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Models and practices for research-policy 'impact'

Key considerations for universities
in moving beyond research-policy boundaries.

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An Urban Futures
Enabling Capability Platform
Discussion Paper
from the Policy@RMIT project

Models and practices for research-policy 'impact': key considerations for universities in moving beyond research-policy boundaries

An Urban Futures ECP Discussion Paper from the Policy@RMIT project

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CONTENTS

Executive Summary	4
1. Introduction	6
Review questions.....	7
Structure of the paper.....	7
2. Approach	8
3. Key concepts: Conceptualising research-policy interfaces	9
Research, policy, and impact.....	9
Research-policy interfaces.....	10
Knowledge work at research-policy interfaces.....	4
4. Key challenges in enabling research to contribute to public policy	12
Policy contributions not impact.....	12
More research may not help.....	12
Problem framing: What (and whose) problem?.....	13
Research that works in one place may not work in another.....	14
What is the role of universities in informing policy?.....	14
'Measuring' research 'impacts' or contributions to policy.....	14
5. Key insights for effective work at research-policy interfaces	16
Saliency, credibility and legitimacy of research are essential.....	16
Reflexivity is key.....	17
Knowledge work is multi-dimensional.....	17
Knowledge work is relational.....	18
6. Conceptual typologies and models of institutional arrangements	20
7. Discussion	23
8. Conclusion	25
9. Glossary	26
10. References	28



EXECUTIVE SUMMARY

This Discussion Paper explores how universities might grapple with questions of achieving policy ‘impact’ by drawing on academic and grey literature. As major institutions with a role in generating new knowledge, universities are directing considerable attention and resources to enhancing the impact of their research. In the field of public policy, research can contribute in myriad ways, including but not limited to: identifying and framing issues; contributing to public debate; and evaluating policies, programs, and projects. Yet, research is rarely, if ever, the only (nor perhaps, most important) factor informing these processes. Moreover, policy research and practice have shifted from notions of ‘evidence-based policy’ to ‘evidence-informed policy’. For these reasons the work involved in enabling research to contribute to public policy should be considered more as a dialogue rather than a linear transfer of knowledge. Further, ideas about the role of universities in informing public policy remain varied, with practice advancing in the presence of limited evidence. While there is considerable attention on how to enable individual research projects and/or researchers to contribute to public policy, and multiple frameworks to assess their complexities and contributions, there is much less guidance on what kind of university based institutional arrangements – the governance, leadership, administrative processes, incentives, and cultural norms – work best. This is a significant issue because institutional arrangements greatly influence how universities and their researchers might engage with policy practitioners to inform policy processes.

This paper examines the following research impact policy questions:

1. What insights emerge from studies of work at research-policy interfaces?
2. What should universities consider when seeking to enhance the policy impact of the research they undertake?
3. What models of institutional arrangements can enhance the ‘impact’ of research on policy?

This review was challenging because of the diverse terms and conceptual framings used in the literature to describe:

- a) the work involved in the exchange of knowledge between universities and public policy entities, and
- b) the institutional arrangements through which this work is done.

Further, where projects and specific arrangements have been established, they are, overall, still largely considered experimental and there has been little evaluation of the research-policy interface landscape. Overall, discussion of the work involved in enabling research to contribute to public policy is characterised by significant ambiguity of key terms and concepts used to describe this work and the challenges of achieving impact in research-policy contexts.

Several conceptual models provide insight into different aspects of what university institutional arrangements need to consider if they are to effectively support a range of ‘knowledge work’. Shaxson et al (2012, 2) refer to such efforts as ‘K*’ and define these as the “functions and processes at the various interfaces between knowledge, practice, and policy”. Yet, while institutional arrangements are recognised as important influences on knowledge work at research-policy interfaces, there is little empirical evidence in the scientific literature about what kinds of institutional arrangements best support the diverse ways research can contribute to public policy. While studies of individual projects or efforts have been reported (e.g Cvitanovic et al. 2018), these provide limited insight into strategic level institutional arrangements that can support diverse impact approaches.

IMPLICATIONS FOR DECISION-MAKERS

While, there is little empirical evidence in the scientific literature about what kinds of institutional arrangements best support the diverse ways research can contribute to public policy, this review has identified a suite of issues that a university needs to consider in order to guide and support programs, projects and individual researchers as they understand and develop their approaches to achieving research impact:

- understanding the different types of research-policy relations;
- recognising the multiple design elements (objects, actors, relationships, networks, organisations) of knowledge work at research-policy interfaces, plus issues relating to how a project might use or address these elements to support knowledge exchange;
- the need to ensure the salience, credibility and legitimacy of the research is enhanced or maintained; and,
- ensuring nuanced assessments of research 'impact' and how such assessments contribute to an overall understanding of how to 'do' impactful research.

The paper concludes with a discussion of these issues as they relate to the establishment of institutional arrangements that support diverse knowledge work in different research-policy interface contexts.

INTENDED AUDIENCE/S

This Discussion Paper is intended for key decision-makers within the University and anyone with an interest in better enabling academic research to contribute to public policy.

INTRODUCTION

This section contextualises the policy impact agenda and issues around establishing institutional arrangements to support the policy ‘impact’ of research. It is guided by the overarching question of how universities should grapple with questions of achieving policy impact of their research.

