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SCIENCE ADVOCACY IN THE IRISH MEDICAL DEVICE RESEARCH FIELD

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This White Paper has been prepared through an interdisciplinary collaboration between CÚRAM SFI Research Centre for Medical Devices, UNESCO Child and Family Research Centre, University of Galway, and the Principal Investigator Impact: Research in Medical Devices Project, led by CÚRAM funded investigator Professor Caroline McGregor.

Special thanks to

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UNESCO Child and Family Research Centre and School of Political Science and Sociology, University of Galway
Newcastle University Business School, Newcastle University
Science Foundation Ireland

Any citation of this report should use the following reference:

Dolan, B., Cunningham, J.A., McGregor, C. and Canavan, J. (2022) Science Advocacy in the Irish Medical Device Research Field [White paper]. Galway: CÚRAM SFI Research Centre for Medical Devices, University of Galway.
ISBN: 978-1-911702-08-5

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Key Messages

This white paper explores how scientists working in medical device research can engage with policymakers on their science, and the role of research centres such as CÚRAM in supporting science advocacy efforts. Taking lessons learned from other fields more established in connecting research to policy (e.g. environmental science, social sciences) and science advocacy initiatives beyond Ireland, this white paper arrives at a set of recommendations for scientists and Research Centres to more effectively advocate for medical device science with policymakers.

Science Advocacy is...

Active support of science, wherein scientists engage with policy audiences to potentially inform, support and influence policy decision making

Science communication in another form

On a continuum, not a binary decision for scientists between the 'ivory tower' of academia and fully fledged activism

Not necessarily a new set of skills or resources to acquire – engaged scientists do much of this work already in their research practices

Science Advocacy in Ireland

Wider and varied pathways to policy needed for scientists

Growing interest and support for efforts to bridge or narrow the research-policy gap

New mechanisms being established to support scientist-policymaker engagement

Science Advocacy in MedTech

MedTech research provides novel strengths for science advocacy efforts:

- MedTech industry is central to the Irish economy
- Medical Device research has been a focus of government strategies over the last 20 years
- Stories of patient impact arising from medical device research can strengthen advocacy messages

For Scientists

What does effective science advocacy look like?

Understanding policymaking processes first

Planning strategies for policy impact
– plan early
– Inform, involve, participate

Early, meaningful, sustained engagement with policymakers, built on openness and trust

Good science communication skills for policy audiences

Interdisciplinary and non-academic collaboration is vital

Factors to consider:

- What do you want to do?
- Who can affect the action that you want to see?
- How do you reach them?

Don't forget:

- Research integrity matters
- Policy change takes time
- Self-care is important

For Research Centres

Centres can support science advocacy efforts of their research community through:

Targeted science communication training and education on policy pathways across the stages of scientists' careers

Identifying science advocacy mentors and champions

Encouraging scientists to expand their formal and informal networks

Incentives and grants

Providing networking opportunities

Employing dedicated knowledge brokers

Leveraging existing resources and networks

Foreword

CÚRAM, meaning 'to give care', is focused on the development of medical implants, and therapeutic and diagnostic devices that address the needs of patients living with chronic illness. CÚRAM National Centre has seen numerous scientific breakthroughs since its establishment in 2015, as researchers focus on improving the quality of life for patients living with long-term chronic conditions such as diabetes, back pain, cardiovascular disease and stroke.

Our vision is to be **'A global leader in the creation and translation of clinic-ready and patient-focused medical devices, to develop the next generation of industry-relevant, publicly engaged researchers, and to become an anchor for industry applicable research.'**

We also strive to provide meaningful opportunities for collaboration between our researchers and public audiences to create a better understanding, input and awareness of CÚRAM's research and its importance in and for society.

As researchers, we are responsible for advocating our work, ensuring continued support and ultimately increasing the impact value for patients. An essential step in this process is educating our researchers on how to communicate their research to policymakers effectively. As this white paper details, researchers already do much of this work, regularly making connections with people who can affect change, and already have many of these skills to hand.

This white paper emanated from an interdisciplinary collaboration between CÚRAM and the UNESCO Child and Family Research Centre. Interdisciplinary collaboration has proven vital in comprehensively addressing the grand challenges we have faced recently. Through our collaborations, we have learned a great deal about how other scientific fields work to connect their research to policy and practice.

The timing of this white paper is crucial, with the increasing focus of our Government on bridging research and policy, included in Impact 2030: Ireland's Research and Innovation Strategy, and the subsequent establishment of an Evidence for Policy Unit at the Department of Further and Higher Education, Research, Innovation and Science. Furthermore, Science Foundation Ireland's recent Shaping Our Future strategy and the Creating Our Future initiative have emphasised their commitment to engaged research and broader stakeholder engagement.

At CÚRAM, we want to ensure our efforts align with the national agenda on bridging science and policy, and this white paper serves as the first step in medical device research. As we continue to develop our competencies in engaging with policymakers, the recommendations of this white paper can guide us to better support our research community to use their voice to advocate for their research with decision-makers.

Prof Abhay Pandit
Scientific Director, SFI Research Centre for Medical Devices (CÚRAM)

1. Introduction

There has been increased emphasis on scientists' 'third mission' roles, beyond research and education, to look beyond the so-called 'ivory tower' of academia to connect with non-academic audiences and industry. This shift includes a growing focus on scientists connecting with policy and serving as advocates for their research, reflected in the Irish Government's recent Research and Innovation Strategy Impact 2030 [1]. Through science advocacy, wherein scientists engage with policy audiences (e.g. politicians, senior civil servants, funders), on the importance and relevance of their science, academics can influence funders and governmental decision-making processes, with the ultimate goal of contributing to overcoming the 'wicked' global challenges of modern life. Responses to challenges such as the COVID-19 pandemic, climate change, health inequalities, and the growing role of digitalisation and artificial intelligence in our society continue to highlight the important role of science in society and scientists in policymaking. However, as highlighted in a recent discussion paper from the Royal Irish Academy and Irish Research Council, despite Ireland's relatively small population and size, "there is still little structural dialogue between the academic community and policymakers."[2]

The increasing complexity of society's grand challenges, including the predicted and significant increases in the ageing population [3], and the global economic and societal burden of non-communicable diseases [4] has led to the Universal Health Coverage mandate of the Sustainable Development Goals. The field of medical device research has significant potential for addressing such societal challenges, to provide transformative solutions for chronic illnesses, solutions that are effective, sustainable and affordable. As such it is vitally important for policymakers to understand and appreciate the role medical device science and scientists can play in positively impacting a large and widely diverse patient population across the life course. Scientists engaging in advocacy also have the opportunity to promote the institution of science more generally, and the vital importance of funding basic science.

