placements** in enterprise, other non-academic establishments, or in the groups of international collaborators
- First PhD Student intake – September 2019

6 SFI Centres for Research Training in:

- Machine Learning
- Digitally Enhanced Reality
- Foundations of Data Science
- Artificial Intelligence
- Advanced Networks for Sustainable Societies
- Genomics Data Science

Objective: To be the best research training programme in the world, providing major opportunities for PhD students in Ireland and a rich source of outstanding graduates, who will be sought by the private and public sectors

7 UK (EPSRC) / Ireland (SFI) Centres for Doctoral Training (CDT's)

- Partnership and Collaboration between EPSRC (UKRI) and SFI
- SFI co-funding of €39m for approx. 200 Irish PhD students
- Linking SFI Research Centres and leading UK Universities
- Enterprise Collaboration

7 UK (EPSRC) / Ireland (SFI) Centres for Doctoral Training in:

- Photonic Integration and Advanced Data Storage
- Advanced Metallic Systems: Metallurgical Challenges for the Digital Manufacturing Environment
- Engineered Tissues for Discovery, Industry and Medicine
- Transformative Pharmaceutical Technologies
- Energy Resilience and the Built Environment
- Advanced Characterisation of Materials
- Atoms to Products, an Integrated Approach to Sustainable Chemistry

Challenge Based Funding

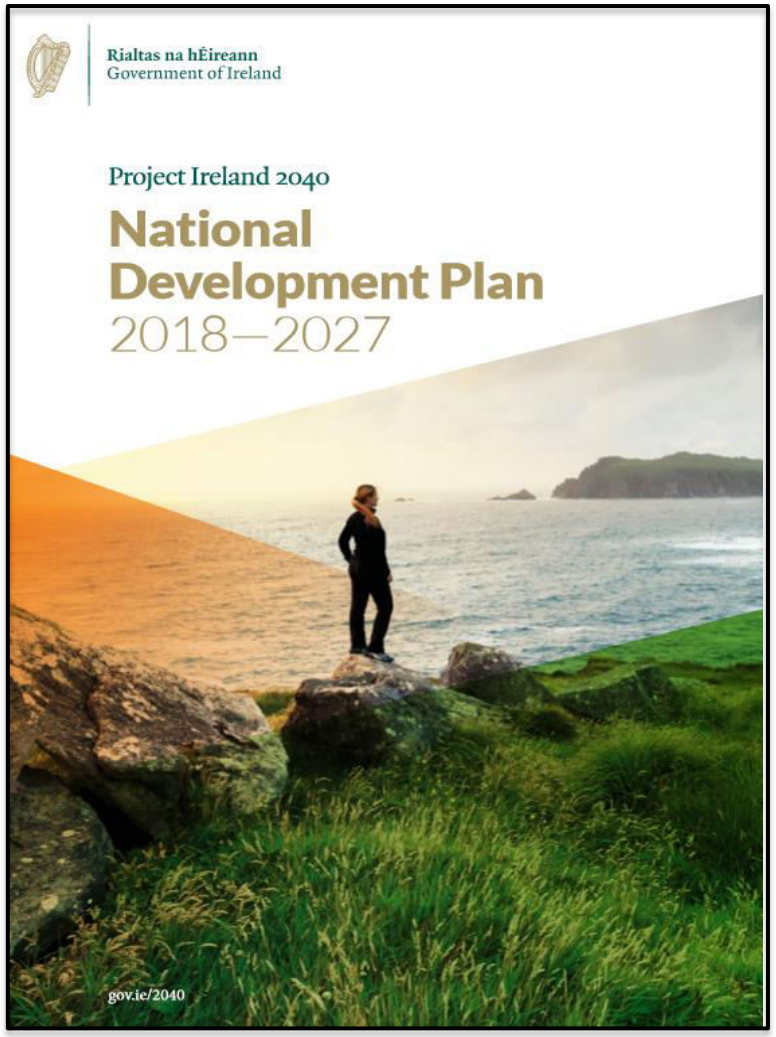
Top Down

- Consultation with industry, government departments, international funders (NESTA, DARPA, Gates Foundation)
- Challenge identification and curation
- Co-funding from industry / charity/ other government departments
- Prize: - Money (blended finance: Grant plus loan / equity investment to rapidly scale commercialisation / deployment)
  - Change in law, provisional licence, tariff, subsidy, procurement
- Launch 2019 / 2020
- Topic – Disruptive Technologies to address Climate Change