Three key terms used throughout this Discussion Paper are introduced:

- * Research–policy interfaces
- * Institutional arrangements
- * Knowledge work

In many parts of the world, including Australia, significant attention is being directed to improving the ‘impact’ of research (Boaz, Fitzpatrick, and Shaw 2008; Greenhalgh et al. 2015). Impact agendas in the UK and Australia, for instance, reflect government and academic institutional moves to extend the ‘why’ of academic research beyond traditional contributions to knowledge (Harris and Jackson 2013) to focus research on broader societal outcomes. The Australian Research Council defines research impact as “the contribution that research makes to the economy, society, environment or culture, beyond the contribution to academic research” (ARC 2018). Put simply, the impact agenda is concerned with enhancing the contribution of research to positive societal benefits.

One specific context where this impact agenda plays out is at what are called science-policy (Van Enst, Driessen, and Runhaar 2014) or knowledge-policy interfaces (Ziervogel, Archer van Garderen, and Price 2016). Science-policy interfaces are used to describe the interface or nexus between the domains of science and policy. In what follows we refer to the broader term, ‘research-policy interfaces’ to describe relations between academic research and public policy, including the humanities and social sciences. At or within these research-policy interfaces, academic institutions and individual researchers are increasingly being called to enhance the impact of their research on public policy as government institutions push for more ‘evidenced-informed’ policy (DIISRTE, 2012). Yet, the relationships between research and public policy processes are complex, dynamic, and contested, such that the assumption that research can inform policy in any straightforward way is highly problematic. Nonetheless, it is possible for universities to enhance the contribution their research can make to public policy at various moments by informing problem framing and policy decision-making processes, monitoring implementation, undertaking evaluation, and contributing to public debates about the policy or its context.

Within this frame, this paper synthesizes research on how universities might facilitate knowledge work with organisations with an interest in public policy matters to inform the design of institutional arrangements to, in turn, support their research contributing to public policy. The term ‘knowledge work’ is used and discussed across different disciplines (see Megill 2012). We use it here to describe the work involved or “functions and processes at the various interfaces between knowledge, practice, and policy” (Shaxson et al. 2012). Knowledge work is more than just a linear transferal or a simple exchange of information. It involves complex social processes that are “characterised by multiple interactions among many entities co-creating dynamic, non-linear patterns of unpredictable behaviour governed by feedback loops that cause cascading changes throughout the (policy) system” (Lemay and Sá 2012, 479). By institutional arrangements, we mean “the governance, leadership, incentives and cultural set-up” (Leith et al. 2017, 133) within a university that enables staff to do knowledge work across different research (disciplines and organisational structures) and different policy problems.

REVIEW QUESTIONS

To explore how universities can grapple with questions of achieving policy impact through their research and by what means they can seek to do this, the Discussion Paper draws on a literature review focused on the following sub-questions:

1. What insights emerge from studies of work at research-policy interfaces?
2. What should universities consider when seeking to enhance the policy impact of the research they undertake?
3. What models of institutional arrangements can enhance the 'impact' of research on policy?

The review revealed there is a sizeable body of academic research, spread across numerous disciplines and focused on an array of policy problems, that advances frameworks and models to define knowledge work and the obstacles and enablers of this work. This includes research focused on questions of why, when, and how policymakers use academic research (e.g. Head et al. 2014; Newman, Cherney, and Head 2016; Taylor and Hurley 2016). However, research on the potential of academic institutions to establish effective 'transdisciplinary', 'interface' or 'boundary' organisations or programs (as such efforts are referred to across the literature) to work with policy organisations, remains in its infancy (Parker and Crona 2012; Harris and Jackson 2013; Sutherland et al. 2012). Some work has assessed arrangements applied within individual projects (e.g. Cvitanovic et al. 2018; Görg et al. 2016) but there is relatively little research on what form more systematic organisational or institutional arrangements should take. Consequently, rather than identifying model institutional or organisational arrangements, the discussion below synthesizes existing understandings of effective knowledge work at research-policy interfaces into a set of key considerations for universities seeking to engage in this area.

STRUCTURE OF THE PAPER

This Discussion Paper is structured as follows: Section Two briefly explains the review methodology; Section Three explains key concepts for conceptualising the field of research-policy impact, focusing on the notion of research policy interfaces; Section Four discusses what the literature identifies as key challenges involved in working at research-policy interfaces; Section Five discusses elements from the literature that have been identified as informing effective work at research-policy interfaces; Section Six explains two conceptual models that are viewed as being useful for helping to inform the development of structures for institutional arrangements; Section Seven draws together insights from the reviewed literature to provide a heuristic or set of questions that can be used to inform the establishment of a research-policy interface organisation; finally, Section Eight concludes by considering the broader implications for how universities can grapple with the complexities of achieving impact at the interfaces of research and policy, including suggested areas for further research and development.

APPROACH

This section explains how the paper was developed. The paper reviewed academic and grey literature on types, challenges, and the effectiveness of different approaches to enhancing knowledge work in research-policy interfaces, with an emphasis on institutional arrangements and key factors to consider.

The review informing this paper engaged with academic and grey literature concerned with analysing, evaluating, and reviewing different types of institutional arrangements involved in enabling work at research-policy interfaces. It explored conceptual and empirical literature from different branches of social science, particularly science and technology studies, science-policy relations, political science, policy studies, and impact science and extension. A variety of key word searches were performed in the online Scopus literature database, including combinations of key words such as 'science-policy', 'research', 'hub', 'interface', 'boundary organisation' and 'knowledge exchange'. Grey literature on specific known organisations working at the interfaces or boundaries of research and policy was also sought using the Google search engine with specific organisation names, such as UKCIP, EPOD, etc. Similarly, organisations or projects attempting to bridge knowledge-policy interfaces referred to in academic or grey literature were sought online, and relevant reports, analyses, and evaluations of those organisations were reviewed.