This white paper explores the theory of science advocacy and the pathways through which individual scientists can engage with policymaking processes. Furthermore, the paper highlights how Irish Research Centres can support their scientists to advocate for their work with policy audiences, and the skills and associated education, training and supports required to more effectively do so (Section 2). We explore science advocacy in an Irish context and specifically in relation to medical device or MedTech research (Sections 3-4). The content of this white paper draws on experiences both domestically and globally (Section 5), translating lessons learned from other interdisciplinary fields to the MedTech research ecosystem, arriving at a set of recommendations for scientists and Research Centres (Section 6).

2. Conceptual approaches to advocacy

2.1 What is science advocacy?

Key messages

Different understandings of advocacy exist across academic and non-academic audiences

There are different types of advocacy (advocacy on behalf of others vs advocacy in the policy sphere) and advocacy messages (policy for science and science for policy)

Policy audiences that scientists can engage with include political leaders and civil servants (primary audiences), and public bodies, individuals and groups that can influence the decision makers (secondary audiences)

Science advocacy is defined as active support of science, wherein scientists engage with policy audiences to potentially inform, support and influence policy decision making

Understanding science advocacy

Understandings of the term advocacy can vary widely and depend primarily on the context in which they are set, as well as the disciplinary focus of the academics involved. Furthermore, advocacy can incorporate a wide variety of individual and group expressions for a cause, idea or policy, or can refer to specific activities or organisations [5]. We must first distinguish between advocacy on behalf of others (case advocacy) and efforts and activities in the political arena to change policies or influence the decisions of government and state institutions [6]. Looking at academic or science advocacy specifically, the focus of this white paper, we can classify two types of advocacy: representational and facilitational [7]. Representational advocacy is focused on strategies for "'selling' public health goals to decision-makers and the wider public," with academics sometimes concerned that this type of advocacy closely resembles lobbying, and can be "rightly criticised as technocratic and elitist." 'Facilitational' advocacy, on the other hand, Research Centres on "taking a more democratic approach to advocacy that centres on listening to, and working with, communities and members of the public whose voices are underrepresented in research and policy debates." [7] While representational advocacy could be more closely associated with policy advocacy, closer to the focus of science advocacy herein, elements of 'facilitational' advocacy can be utilised in science advocacy, as demonstrated throughout this white paper.

Various science advocacy-focused organisations offer an understanding of advocacy in science as an active endeavour, 'scientists 'doing' advocacy' (AAAS). Other words for advocacy often used include active espousal, aid, approbation, approval, auspices, championship, countenance, encouragement, and endorsement [8]. A common trait of these words is the active nature of the

action, as well as a focus on support, and as such we must understand advocacy as a type of 'active' support mechanism to inform the policymaking process.

To this end, we can understand science advocacy first and foremost as active support of science, wherein scientists engage with policy audiences to potentially inform, support and influence policy decision making.

Science advocacy messages

The ultimate aims of these endeavours depend on the message of the individual scientists involved, and could range from advocating for continued or increased funding of research to evidenced-based decision making. There are different types of science advocacy messages for policy audiences, which are often categorised as **policy for science** and **science for policy** messages. Policy for science, wherein one advocates for scientists' interests, can often be reactive, reacting to scientists' needs or to potential funding cuts. Science for policy on the other hand "seeks to inform policymakers about the relevant science on an issue they are considering", and could be considered a more proactive endeavour [9], perhaps closer to the concept of issue advocacy. Scientists undertaking such activities should note that "science cannot resolve value dilemmas or decide how to make the necessary trade-offs between different interests - that is for the politicians" [10] and scientific evidence is only one part of the equation.

There is of course often overlap between messages, with many advocacy organisations arguing that the strongest campaign strategies combine elements of both, as well as engaging other relevant stakeholders and public audiences to further strengthen science advocacy efforts.

Science advocacy audiences

While politicians and other decision makers in government could be considered the primary target audiences of science advocacy, other individuals and organisations can influence the decision makers on policy development and change. This secondary audience could be an individual or group, and could involve "international governance and advisory bodies, thinktanks, NGOs, business and industry, professionals, trade unions, religious institutions, and community and lobby groups." [11] These secondary audiences can be considered as 'influencers' and could even become allies or partners in scientists' advocacy efforts. Mirroring this, at the wider governmental level, there is increased emphasis amongst policymakers in engaged research, to include public voices in shaping research agendas and policy. Two prime examples of this include Horizon Europe's increased focus on citizen science, and the recent Government of Ireland initiative, Creating our Future, wherein SFI invited the public into a conversation on research with a goal of eliciting over 10,000 ideas on what researchers should explore to create a better future.

Policy and policy audiences in this white paper focus primarily on the governmental level, but it should also be noted that the findings and recommendations of this white paper could also be utilised in engaging with other forms of policy in public life, for example in advertising, marketing, social media and journalism. Scientists can also advocate for their science in this realm. A practical example of this would be in the 'Ask for Evidence' campaign organised by Science About Science, wherein researchers were encouraged to challenge unfounded or suspect claims in advertising, journalism, and marketing.

2.2 Why engage in science advocacy?

Key messages

Reasons for scientists to advocate for their work to policymakers include:

- Basic responsibility of scientists as global citizens and community members
- Requirement of publicly funded research
- Specialist knowledge to better inform policy
- Emphasise the necessity for science in society, and the rigour and integrity of the scientific process
- Public trust in science remains

The central challenge of academia is "not a knowledge gap, but rather a translation deficit." [12] While there exists much debate as to the nature of the role of scientists and their science in policy deliberations (e.g. [13]), there is general agreement that scientists have potential to play an important role in policymaking [14]. Firstly, beyond the factors highlighted already, engaging with policymakers can be understood as a basic requirement of all citizens, in terms of engaging in democratic policymaking [14]. Furthermore, similar to the arguments surrounding the impact agenda, scientists should understand engaging with public policy as an obligation for receiving public funding, providing potential benefit to society. Related to this, scientists' specialist knowledge obliges them to contribute to the common good, that they can have "an outsized impact."[15]

A common argument made on behalf of scientists as advocates relates to public trust in science, for example in the case of climate change, where scientists still appear to have the upper hand in this regard: "The implication is that relative to authority, deference, and respect, scientists have earned a rich bounty of perceptual capital."[16] This idea of public trust in science has been bolstered through recent large scale survey findings over the past number of years, with over 70% of people globally trusting scientists [17] and with trust in science and scientists increasing during the Covid 19 pandemic [18]. SFI's recent Science in Ireland Barometer 2020 survey further highlights this trust, with over 80% of respondents trusting both science and scientists [19].

"Science is one of many sources of knowledge that inform policy. Its unique strength is that it is based on rigorous enquiry, continuous analysis and debate, providing a set of evidence that can be respected as valid, relevant and reliable." [20]

2.3 Challenges and barriers to science advocacy engagement

Key messages

Challenges of engaging in science advocacy include risks to scientific objectivity and public trust of scientists, time constraints, lack of knowledge of policymaking and support

There is a clear need for educating our scientists in responsible advocacy principles, and science communication skills specifically for policy audiences

To explore how best Research Centres can support individuals in their science advocacy efforts, we must first identify the barriers faced by our scientific community to engage with policymakers. Recent studies[a] found that the biggest barrier identified for scientists was lack of knowledge or guidance on how to engage, alongside lack of confidence, time or support, challenges that Research Centres could play a role in overcoming.