Bottom Up

- SFI Future Innovator Prize - launched September 2018 - €1m
- Artificial Intelligence for Societal Good Challenge - launched June 2019 - €1m
- Zero emissions - launched June 2019 - €3m

National Development Plan 2018-2027



10 Strategic Outcomes

1. Compact Growth
2. Enhanced Regional Accessibility
3. Strengthened Rural Economies and Communities
4. Sustainable Mobility
5. **A Strong Economy, supported by Enterprise, Innovation and Skills**
6. High-Quality International Connectivity
7. Enhanced Amenity and Heritage
8. Transition to a Low Carbon and Climate Resilient Society
9. Sustainable Management of Water and other Environmental Resources
10. Access to Quality Childcare, Education and Health Services

National Development Plan 2018-2027
Research Focus

- €500m challenge based disruptive technologies innovation fund
- 20 SFI Research Centres
- 500 additional PhD/MSc researcher enrolments to be delivered by SFI by 2020
- Upgrade and expand Tyndall Research Centre
- Implement Innovation 2020 actions
- Strengthen international collaborations

SFI's Brexit Strategy

1. Strengthen bilateral links with UK
   - *joint funding with UKRI (EPSRC, BBSRC), Royal Society, Wellcome Trust*
   - *joint appointments with leading UK Universities, e.g. Prof. Séamus Davis, University of Oxford/UCC*
   - *co-supervised PhD students (CRT's and CDT's)*
2. For those excellent people who are thinking of leaving, encourage their relocation to Ireland – full time or joint appointments
3. Widen and deepen links with other EU countries
   - *joint SFI / Fraunhofer centre in Microfluidics*
4. All-Ireland initiatives, e.g. research centres – ongoing discussions

Ireland and Horizon 2020

Total draw down to date:

€760m

1.88% of total H2020 drawdown to date (up from 1.67% last year)