The resulting discussion and analysis focus on the insights that this literature and these examples provide into (a) the range of approaches employed by academic institutions to enable research impact, and (b) the effectiveness of these approaches, where they have been evaluated. Given the breadth of academic research across numerous disciplines on increasing societal value and impact (and critical discussions of this 'impact' agenda) and the experimental nature of much interface work mentioned above, this paper is not intended as a definitive and comprehensive review of the work underway or the institutional arrangements in use. Its contribution is, however, to begin the task of weaving through diverse understandings to provide a broader scale review and critique.

KEY CONCEPTS

A diverse range of terms are used in what we call knowledge work, whether that work is at the intersections of research and policy, research and practice, or other interfaces. This section emphasises that linear conceptions of the 'transfer' of knowledge from research into policy, or vice versa, are highly problematic.

Universities are engaging with the impact agenda and seeking to enhance the policy impact of their research. However, achieving this important goal is a complicated task because Universities first need to consider basic questions and assumptions about 'what is research', 'what is policy', and 'what is impact'? Understanding these concepts is required to better inform the work involved in achieving policy impacts of research. Here we briefly define the terms 'research', 'policy', and 'impact', before introducing the range of terms that characterise research-policy interfaces and the work involved in those interfaces.

RESEARCH, POLICY, AND IMPACT

There are a variety of ways the terms 'research', 'policy', and 'impact' are defined in the literature. This Discussion Paper draws on the following working definitions, noting that there is much debate about what these terms mean.

- **Research** is understood as the "creation of new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies, inventions and understandings. This could include synthesis and analysis of previous research to the extent that it is new and creative" (ARC 2018). In using this definition, we view 'science' as something narrower than research, and research as narrower than knowledge.
- **Policy** is understood as "the disposition and deliberate action of government on any and every matter over which it exercises authority. This includes the stated and unstated; action and inaction; the choice of ends and the choice of means" (Fenna 2004, 5). In using this definition, we are mindful that there is no single authoritative definition of public policy.
- **Impact** is understood as "the contribution that research makes to the economy, society, environment or culture, beyond the contribution to academic research" (ARC 2018). Put simply, the impact agenda is concerned with enhancing the contribution of research to positive societal benefits. It is increasingly recognised that what constitutes a 'contribution' of research to policy is defined and enacted differently in different contexts (Morton 2015). Nor does 'contribution' mean that the University necessarily delivers the end benefit arising from its impact activities.

RESEARCH-POLICY INTERFACES

The ways in which research and policy intersect are variously conceptualised. These intersections and responses have been described using numerous metaphors, from deficit discussions of 'knowledge-action gaps', to a science-policy 'nexus' or 'interface'. Van den Hove (2007, 815) proposed the science-policy interface be understood as "social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making". However, the use of the term 'science-policy interface' risks conceiving of science narrowly as STEM (science, technology, engineering and mathematics) research being 'transferred' in a linear fashion to policy in order to solve what is viewed as a 'technical' problem (or 'structured problem' in Hoppe's (2011) terminology). A broader more inclusive understanding is to refer to 'knowledge-policy interfaces'. This term acknowledges that there are diverse ways of knowing and interpreting worlds (Todd 2016; Ziervogel, Archer van Garderen, and Price 2016). However, here we use and are concerned with more limited research-policy interfaces, and the complexities and nuances of the work involved in enabling the 'impact' of research in policy (Coffey and O'Toole 2016).

Underlying the diverse terms used to describe interfaces are different framings of the proper relation between knowledge/research/science and policy. Boswell and Smith (2017) propose that these relations are generally conceptualised in four ways:

- (1) knowledge shaping policy;
- (2) politics shaping knowledge;
- (3) co-production; and
- (4) as distinct and autonomous spheres of science and policy.

These simple conceptualisations provide a useful heuristic for categorising the different relations between knowledge/research/science and policy and for considering how effective knowledge work within academic institutions at research-policy interfaces can be conducted.

Research-policy interface work has previously been informed by concepts of research and policy as two distinct spheres. Critiques of this view led Guston (2001) to propose the concept of 'boundary organisations' as an entity that induces stability at the boundary between science and policy. He suggests boundary organisations enable and facilitate the use of boundary objects, involve "the participation of actors from both sides of the boundary, as well as professionals who serve a mediating role" and "exist at the frontier of the two relatively different social worlds of politics and science" (Guston 2001, 401). In this view, boundary work, a term originally used by Gieryn (1995) to describe why and how the boundaries of 'science' and 'nonscience' are drawn, has been more recently used to describe work at the science-policy interface that demarcates and coordinates different sides of a boundary (Hoppe and Wesselink 2014, 74–75).

However, the idea that stabilising difference (Parker and Crona 2012) or converging two distinct communities (Newman, Cherney, and Head 2016) is what constitutes boundary work has come under critique for sometimes ignoring the politics of such work. For example, Leith et al (2014: 164), consider that "distributed forms of power and knowledge production blur the boundaries between traditional roles of science, policy and politics as well as between the public and private sphere". Further, Parker and Crona (2012), have suggested boundary work should be defined by instability rather than thinking of boundary organisations as involved in boundary management that bridges and stabilises difference. These insights have seen conceptualisations of research-policy interactions framed in terms of 'interfaces' (Van Enst, Driessen, and Runhaar 2014; Van Den Hove 2007) . This framing not only reflects shifts from dualistic and linear explanations of two (or more) distinct communities (ie. research and policy), but also emphasises the relational, social, and political complexities of the interfaces between research, policy and practice. In what follows, we refer to research-policy interfaces in the plural to acknowledge that there are multiple spheres and multiple interactions that define research and policy.