A central challenge of science advocacy for individual scientists relates to maintaining scientific accuracy and objectivity. Scientists acting as advocates run the risk of losing legitimacy in certain instances, that they will be perceived perhaps as being motivated by personal interests. This could result in the credibility or trustworthiness of scientists coming into question [21], and indirectly, that of their field and of the scientific enterprise as a whole [22]. Science advocacy can further be incredibly challenging depending on the particular context in which the activities take place. For example, scientists can be asked to contribute their scientific expertise in the midst of "clashing values, differing preferences, and opposing, often mutually exclusive, societal priorities" [13]. Related to this is the sometimes contentious theme of lobbying. Lobbying could certainly be considered a form of advocacy, or a step along the advocacy continuum, as explored in greater detail in section 2.4 below, but that does not necessarily make advocacy a form of lobbying. Scientists must nonetheless remain cognisant of this tightrope they must walk in advocating for their science [21]. These inherent risks for scientists speaking out for their science highlight the need for scientists to be appropriately educated and supported (including self-care and their personal wellbeing) to engage responsibly in advocacy-type activities.

'Responsible advocacy' provides a frame through which to overcome these hurdles, wherein limits or regulations are imposed on scientists' communication and advocacy practices [23]. The specifics of a set of responsible advocacy principles [23] or a code of conduct [24] closely mirror much of modern science processes, particularly in relation to the practices of responsible research and innovation (RRI), and as such would in theory be relatively easily adopted by researchers. These guidelines share a focus on emphasising honesty, accountability and fairness across all engagement activities.

[a]Surveys conducted by the Parliamentary Office of Science and Technology (POST) and Parliament's Outreach team in the UK in 2017 to better understand academics' perceptions of barriers to engaging with Parliament

Furthermore, science advocacy in policymaking processes in general is not a straightforward endeavour: "the issues for which scientific input is most needed by policymakers are the ones for which the science is most often complex, multidisciplinary and incomplete."[25] Therefore scientists must be sufficiently supported and incentivised to engage on such issues.

Scientists are under increased pressure from a variety of sources to engage in third mission activities, and as such the time required to engage in advocacy, and learning the necessary skills, could certainly be considered a barrier for this busy group. Scientists engaging in policy-related advocacy must also consider the different world views of academics compared to policymakers, and how best to communicate and engage with this group. Effective science communication skills and knowledge of the policymaking process and ecosystem are vital in this regard.

2.4 How and when to engage in science advocacy

Key messages

How to engage:

- Scientists must first understand the policymaking process to be able to effectively advocate for their science to policy audiences
- Science advocacy can be best understood on a continuum, from academia to science activism
- Science advocacy is a two-way process, creating long-term and sustainable relationships between researchers and policymakers built on trust and openness

When to engage:

- Science advocacy can be incorporated into all phases of the research process, including through cocreation of projects with policymakers
- Timing of science advocacy efforts (windows of opportunity) is key to effective engagement

To a certain degree science advocacy could be considered "a state of mind, or orientation, as much as a set of activities."[7] Nonetheless there are a number of commonalities in how individual scientists advocate for their science. Science advocacy involves building bridges between science and policy, through boundary spanning [25], creating and sustaining trust, and offering opportunities to policymakers [26]. While there is no agreed-upon set of activities that constitute science advocacy, scientists should be cognisant of the breath of advocacy efforts that could be undertaken, between the traditional ideals of academia and full-fledged activism, represented as the continuum in Figure 1. These advocacy-related activities could be viewed as overlapping with those relating to evidence-informed policymaking, as well as to the research impact agenda and other public engagement activities already undertaken by our research community.

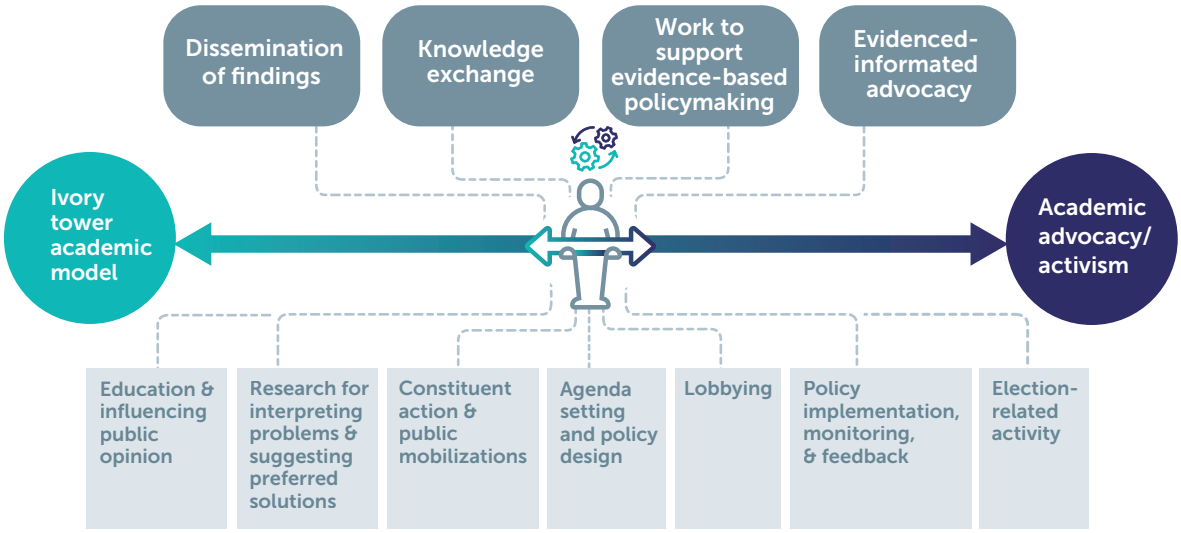


Figure 1: Continuum of advocacy efforts (Adapted from [7] and [5])

Based on an extensive review of relevant literature, a number of common themes were identified for scientists to consider when tasked with effectively advocating for their science with policy audiences.