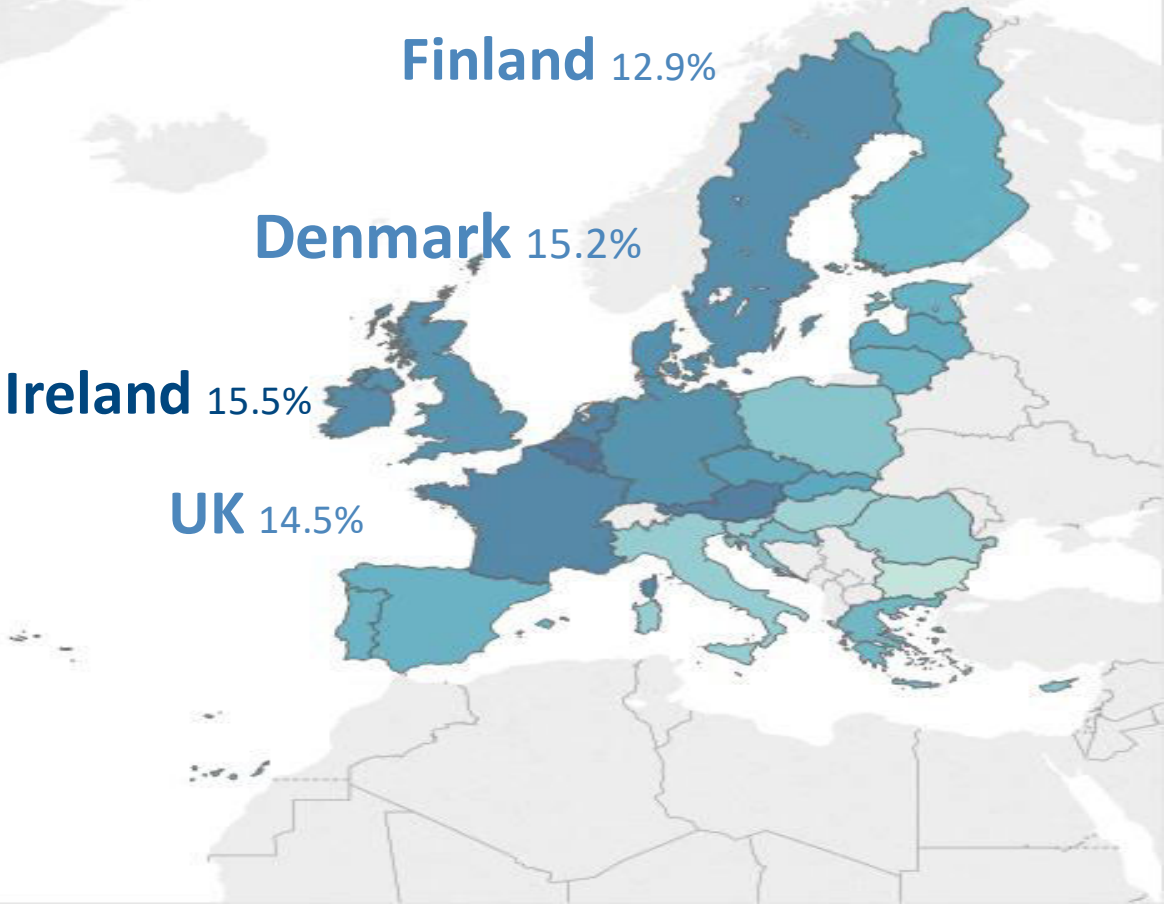
Target: 1.56%; juste retour: 1.2%

Sector Success

- Higher Education 55%
- Companies 34%
- Public sector, etc. 11%

Success rates

EU av. 11.9%



Irish researchers from academia and industry continue to excel

5 Projects
Over €6m each
23 Irish partners

2 Projects
Over €10m each
7 Irish partners

Wins to date > €1m
230 projects
448 IE participants

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One stop shop for breakthrough & disruptive innovators	**Open** to all innovators, in any field, at any time **Highest potential** innovators selected on basis of ideas and team
Agile funding from idea to investment	**Pathfinder grants** for advanced research on emerging technologies **Accelerator funding** for innovative start-ups (<€2.5 million grant, <€15 million equity) **Crowding in private investment** (VC, Invest EU)
Building ecosystems and communities	**Access** to mentoring and advisory services and to knowledge partners (e.g EIT) **Expert Programme Managers** to engage with projects and communities **Prizes** for breakthrough technologies

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Second phase launched in 2019

- ✓ **Increased budget of €2.2 billion** (€1.0bn in 2019; €1.2bn in 2020)
- ✓ **Introduction of pilot pathfinder**, with 6 strategic emerging technologies targeted (human-centric AI, novel medical devices, zero-emission energy generation, etc
- ✓ **Introduction of pilot accelerator** with option to apply for blended finance (combined grant and equity)
- ✓ **New EIC Advisory Board** to bring in leading innovators for ongoing design & implementation
- ✓ **First EIC programme managers** recruited to actively engage with pathfinder projects

EUROPEAN INNOVATION COUNCIL eic

Full EIC under Horizon Europe (2021-27)

- ✓ **Proposed budget of €10 billion**
- ✓ **Dedicated governance with EIC President and Advisory board**
- ✓ **More flexible rules for funding** (ability to stop or reorient, links to Invest EU) with increased role for expert **programme managers**
- ✓ **Full accelerator** funding with both grant and blended finance
- ✓ **Full pathfinder scheme** for grants in advanced research and transition activities
- ✓ **Fast track access** for Horizon grant holders (incl. European Research Council) and certified national schemes
- ✓ **Creation of EIC Forum** with Member States innovation agencies

Thank You