KNOWLEDGE WORK AT RESEARCH-POLICY INTERFACES

There are also numerous terms used to describe what happens at research-policy interfaces. Knowledge transfer, knowledge management and knowledge mobilisation (see Shaxson et al. 2012, emphasis added), and boundary spanning, co-production, and transdisciplinary research are some of these terms. More broadly, language has shifted from transferring knowledge from research into policy domains, to talk of knowledge exchange that emphasises the insights policymakers and other actors and diverse social, cultural and political contexts bring to the making (or not) of evidence-informed policy. More recently, there is an emerging sense that this conception is still too linear and transactional.

One way of expressing this emerging idea is Shaxson et al's (2012, 2) concept of 'K*'; a "collective term for the set of functions and processes at the various interfaces between knowledge, practice, and policy" where these functions and processes are understood to improve "the ways in which knowledge is shared and applied; improving processes already in place to bring about more effective and sustainable change". Building on the work of Fisher (2012), Shaxson et al (2012) describe these functions and processes as a spectrum of activities called the K* spectrum. This positions different types of knowledge exchange on a spectrum ranging from linear dissemination of knowledge through to the work of knowledge brokers and then innovation brokers whose work is defined by co-production. They argue that terms such as knowledge brokering, translating, exchange, and mobilisation "are all used extensively but the different terminology has hidden the fact that the actual functions they describe are all systematically related to each other" (Shaxson et al 2012, 2). This spectrum, along with reviews of knowledge exchange programs such as UKCIP (UKCIP and Cooper 2016), emphasise the diverse activities involved in work at research-policy interfaces. Therefore, we draw on Shaxson et al's concept of K* but, as introduced above, use the clearer term "knowledge work" to encapsulate these diverse activities. Importantly for this paper is Shaxson et al's (2012) emphasis that effective knowledge work is about more than the efforts of individual people and projects, which broadens the focus to also consider how institutional arrangements shape that work.

KEY CHALLENGES IN ENABLING RESEARCH TO CONTRIBUTE TO PUBLIC POLICY

This section summarises significant challenges in working at research-policy interfaces and thereby, efforts in enabling research to contribute to public policy. Appreciating these challenges is critical for the design of any institutional arrangements.

Based on an understanding of the importance of knowledge work at research-policy interfaces, this section identifies key challenges in negotiating this terrain. It describes: the importance of focusing on research 'contributions' to policy rather than 'impact'; how more research may not be what is needed for particular problems; the importance of recognising the influence of problem framing; and the challenges associated with evaluating research 'impact' on policy.

POLICY CONTRIBUTIONS NOT IMPACT

Direct and indirect impacts of research on policy can be difficult to track, may take different forms, and may be influenced by temporal, cultural, and political factors (Harris and Jackson 2013). Further Morton (2015, 405) argues that "The ways in which research is taken up, used, and reused in policy and practice settings means that linking research processes or outputs to wider changes is difficult, and timescales are hard to predict". Such insights are shifting emphases from ideas of research 'impact' to a more nuanced appreciation that research is only one factor that contributes to public policy and its processes.

Appreciating that research contributes to public policy and its processes, rather than 'impacts' it, widens the scope for considering research 'impact', including the contributions of research to public debates. This is particularly crucial for blue-sky, exploratory research that may not immediately identify any particular 'impact pathway'. As McNie et al (2016, 886) argue, "directing research toward practical ends has always been part of our scientific enterprise but doing so does not drive out fundamental and novel discoveries". Failing to heed such warnings runs the risk that university research becomes reactive and fixated on working 'in the system' rather than working 'on the system'.

MORE RESEARCH MAY NOT HELP

Another challenge facing the agenda for research to contribute to policy is that more research may not necessarily help in resolving or responding to a policy problem (Sarewitz 2004; Harris and Jackson 2013; Lucas et al. 2015). Put simply, many policy challenges involve ethical and political judgements, and such situations may be better dealt with using democratic rather than technocratic processes. Moreover, for many policy issues, research can inform on alternative means to achieve contending ends, but it cannot make the choice between them (Bosomworth 2018). These points highlight issues surrounding the potential politicisation or misuse of evidence. As Shaxson (2013, para. 4) and others have cautioned:

"the choice of which evidence to use in policymaking is exactly that – a choice. Among the

many different types of evidence to choose from, our individual values and beliefs condition what we accept as evidence in the first place, not just which evidence is the most rigorous”.

It might be added, the recognition that policy making is a political process means that research organisations need to be mindful that what is counted as evidence may vary depending on the policy or political context (Marston and Watts 2003). This in turn poses problems for researchers seeking to have impact in a given policy setting; their research may not be of interest or palatable to the policy or political sphere even where it has the potential to illuminate a policy issue, due to differing rationalities at play.

PROBLEM FRAMING: WHAT (AND WHOSE) PROBLEM?

Determining “what counts” (Bosomworth, 2015) links to problem framing, and the ways in which problem framing directs attention to or defines what is included, excluded or just not considered in problem framing and policy making processes. A range of work informed by social constructionist inquiry has raised questions about how problems are framed, where framing “is a way of selecting, organising, interpreting and making sense of a complex reality to provide goal posts for knowing, analysing, persuading and acting” (Rein and Schon 1993, 146). For example, different academic disciplines are informed by different ontological and epistemological dispositions. This means that researchers from different disciplines (and sometimes within disciplines) may have fundamentally different ways of thinking about problems, how they may be understood and how they might be resolved. Equally, different government departments and different individual policy practitioners have fundamentally different ways of thinking about problems.