Understanding policymaking

As a first step, understanding the policymaking process at a regional, national and international level is key to engaging in science advocacy directed at policymakers, for organisations and for individual researchers [27]. Most often viewed as a cyclical process (see Figure 2 below), the policymaking process offers opportunity for stakeholder input throughout, particularly in the early stages of the policy development process, from agenda setting through to assessing risks and uncertainties.[28] Agenda setting is often acknowledged [29], as the phase at which advocacy organisations and individuals have the most chance of influence, though there are opportunities for engagement in science advocacy across the policymaking process. While this staged or phased conceptual approach provides a logical flow of an issue through the policy process, complex feedback flows must also be considered. Highlighting this complexity, policy development activity can be as "often a seamless web involving a bewildering mesh of interactions and ramifications."[30]

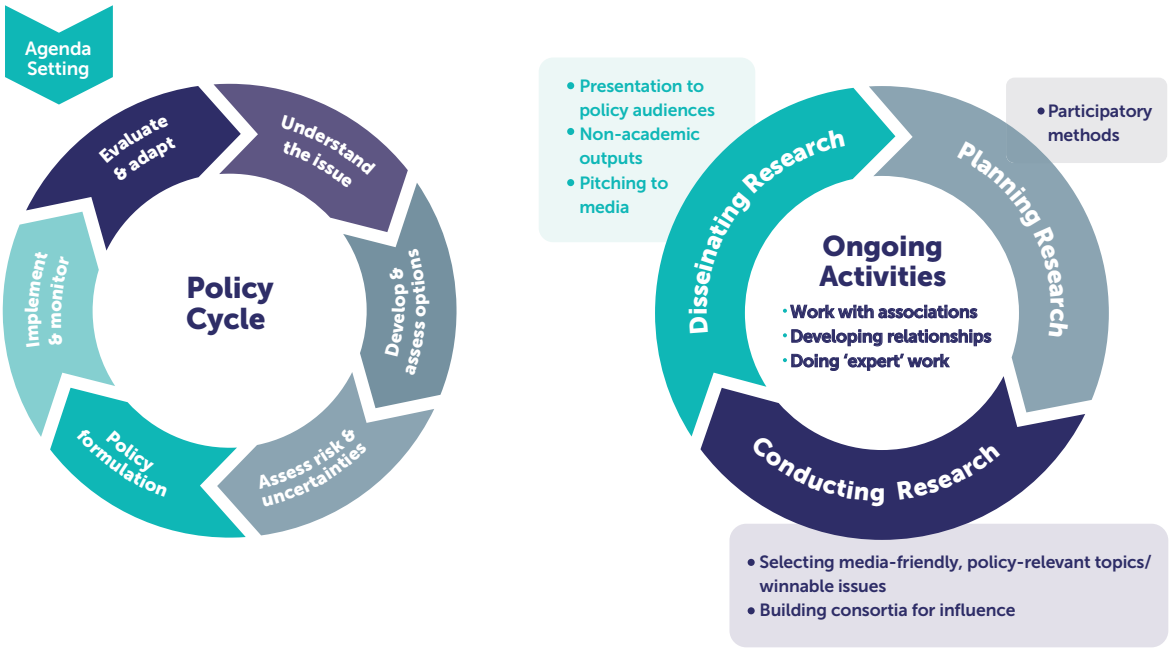


Figure 2: Policymaking and Research as cyclical processes (adapted from [28] and [7])

Science advocacy as part of research practices

Central to science advocacy efforts is science communication training, providing researchers with a set of skills to advocate for their work to policy audiences. The research-advocacy lifecycle [7] presented in Figure 3 depicts common advocacy-related science communication activities that can take place among academic researchers in the field of public health. Advocacy activities can be part of planning, conducting and disseminating research, though with the exception of participatory research methods, most activities relate to the planning and dissemination stages. The centre of Figure 3 outlines common, perhaps pre-existing activities, of scientists that can aid advocacy efforts, with such activities including "working within NGOs to wield greater legitimacy and resources, actively seeking to influence policy development through strong relationships with policymakers, and offering oneself as an 'expert' for commissions or advisory groups."[7] It should be highlighted that the European Commission's recent Science for Policy Handbook [10] placed cocreation at the centre of Science for Policy 2.0, emphasising the need for a more integrated model of knowledge-policy relationships.

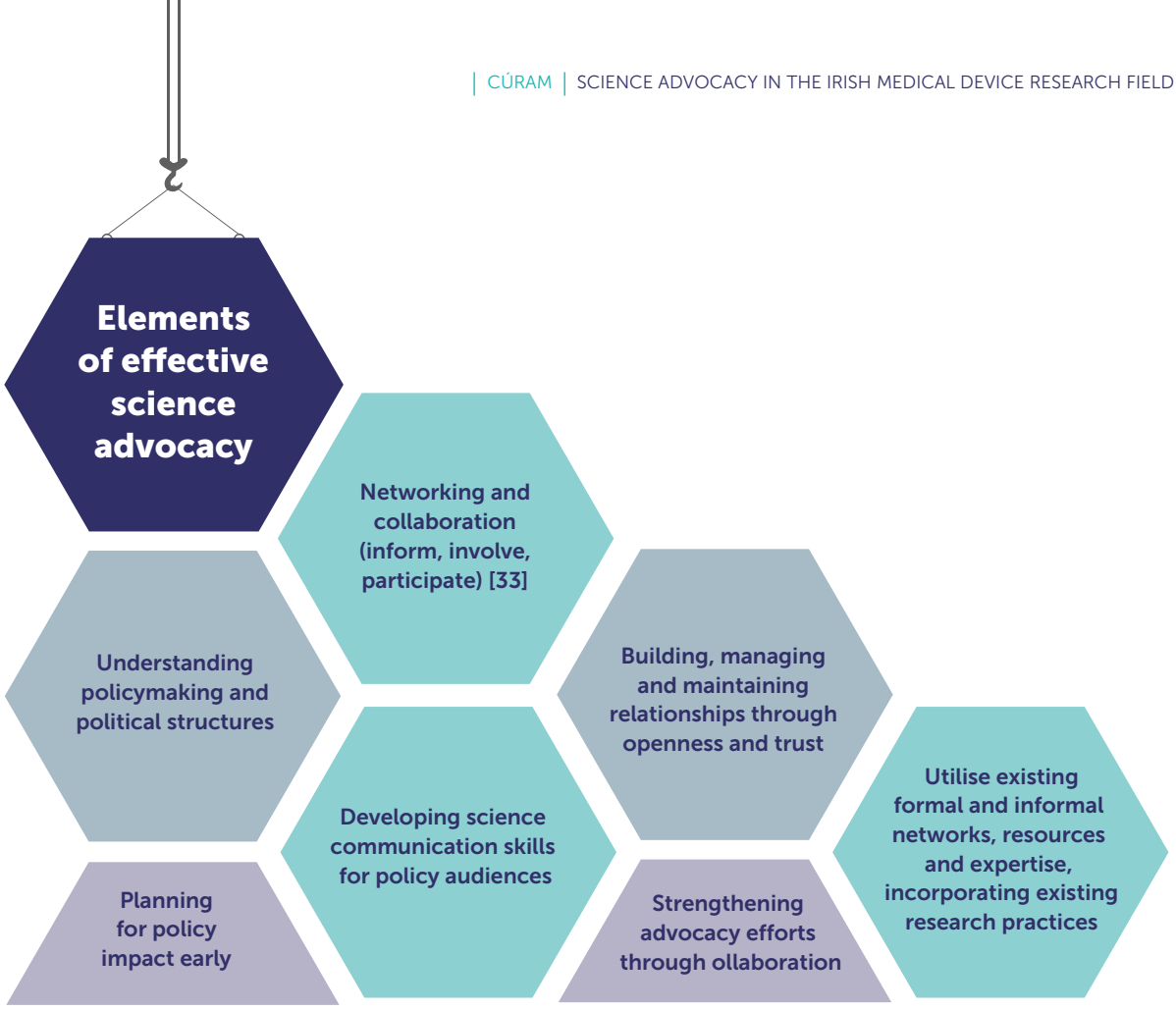
Engagement with policy audiences

Literature on advocacy activities emphasise the importance of advocacy as a two-way process, a dialogue between researchers and policymakers, developing long-term, sustainable relationships with stakeholders [28]. Building and maintaining meaningful relationships between scientists and policymakers, as opposed to simple knowledge transfer, is a crucial element of science advocacy efforts. This relies on building mutual trust, "where both scientists and policymakers are honest about their values and goals" [20] with this trust "critical, fragile, dynamic." [31] This focus is similar and interrelated with that of engaged research, which is the focus of the IUA's Campus Engage initiative. Campus Engage has developed resources for engaged research, particularly the series of policy briefings for civil servants and policymakers, HEIs, and funding agencies on 'Engaged Research for Impact', a potentially useful tool for scientists seeking to undertake effective science advocacy.[b]

Framing your message

Guidelines on providing scientific advice to policymakers recommend that messages to policymakers be relevant (addressing policymakers' key questions), credible (scientifically sound and authoritative), legitimate (developed through fair processes) and timely (delivered in time to inform the decision-making process) [28]. Through understanding the goals and interests of policy audiences, as with all forms of effective science communication, scientists can become "bilingual in science and policy" [10]. Timing of communication between researchers and policymakers can be considered a key component of effective science advocacy efforts, identifying the correct time to exploit 'windows of opportunity.' [32]

[b] For more information, visit: https://www.campusengage.ie/



2.5 How can Research Centres support science advocacy?

Key messages

Important role for Research Centres and academic organisations in overcoming barriers to engaging with policy audiences, including barriers of scientists' lack of knowledge, confidence, time and support

Considerations at an organisational level include providing guidance on the types of advocacy scientists can engage in, and whether to engage directly with policymakers

Efforts for supporting science advocacy include offering training and education on the policymaking process and science communication to policy audiences, networking and relationship building and leveraging existing resources

Research organisations can play a key role in advocating for science, as outlined throughout this white paper. For Research Centres and academic organisations in general, consideration must be given to the role they wish to play in supporting their researchers in science advocacy for eventual policy impact: first in terms of direct advocacy from a Centre level [34] as opposed to training of scientists in effective and responsible science advocacy, and also as to the type of advocacy

undertaken. The Overseas Development Institute (ODI) 'Tools for Policy Impact: A Handbook for Researchers' [35] offers a model from which organisations can reflect on their own advocacy focus, whether an organisation takes a cooperative or confrontational approach to their advocacy, i.e. whether to 'whisper to or shout at' government, and whether the message of the advocacy piece is more evidence-based or more interest/value-based. This white paper focuses primarily on Centre-level supports for individuals' science advocacy efforts, as opposed to direct advocacy at a Centre level. To this end, there are a number of ways in which research organisations and societies can support scientists in their advocacy activities.

Centres can support their research communities to overcome the barriers outlined in section 2.3 through providing targeted training and supports across the stages of scientists' careers, providing training, grants, networking opportunities, mentoring, dedicated knowledge brokers, and through encouraging their members to expand their connections and networks, both formal and informal [36]. "If scientists want to advocate for science, they need to add some additional skills to an already exceptional skill set." [37] As outlined in section 2.4, Research Centres can offer education and training to scientists in the policymaking process in Ireland and internationally. Furthermore, as emphasised throughout this document, science communication and public outreach and engagement can serve as tools in science advocacy efforts and so require sufficient allocation of resources within Research Centres for scientists to develop these necessary communication skills.

Research Centres innately seek to establish themselves as trusted sources of information in the eyes of the public, and to develop relationships with policymakers and civil service organisations (CSOs), considered important intermediaries between citizens and policymakers [38]. These activities can serve to enhance the networks of the individual scientists within these organisations. Research Centres need to take an agile approach to their science advocacy endeavours, to be as responsive as possible to emerging opportunities and policy demands [36]. Similarly, Centres can encourage their scientists to become members of scientific societies or in looking for opportunities to join committees, with many scientific societies and associations having committees focused on policy and public engagement [39]. By leveraging pre-existing relationships with policymakers, science advocacy efforts of individual scientists can be strengthened. Another recommended path for Centres is in supporting dedicated knowledge brokers, providing capacity to drive collaboration, capacity "to spend time building relationships, sustaining momentum, iterating collaborations, and checking-in frequently" [36], identifying and illuminating pathways to policy for scientists.

3. MedTech sector context and considerations

Medical device research, as a key actor in public health research, requires significant considerations in relation to science advocacy. At a very fundamental level, there exists a long translation path from bench to bedside for medical device research and development, on average 3-7 years. Therefore, it is essential for scientists throughout the translational research process to effectively communicate their work to stakeholders, including policymakers, to ensure they maintain funding, allowing their research to advance to the next stages of development and to ultimately impact patients' lives.

Medical device research requires significant input from patient groups. As such, current emphasis regarding policy and practice on Patient and Public Involvement in Research (PPI) also bears consideration for endeavours related to science advocacy, the role of PPI in science communication, and science advocacy with policymakers. Furthermore, engaging with policymakers, stakeholders from outside of academia, requires medical device scientists to have knowledge of and engagement with medical device industries and awareness of their potential economic impact, to strengthen their position or case in such discussions.

The medical device sector in Ireland has grown substantially over the past 25 years and is now recognised as one of the five global emerging hubs [40]. The number of medical technology companies in Ireland has increased from 50 to over 450 in the past 25 years [41], with the most significant number of people directly employed in the MedTech industry in the EU [41]. The medical device cluster in the west of Ireland, in Galway city and county more specifically, currently has over 100 medical technology companies in the region, with the sector dominating local industrial employment, representing over 50% in Galway city alone, which is the highest share for any region in the state in this sector [42].

With these developments, medical device related research has become a key national research priority [43]. There has been significant public government investment in medical device research through the Programme for Research in Third Level Institutions (PTRLI) and Science Foundation Ireland (SFI), including establishing Ireland's first stem cell manufacturing centre in 2015 and CÚRAM, the SFI Irish Centre for Research in Medical Devices, both based in University of Galway, Ireland.

These facts highlight that medical device research is vitally important to the continued growth of the regional and national economy, and medical device scientists have novel advantages to utilise this knowledge to leverage their science advocacy efforts with local and national policy audiences.