Understanding problem framing emphasises that no problem situation is the same for all stakeholders and has implications for decisions around what information or research ‘counts’ in informing approaches to policy problems. This crucially highlights that problem framing has important consequences for the ways issues are understood and subsequently addressed (Coffey and Marston 2013; Bacchi 2009; Fischer, 2003; Hajer 1995), including choices around what disciplinary and individual research might be useful (Bosomworth 2015). For instance, mainstream problem solving focusses on the logical steps involved, including: identifying the problem, assessing the impacts, identifying and assessing possible solutions, choosing the best solution, and implementing it (Howlett and Ramesh 1995). This linear approach to problem solving features prominently in technical disciplines such as engineering, mathematics, and chemistry, as well as some areas of social science, notably economics and traditional urban planning. As discussed above, while such an approach may work well in certain circumstances, in others it may inflame situations (Sarewitz 2004).

One way of understanding the implications of problem framing for research contributions to policy is Hoppe’s (2011) suggestion that problems are variously ‘structured’ by the degree of agreement around available knowledge (means) and norms and values (ends). The more that we understand an issue and agree on its drivers and implications, the more structured it is (e.g. smoking impacts on health). The less we understand and agree on an issue’s drivers and implications the more ‘unstructured’ it is (e.g. climate change).

Understanding how a problem is structured highlights how research plays very different roles in differently ‘structured’ problems. For instance, technical information is unlikely to help address disagreements around the values we should seek to encourage in response to climate change. However, technical information is going to be highly useful in understanding aspects of how different medicines might address different health issues. Leith et al. (2014, 164) provide a useful framework that summarises divergent problem forms and responses into a typology of problem structures and appropriate processes, roles and forms of knowledge. Here, different types of problems - well structured, moderately structured, poorly structured and unstructured - lend themselves to different kinds of policy processes - linear, negotiation, compromise and learning - and different forms of knowledge - data, contextualised information, conceptual knowledge, and options and perspectives. Problem structuring also provides a way to highlight situations where proposed solutions

may preference one 'stakeholder's' framing of the problem over another.¹

Appreciating that there are diverse understandings of the nature of the world, the nature of knowledge and, subsequently, the nature of policy problems, also underscores the importance of attending to questions of power and difference in exploring policy problems. For instance, what happens when Indigenous knowledge and worldviews are incorporated into policy problems and framings of the research-policy interface? How do different models of knowledge work assist when power is seen as a diffuse element of the policymaking process (Béland 2009), as opposed to another criteria or design element to consider? For instance, Indigenous scholars have long called for “a decolonial approach - to research and practice - that incorporates and acknowledges the critical scholarship of Indigenous thinkers whose work and labour informs many current trends in Euro-Western scholarship, activism and socio-political discourse” (Todd 2016, sec. abstract). Put simply, great care, and considerable reflexivity, must be exercised in characterising problems; that is, attention to who is included or able to 'do' problem framing. As such, ideas about 'appropriate responses' and thereby, who frames or defines what type of research may be relevant, are crucial considerations for the 'impact' agenda. This means that researchers must be attentive to the power relations at play in their dealings with the policy sphere. It also means that the types of interventions may need to vary to the context, but also that the potential for research to inform decision making will depend on how the problem is structured and by whom.

RESEARCH THAT WORKS IN ONE PLACE MAY NOT WORK IN ANOTHER

A related issue is that both research and policy problems are typically context specific. Research is often conceived of as generating generalisable, or transferable, knowledge. However, this may not be straight forward in relation to policy issues because every policy issue is effectively unique, each case is influenced by particular circumstances, and what has happened or worked before, may not work here or now. For example, Schot et al. (2017) emphasise the importance of experimentation in driving policy change, but caution against merely scaling up knowledge emerging from such experiments. Their review of different knowledge work projects found that the projects “do not conform to a neat progression from experiments to scaling up. Rather they offer a continuum of experimental policy engagements contributing to different forms of learning at different stages” (Schot et al. 2017, 11).

WHAT IS THE ROLE OF UNIVERSITIES IN INFORMING POLICY?

A specific challenge for universities seeking to support research contributions to policy relates to the role of academic institutions in informing policy and driving innovation. These challenges need to be considered within broader debates about the purposes of universities within society (Collini 2012). In the context of knowledge work at research-policy interfaces, these challenges also need to be considered within the context of debates about the role of the state in driving innovation. In contrast to mainstream economic theory which assumes innovation emerges from the private sector, Mazzucato (2011) argues the state has a critical role in driving innovation. Her research demonstrates that “The public sector has indeed performed an important role in undertaking the most risky research, even when that research was not

¹ A good example of this is provided by the Abel Tasman 'super trawler' case where regulatory scientists viewed the issue in a way that was consistent with a structured problem, whereas external stakeholders viewed it very differently which ultimately undermined the 'super trawler's' social licence to operate (Haward et al. 2013).

'basic'" (Mazzucato 2011, 21). This view has challenging implications for universities in terms of engaging with the state around innovation. For example, there is a risk that universities lose sight of their role in generating new 'basic' knowledge because they become too focussed on demonstrating short term impact.