4. Science advocacy in Ireland

At present, pathways to policy in Ireland remain "relatively narrow in comparison with some other European countries." [26] A number of areas have been identified for improvement in Ireland's research ecosystem for effective policy advocacy efforts: "Ireland currently has few public policy think tanks; the academic career promotion structures and research funding evaluation measures undervalue public policy outputs and impacts; researchers typically have limited knowledge of the research and data needs of government departments; and there is a paucity of training of both researchers and policymakers on each other's needs and imperatives." [2]

In 2022, the Government of Ireland's released their Research and Innovation Strategy, Impact 2030. This strategy identified the need for greater involvement of the R&I system in informing public policymaking, proposing the creation of a dedicated Evidence for Policy Unit within the Department of Further and Higher Education, Research, Innovation and Science (DFHERIS), which could support scientists advocacy efforts into the future. DFHERIS can be viewed as the Government department of most relevance in the context of science advocacy. DFHERIS has also recently initiated an open consultation process (August 2022) on the sourcing of science advice, with the goal obtain insights from the wider public and other relevant stakeholders on what this could look like in the future.

This increased focus on policy impact and advocacy-related endeavours is reflected in SFI's focus on advocacy in their strategy 'Shaping Our Future 2025' [44], with a key goal to inform government policy, and in seeking "the establishment of a Research Advocacy Forum so that enterprise and philanthropic stakeholders and members of the public advocate for science, to drive increased national and international support for Irish research and innovation."

In Ireland at present, there are a number of examples of innovative policy advocacy related initiatives, including efforts by the Geary Institute for Public Policy at UCD, Maynooth University's All-Ireland Research Observatory (AIRO), and UCC's Department of Government and Politics, seeking to create connections with local and national political stakeholders and provoking discussion on international issues and global challenges.

Key funders in the Irish research ecosystem, including the IRC, SFI, HRB, EI and Teagasc, among others, can play a vital role in science advocacy and research processes in general through investments at both the institutional and individual research level. Initiatives connecting Irish research to the work of the Government include the recent IRC Oireachtas shadowing scheme, wherein researchers, whatever their career stage, can shadow TDs and Senators working in an area related to their research. Furthermore SFI have established a pilot initiative, the SFI Public Service Fellowship, offering researchers the chance to be temporarily seconded to Government Departments and related agencies, working as 'SFI Researcher in Residence' on specific projects. The RIA also supports governmental interactions between their members and Irish and Northern Irish elected politicians. Another potential avenue for researchers looking to develop stronger science advocacy focus could be through the HRB's Applying Research Into Policy and Practice Postdoctoral Fellowships scheme.

Another significant development of relevance to science advocacy efforts is that of the increased focus in Ireland and globally on 'open science', with Ireland having a National Open Research Forum (NORF), charged with the development of a national strategy for open research. With this drive

towards FAIR research outputs (Findable, Accessible, Interoperable and Reusable), one of the main aims of these endeavours is to make science more accessible and useful to policymakers.

The joint IRC-RIA roadmap also highlighted the important leadership role for the Irish Universities Association (IUA), Technological Higher Education Association (THEA), technological universities, and the Royal Irish Academy (RIA) in this context. These organisations, alongside academic support initiatives such as the IUA's Campus Engage and Knowledge Transfer Ireland (KTI), provide potential to support scientists in their knowledge transfer, brokerage and advocacy endeavours. This report also noted that existing mechanisms, such as "the Public Service Reform and Civil Service Renewal frameworks, the higher education System Performance Framework, and the national research and innovation strategy" could incentivise greater research-policy engagement.

5. International examples of science advocacy support

5.1 Europe

Scientists in Ireland rely heavily on European Union funding and therefore it is of benefit to first explore how scientists engage with policymakers and the policymaking process at an EU level. The European Commission's Scientific Advice Mechanism (SAM) brings together EC policymakers, a group of Chief Scientific Advisors and academic experts into the Science Advice for Policy by European Academies (SAPEA) initiative. One of the key partners of SAM, the SAPEA has developed a number of outputs of relevance to this white paper, in particular the recent Making Sense of Science for Policy under Conditions of Complexity and Uncertainty [20], which offered a number of relevant insights and approaches to bridging science and policy, utilised throughout this document.

The European Academies Science Advisory Council (EASAC), which brings together the National Academies of Science of the EU Member States, Norway, Switzerland and United Kingdom, collaborate to provide independent science advice to European policymakers. To this end, the EASAC released a guide to 'Good Practice in the Dialogue between Science Academies and Policy Communities' in 2012 [28]. Key messages from this document include an emphasis on the need for bidirectional discourse between policymakers and science advisors to improve the quality of policy decisions, and that the science advice is relevant, credible, legitimate and timely, with organisations contacting policymakers before a need arises. Activities of the EASAC include workshops to brief policymakers, short, timely statements on topical issues and clear summaries of reports for lay audiences. The EASAC is also an affiliated network of the InterAcademy Partnership (IAP). The IAP, with more than 140 national, regional and global member academies, works to support science for evidence-based solutions to global challenges, providing independent advice to national governments and inter-governmental organisations (e.g. United Nations).

Another key document in the development of this white paper, the European Commission's Joint Research Centre (JRC) recently published a Science for Policy Handbook, outlined a number of skills and practices for individual scientists, emphasising co-creation between scientists and policymakers as the centre point of Science for Policy 2.0 [10]. The work of the Geneva Science-

Policy Interface is a good example of this type of cocreation in action at an international level, supporting boundary spanning activities amongst science and policy stakeholders. Other relevant examples to consider relate to the role of science engagement organisations at the European level, such as ECSITE and EUSEA. These science engagement organisations, similar to scientific societies, place a focus on policymakers as an audience for their work and often advocate on behalf of members. A recent example of this is in how these organisations engaged with EU partners in how science engagement was framed within Horizon Europe.

5.2 United Kingdom

Ireland's closest neighbours, the United Kingdom, offer a number of interesting examples of efforts made to encourage scientists to engage with policymaking, in advocating for their science. At a governmental level, the principal knowledge brokering activities of the UK parliament are carried out by the Parliamentary Office of Science and Technology (POST)'s Knowledge Exchange Unit (KEU), with the goal to support the exchange of information and expertise between researchers and the UK Parliament. Working with higher education and beyond, they seek to facilitate and strengthen this exchange of knowledge in a variety of ways. Resources and support they offer include as a first point of contact for any researcher wishing to work with or find out more about UK Parliament. KEU also provide online resources and training for researchers and knowledge mobilisers on how and why to engage with UK parliament, and social media presence to communicate key opportunities and information around engaging with Parliament. They also work with a network of knowledge brokers or mobilisers in HEIs, such as university KE staff, impact officers, policy managers, or academic librarians, to distribute engagement opportunities and maximise their reach.

At university and research centre levels, there are a number of relevant and innovative initiatives currently underway in various guises, with the Policy Impact Unit at University College London (UCL), the Cambridge Centre for Science and Policy, Policy@Manchester and the Institute for Policy Research at the University of Bath, as four prime examples of efforts to connect academics and policymakers. UCL was recently awarded close to £4m by Research England to explore ways of improving academic-policy engagement, in partnership with other universities and governmental organisations. This project, called CAPE: Capabilities in Academic-Policy Engagement, looks to develop activities "to improve the quality of academic input into public policy, enabling universities to respond to emerging and pressing questions in an agile, targeted way." [36] Included in the outputs to date is a series of case studies and podcasts on strengthening academic-policy engagement, policy fellowships and workshops for academics and policy professionals, with plans to collaborate on events and publications with the Universities Policy Engagement Network (UPEN). Members of this initiative are also currently undertaking an independent evaluation of what works best in terms of specific mechanisms that can drive research-policy engagement. The National Co-Ordinating Centre for Public Engagement in the UK also offers guidance for researchers on engagement with policymakers, specifically via meetings with policymakers through written policy briefs[c], as well as providing information on policy audiences.

[c] For more information, visit: https://www.publicengagement.ac.uk/do-engagement/understanding-audiences/policy-makers

5.3 United States

In the US there are a large number of highly active and vocal science advocacy programmes. The American Association for the Advancement of Science (AAAS), who through a variety of activities, seek to leverage scientific evidence to engage policymakers and society. AAAS activities include taking and articulating positions on critical science-related issues in public statements and in news media, facilitating workshops, seminars, and events for scientists, policymakers, and the public to engage and communicate. The association also works with global partners to strengthen advocacy for evidence at an international level.

Another active player in this field, the National Science Policy Network (NSPN) is a non-profit organisation representing early-career science policy, advocacy, and diplomacy groups in the US, focused on "providing a platform for sharing resources, building relationships, and training the next generation of scientists and engineers to be pivotal voices in all levels of policy making."[45] Relevant activities and outputs of the NSPN include the SciPol Scholars in Residence programme and bootcamp, policy writing workshops and an annual policy memo competition, symposiums, and a crowd-sourced list of science policy conferences, resources, communities etc. Another highly active advocacy organisation in the US is the Union of Concerned Scientists. In their science advocacy toolkits, the UCS presented several paths through which scientists can influence local to federal government policy.

MIT also have a number of interesting and relevant programmes for their researchers, including MIT Academics for the Future of Science and the MIT Science Policy Initiative. Founded in 2007, this programme involves a group of postdoctoral researchers, graduate, and undergraduate students working with the MIT DC Office and other science policy advocates "to foster discourse between the scientists of tomorrow and policy-makers of today."[46] This is a student-run programme that organizes monthly discussion meetings around presentations and current events, four-day Science Boot Camps for students and postdocs, Executive and Congressional visit days, where students meet with agencies and Congressional representatives, and policy and advocacy workshops and panels.

These various organisations and initiatives provide some practical examples for how scientists can be supported to more effectively advocate for their science with policymakers in different contexts, examples that can be translated to the context under consideration in this white paper.

6. Recommendations for embedding science advocacy at CÚRAM

The overarching aim of this white paper is to explore the theme of science advocacy, how it is understood, approached, challenges and risks therein for individual scientists, and to learn from other research fields and contexts. These interdisciplinary insights provide potential to be adapted to fit science advocacy in the medical device research field in Ireland. Policymaking is a "complex and messy" process, [47] and as such requires attention from the individual to organisation level, to develop and embed science advocacy practices in research. This paper highlights a clear need for embedding science advocacy in research practices, the many reasons to engage in such activities, as well as the many pre-existing opportunities and practices that could be incorporated for more effective engagement with policymakers.

At the level of the individual scientist, engaging in science advocacy could be considered an added task for some, perhaps already overburdened, scientists. The risks and challenges outlined in this paper cannot be ignored, risks to perceived objectivity, public trust in science, and public profile. These risks emphasise the need for researchers to undertake science advocacy in a professional and responsible manner. Scientists must learn to communicate responsibly with policymakers, but also must be supported and encouraged to engage by their Research Centre and/or university. Training in science advocacy and engaged research is of paramount importance and a primary concern in embedding such practices. As such, resources are required for capacity building in areas related to science advocacy such as science communication for policymakers (e.g. how to write policy briefs or memos, understanding audience goals), education on the policymaking process (in Ireland and Europe), and on the purpose and impact potential of science advocacy, and in responsible advocacy. Scientists must also be supported and provided with time and resources to prepare and plan for advocacy activities early and often, particularly in building sustainable relationships with policy decision makers or influencers. It is worth noting that there is potential to apply an ecological approach to science advocacy, similar to that of planning for impact. Through a reflective ecological approach, engaged scientists could potentially plan, map and monitor engagement with policymaking, from the micro-level of their own day-to-day activities in the lab, to the macro-level influence on Government bodies, similar to the Planning for Impact toolkits of the PI Impact project at CÚRAM[d].

At an organisational level, Research Centres can offer a central support system to aid researchers undertaking science advocacy. Research Centres must first focus on training, to educate their research community on the various approaches and challenges of science advocacy, and support, but not lead, their researchers to move into this complex area. As outlined above, science advocacy could entail any number of aims for the scientists undertaking such activities, from simply raising awareness of the need to fund such research to influencing specific policy based on scientific evidence. Centres should focus first on educating early-career researchers in science advocacy practices and policymaking processes, as well as offering science communication training for engaging with policymakers. Beyond this, Research Centres can look to bridge the research to policy gap from the other side, by providing policy stakeholders with avenues and opportunities to engage with scientists on policy priorities, including through networking and brokering opportunities and policy fellowships.

[d] For more information on using these toolkits, visit: www.piimpact.com

Alongside this, Research Centres could seek to harness or channel the expertise and resources already available, from the identification of more experienced scientists to act as mentors or champions of science advocacy for ECRs, to the growing or perhaps already established reputation of the Centre in policy circles. Centres could become ports of calls for policymakers to connect with, to offer guidance and advice on policy issues. Centres could also encourage and utilise involvement in societies. As emphasised above, science societies have strong networks of experts who can weigh in on a specific scientific topic, perhaps have pre-existing relationships with policymakers and government agencies, and strong reputations within and beyond academic circles. Research Centres can also support and further embed science advocacy through simply highlighting, publicising and celebrating more the science advocacy efforts of individual scientists.