Further, it has been questioned whether universities are the obvious or best sites from which to establish research-policy interfaces. Parker and Crona (2012, 263) for example, caution that academic research institutions can "differ significantly from the ideal environment assumed by boundary organization theory". They therefore propose the role of knowledge work within academic research settings to be that of a dynamic and hybrid organisation that is required to continually negotiate the demands and tensions of research-policy interfaces. In their view, what they refer to as "boundary management" and what we have been calling knowledge work, in a university setting is a "an active [and] dynamic ... process of coordinating relations among stakeholders while simultaneously adjusting the social composition, structure and research focus of the organization" (Parker and Crona 2012, 281). More practically, the nature and size of universities may limit their capacity to effectively inform policy debate: for example, universities may be slow and cumbersome in their capacity to provide advice to government on matters of urgency, compared to advice from within public sector or private sector providers.

This means universities, individually and collectively, need to consider what kind(s) of organisations(s) they are (what is the role of universities in society) and how might they enact such roles? What are the strengths and weaknesses associated with such roles (e.g. loss of academic freedom, co-option, partisanship) and how might they be managed (e.g. clear principles for engagement, adoption of strategies which avoid putting all eggs in one basket)? This also suggests that institutional arrangements at a university need to support a range of approaches to working at different knowledge-policy interfaces across multiple policy spheres. More specifically, different forms of research-policy interfaces are needed to support different types of arrangements and functions at different levels and in different areas of the university.

MEASURING RESEARCH IMPACTS or CONTRIBUTIONS TO POLICY

Finally, there is also significant discussion about the challenge of measuring societal and policy 'impacts' of academic research (e.g. Boaz, Fitzpatrick, and Shaw 2008; Bornmann 2012, 2013, 2017; Hansson and Polk 2018; Schot et al. 2017). These discussions range from studies that point out the problems and challenges of the idea and implications of research 'impact' (e.g. Bayley and Phipps 2017; Bornmann 2017; Morton 2015) to studies that propose different approaches to assessing impact. For example, Schot et al (2017) argue for an 'Innovation Histories' method to evaluate science and policy work. They propose asking a set of questions in relation to several elements of boundary work and/or policy, including considering the work's/policy's directionality, societal goals, system-level impacts, the extent to which it is reflexive, the extent to which it managed conflict, and consensus and its inclusiveness.

Given the challenges of knowledge work at research-policy interfaces, efforts to monitor and measure the contributions of research to public policy need to be considered within wider understandings that:

- 'research' is understood and used by different actors in different ways at knowledge-policy interfaces (Patton, 2008; Hurley et al. 2016);
- research use in public policy is a complex social process in which there are/may be diverse framings of policy problems and contexts;
- there are also potentially diverse conceptualisations of change and transformation (Schot et al. 2017); and,
- research is only one contribution to public policy.

As such, institutional arrangements that seek to enable or incorporate monitoring and evaluation of knowledge work should be informed by sophisticated and reflexive understanding of these challenges in context.

KEY INSIGHTS FOR EFFECTIVE WORK AT RESEARCH-POLICY INTERFACES

This section outlines insights about what is needed to enable effective knowledge work at research-policy interfaces, and what strategic institutional arrangements will be needed to support such work.

While there are many best practice guides to enhancing the impact of individual research projects, these often fail to consider the broader context within which they operate. In this section we outline four key characteristics which, based upon the literature reviewed, offer potential for enabling more effective work at the types of research-policy interfaces that are the focus of this paper. In broad terms the characteristics that enable effective work at research-policy interfaces include that research is:

- Salient, credible and legitimate
- Reflexive
- Multi-dimensional
- Relational

The following sections discuss these characteristics in turn.

SALIENCE, CREDIBILITY AND LEGITIMACY OF RESEARCH ARE ESSENTIAL

Cash et al (2003) suggest that salience, credibility and legitimacy influence whether or not research is likely to influence policy processes. They (2003, 8086) define salience, credibility, and legitimacy as:

- Salience “deals with the relevance of the assessment to the needs of decision makers”.
- Credibility “involves the scientific adequacy of the technical evidence and arguments”.
- Legitimacy “reflects the perception that the production of information and technology has been respectful of stakeholders’ divergent values and beliefs, unbiased in its conduct, and fair in its treatment of opposing views and interests”.

Cash et al (2003) also suggest various kinds of knowledge work are required to enable these characteristics (Figure 1).

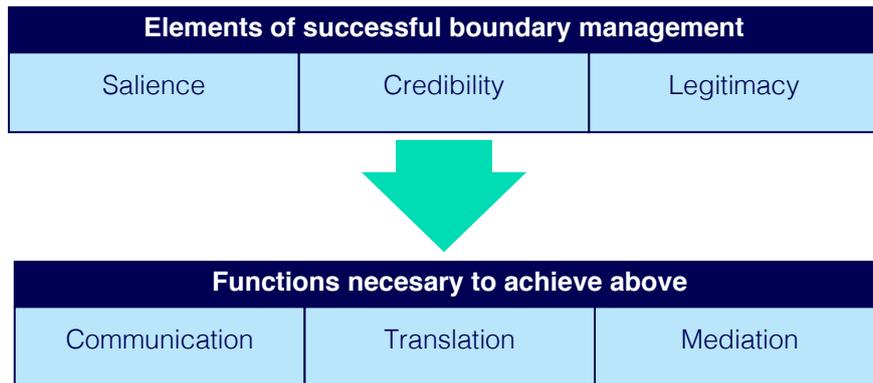


Figure 1. Boundary management framework and functions, adapted from Cash et al (2003).