For Centres such as CÚRAM with established and productive education and public engagement (EPE) initiatives, outputs of these programmes (e.g. documentary films, teacher training toolkits) could be utilised by researchers as introductions or icebreakers for policymaker audiences. Other possible avenues for Research Centres to pursue in terms of supporting and embedding science advocacy include organising networking events, similar to the work of UPEN and CAPE in the UK, to bring policymakers and researchers together, and the development of evidence-based reports written specifically for policymaker audiences. Finally, Research Centres should seek to connect and collaborate more with other initiatives involved in science advocacy for policymaking, where there are common or overlapping interests, for example the work of Campus Engage and KTI and the support they could provide the research community, PPI Ignite, and other citizen science focused initiatives. Collaboration with other Research Centres could also strengthen efforts in this regard. The development of a Centre-level strategy for science advocacy, from which these different strands of support would emanate, would provide a solid foundation upon which a vibrant science advocacy pillar could emerge. Dedicated persons or teams that identify and/or set up science advocacy opportunities would also be of value to these efforts. Such resources would ensure these opportunities align with the Centre's strategic vision, and those of the wider research ecosystem, to align with and bolster current trends and movements towards more transparent, and therefore more equitable, research to policy pathways, thus maximising science advocacy activities' impact and reach.

Abbreviations & acronyms

AAAS – American Association for the Advancement of Science

ARI – Areas of Research Interest

CAPE – Capabilities in Academic-Policy Engagement

CSO – Civil Society Organisation

DFHERIS – Department of Further and Higher Education, Research, Innovation and Science

EASAC – European Academies Science Advisory Council

EC – European Commission

ECR – Early career researcher

ECSITE – European Network of Science Centres and Museums

EPE – Education and Public Engagement

ESEP – Engaging Scientists and Engineers in Policy Coalition

EU – European Union

EUSEA – European Science Engagement Association

FAIR – Findable, Accessible, Interoperable and Reusable

HRB – Health Research Board

IAP – InterAcademy Partnership

IRC – Irish Research Council

IUA – Irish Universities Association

HEI – Higher Education Institutions

JRC – Joint Research Centre

KE – Knowledge Exchange

KEU – Knowledge Exchange Unit

KTI – Knowledge Transfer Ireland

MIT – Massachusetts Institute of Technology

NCCPE – National Co-ordinating Centre for Public Engagement

NGO – Non-Governmental Organisation

NORF – National Open Research Forum

NSPN – National Science Policy Network

ODI – Overseas Development Institute

PI – Principal Investigator

PTRLI – Programme for Research in Third Level Institutions

RIA – Royal Irish Academy

RRI - Responsible Research and Innovation

SAM - Scientific Advice Mechanism

SAPEA - Science Advice for Policy by European Academies

SFI – Science Foundation Ireland

STEM – Science, Technology, Engineering and Mathematics

THEA – Technological Higher Education Association

UK – United Kingdom

UPEN – University Policy Engagement Network

Relevant links

Tools for engaging in science advocacy

EPA Bridge tools: https://www.epa.ie/publications/research/communicating-research/research-131-bridge-tools-for-science-policy-communication.php

Research and Policy in Development (RAPID) - Context, Evidence, Links Framework: https://odi.org/en/publications/tools-for-bridging-research-and-policy-the-rapid-context-evidence-links-framework/

NDI Policy Development and Policy Advocacy Course Materials: https://www.ndi.org/policy-development-and-advocacy-ar-en

EC Joint Research Centre - Science for Policy Handbook: https://ec.europa.eu/jrc/communities/en/community/evidence4policy/document/science-policy-handbook

SARA: An Introduction to Advocacy Training Guide: https://resource-centre-uploads.s3.amazonaws.com/uploads/1981.pdf

PI Impact – Planning for Impact Toolkits: http://www.piimpact.com/index.php/resources/professional-tools-and-resources/

Policy-facing research institutes and initiatives - Based in Ireland[e]

- All-Island Research Observatory (AIRO), Maynooth University:https://airo.maynoothuniversity.ie/
- Campus Engage: http://www.campusengage.ie/
- Department of Government and Politics, UCC: https://www.ucc.ie/en/government-and-politics/
- Geary Institute for Public Policy, UCD: https://www.ucd.ie/geary/
- HRB Postdoctoral Fellowship Applying Research Into Policy and Practice (ARPP): https://www.hrb.ie/funding/funding-schemes/all-funding-schemes/grant/hrb-postdoctoral-fellowships-applying-research-into-policy-and-practice-arpp-2020-next-call-exp/
- IRC Oireachtas Shadowing Scheme: http://research.ie/2018/07/11/researchers-to-shadow-oireachtas-members-under-new-irish-research-council-initiative/
- Knowledge Transfer Ireland: https://www.knowledgetransferireland.com/
- PPI Ignite: https://ppinetwork.ie
- RIA Oireachtas Science Pairing Scheme:https://www.ria.ie/oireachtas-science-pairing-scheme
- SFI Public Service Fellowships: https://www.sfi.ie/funding/funding-calls/public-service-fellowship/

List of Policy-facing research institutes and initiatives - Based outside Ireland

- Alliance for Useful Evidence: https://www.alliance4usefulevidence.org/
- American Society for Biochemistry and Molecular Biology: https://www.asbmb.org/asbmb-today/policy
- British Science Association – For Thought: https://www.britishscienceassociation.org/for-thought
- CAPE: Capabilities in Academic-Policy Engagement project: https://www.cape.ac.uk/
- CASE: Campaign for Science and Engineering: https://www.sciencecampaign.org.uk/about-us.html
- Centre for Science and Policy, University of Cambridge: http://www.csap.cam.ac.uk/
- Engaging Scientists & Engineers in Policy (ESEP) Coalition: https://www.science-engage.org
- European Academies Science Advisory Council (EASAC): https://easac.eu/
- Geneva Science-Policy Interface: https://gspi.ch
- International Network for Government Science Advice (INGSA): https://www.ingsa.org
- International Science Council: https://council.science
- Knowledge Exchange Unit, UK Parliament: https://www.parliament.uk/get-involved/research-impact-at-the-uk-parliament/knowledge-exchange-at-uk-parliament/
- National Science Policy Network: https://scipolnetwork.org/
- Overseas Development Institute: https://odi.org/en/
- Policy Impact Unit, University College London: https://www.ucl.ac.uk/steapp/collaborate/policy-impact-unit-1
- Policy@Manchester, University of Manchester: https://www.policy.manchester.ac.uk/
- Science Advice for Policy by European Academies (SAPEA): https://www.sapea.info/
- Science About Science: https://senseaboutscience.org/
- Scientific Advice Mechanism, European Commission: https://research-and-innovation.ec.europa.eu/strategy/support-policy-making/scientific-support-eu-policies/group-chief-scientific-advisors_en
- SKAPE Centre for Science, Knowledge and Policy, University of Edinburgh: http://www.skape.ed.ac.uk/
- The Conversation - https://theconversation.com/uk
- STEM Advocacy Institute: https://stemadvocacy.org/
- UK Parliamentary Office of Science and Technology (POST): https://post.parliament.uk/
- Union of Concerned Scientists: https://www.ucsusa.org
- Universities Policy Engagement Network (UPEN): https://www.upen.ac.uk/

[e] Adapted from [2]

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