This conceptualisation implies that research not only needs to be credible, such as by being produced by reputable scholars or being peer-reviewed, but it also needs to be relevant to the particular policy context and viewed as legitimate by policymakers.

REFLEXIVITY

While Cash et al's (2003) model remains influential in discussions of knowledge work (Cook et al. 2013; Witter et al. 2017; Harris and Jackson 2013), it appears premised on an assumption of the boundaries between research and policy being stable and readily identifiable. As discussed above, this assumption contrasts with ideas about instability and tension as defining of research-policy interface work (Parker and Crona 2012). Consideration of these differing views underscores the need for reflexivity in mediating boundaries between research and policy. Just as McNie et al (2016) suggest that the boundary between science and society needs to be managed to ensure that research responds to the needs of users while assuring the credibility of science, so too do boundaries between research and public policy need to be managed. Reflexive knowledge work at research-policy interfaces is required to avoid politicisation of science, whereby science is used for partisan ends, and the scientization of politics, whereby questions of value are treated as technical issues (Hoppe 1999; Weingart 1999; Vos and Everson 2009). This is important because, as highlighted earlier, how a problem is framed and thereby the approach to analysis selected "always involves choices to include some things and exclude others, and to view the world in a particular way when other visions are possible" (Stone 2002, 378).

KNOWLEDGE WORK IS MULTI-DIMENSIONAL

The challenges described in Section 4 demonstrate that knowledge work at research-policy interfaces is multi-dimensional. Usefully, Leith et al (2017, 132–33), provide broad categories for these dimensions. In so doing, they provide components that any research effort aimed at contributing to public policy processes will need to consider to be effective. These design elements are objects, actors, relationships, networks and organisations (Box 1).

- **Objects** – the things such as reports, maps, graphs and tools that can be used in many different ways, but principally to open up or close down discussion, dialogue and debate (and thereby frame problems and policy options)
- **Actors** – the human and social skills and capabilities of individuals that can foster or undermine coordination, and through which negotiation and demarcation of roles, responsibilities and authority are practised;
- **Relationships** – the strength of linkages, trust and reciprocity among individuals, within teams and beyond them that allow for divergent perspectives to be included;
- **Networks** – the characteristics of the network of individuals, organisations and institutions (rules and norms) involved in the governance of problems;
- **Organisation** – the governance, leadership, incentives and cultural set-up within organisations that allow their staff to do boundary work.”

Box 1. Design elements/processes for embedding knowledge in science-policy governance settings, from Leith and colleagues (2017, 132–33).

Leith et al (2017) emphasise the significance of the structures and relations between objects, actors, networks and organisations within every organisation and every project that is working at an interface of research and policy. Their work highlights that care needs to be taken not to place undue attention solely on science communication or individuals, as effective research-policy interfaces require that all the design elements and their interrelationships be supported. Researchers themselves might also consider these elements in any ‘impact planning’ they may undertake.

KNOWLEDGE WORK IS RELATIONAL

A growing body of empirical studies continue to critique much of the ‘research impact’ rhetoric for over-simplifying and inadequately appreciating the complex, dynamic and relational nature of knowledge exchanges between research and society generally, and between research and public policy specifically (Hoppe, 1999; Fischer, 2003; Sarewitz 2004; McNie 2007; Hoppe 2011; Lemay and Sa 2012; Leith et al. 2017). As Lemay and Sa argue (2012, 479), research use is a process “characterised by multiple interactions among many entities co-creating dynamic, non-linear patterns of unpredictable behaviour governed by feedback loops that cause cascading changes throughout the (policy) system”.

Empirical studies that investigate co-production and collaboration between policy and research reveal the relational and potentially long-term nature of this complex work. For instance, Dunn et al.’s (2018) study of urban water management in Melbourne, Australia, reiterated the social nature of research-policy interfaces in which key actors involved in relationships built over time were central to the co-production of knowledge and policy. Meanwhile, Cvitanovic et al.’s (2018) review of the Baltic Eye Project emphasised the importance of the co-location of scientists, policy analysts, science communicators and journalists. Trust and giving relationships time to develop are central to this exchange. As McNie et al. (2016, 889) argue, “people are more willing to share useful information, listen and absorb knowledge, when the relationship is grounded in trust”. Trust is not an automatic phenomenon, however; it requires time to develop (Lacey et al., 2018), a factor that is sometimes overlooked in favour of instrumental actions. These and other studies therefore emphasise the “near vital” role of supporting productive and collaborative interactions and engagements between researchers and users (Spaapen and van Drooge 2011, 214). In particular, institutional arrangements need to be sufficiently nuanced and patient to allow time

and space for this potentially slow and complex trust-relational work.

In addition to trust, the literature regarding evidence-informed policy and associated work at knowledge-policy interfaces frequently reiterates the importance of leadership in its broadest sense (Dunn, Bos, and Brown 2018; Davison 2015; Cvitanovic et al.. 2018). For example, evaluations of the ARCC network (UKCIP and Cooper 2016), The New Zealand Policy project (Davison 2015), and like academic work (Dunn, Bos, and Brown 2018; Leith et al.. 2016) have emphasised the role of committed individuals to communicating, convening, and collaborating at the interface. Still, as Leith et al. (2017) identify, there are multiple factors required for effective knowledge work beyond just individual actors or 'leaders'.

Fundamentally, knowledge work is relational in the sense that the use of research and the work involved in establishing and maintaining relationships between diverse actors are "complex and convoluted" social processes (Lemay and Sá 2014, 79). Appreciating this complexity requires "flexible and adaptive approaches that acknowledge the limitations of predicting, planning and controlling the research use process and outcomes, and embrace unexpected outcomes" (Lemay and Sa, 2012, 481). Recognition that developing trustful relationships as a critical enabler of research contributions to public policy has implications for researcher capacity (e.g. time needed and allocated towards building and maintaining relationships wistakeholders) and capability development (e.g. networking skills, managing relationships).

CONCEPTUAL TYPOLOGIES AND MODELS OF INSTITUTIONAL ARRANGEMENTS

Institutional arrangements to support research contributions to policy can take many forms. This section outlines two conceptual models that may help inform the consideration of which types of arrangements might be useful.

As the discussion above suggests, academic research continues to conceptualise what effective knowledge work involves, highlighting its collaborative, co-productive nature. These insights have, in turn, led to numerous terms to describe the organisational structures (and tools) aimed at enabling and/or facilitating knowledge work. These include: boundary organisations, laboratories, and research programs (Harris and Jackson 2013); working groups (Young et al. 2014; Akhtar-Schuster et al. 2016); formal and informal networks (UKCIP and Cooper 2016; Crona and Parker 2011; Lightowler and Knight 2013; Görg et al. 2016); synthesis centres (Lynch et al. 2015); transformation labs (McGann, Blomkamp, and Lewis 2018; Schöpke et al. 2018); and research centres such as the Harvard Kennedy School's Evidence for Policy Design (2018) or the Decision Center for a Desert City (Crona and Parker 2011; Parker and Crona 2012). These terms reflect different forms of arrangements emerging from work at knowledge-policy interfaces at different levels of societal governance and respond to diverse societal and policy problems.

Despite this array of experimentation and nomenclature, the present review found very few models to guide the establishment of institutional arrangements that could support knowledge work across different research disciplines and different policy problems. Most of the literature reviewed provides insights into the barriers and facilitators of work at interfaces between research (or knowledge more broadly) and policy, rather than evaluating the deliberate effectiveness of governance or institutional arrangements to support such work. Few studies focused on how to establish these arrangements (for exceptions, see Görg et al. 2016; Cvitanovic et al. 2018).

The review identified two conceptual models that may help inform the design of research-policy interface structures. They are outlined below. Robert Hoppe (2005) presents a typology of boundary arrangements of research-policy interfaces, which draws on science and technology studies' focus on the production of knowledge. He presents these arrangements (Figure 2) in terms of different conceptions of relationships between knowledge and policy. Hoppe's typology positions these arrangements using two criteria: "[their] position on whether or not science and politics ultimately serve the same purpose (convergence/divergence)" and their preference for the primacy of policy or science (Hoppe and Wesselink 2014, 76). As such, this typology positions 'enlightenment model' arrangements as premised on the idea of scientific authority and of science as separate to politics in contrast to consulting and technocratic models where this work and policy are seen to serve the same purpose and where political authority is seen as primary.

A further conceptual framework developed by Hoppe et al (2013; 2014, 75) positions boundary arrangements as work that happens at multiple levels of society: "at [the] micro level in policy advice and implementation projects, at [the] meso level in policy networks, and at [the] macro level in the political-cultural sphere". Hoppe and Wesselink (2014) note that these models are not static. Moreover, that in practice, divergences between values and practice are always at play, such

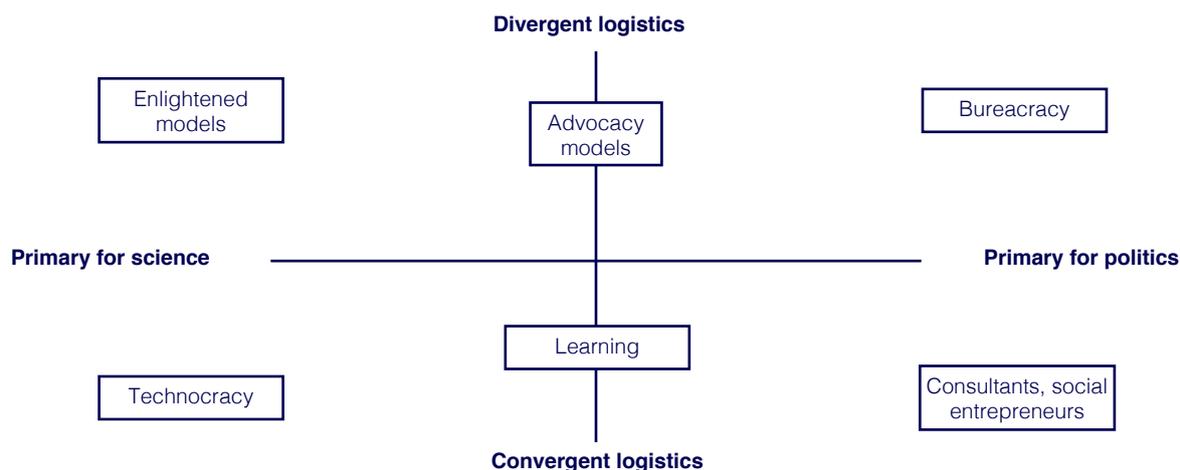


Figure 2. Adapted from Hoppe's (2005) Typology of boundary arrangements for research-policy interfaces

that how a “particular knowledge institute [functions] may well be the consequence of the frictions, chafing and clashes between different models” (Hoppe 2005: 212). These two models, like Boswell and Smith's (2017) four conceptualisations of research-policy relations introduced above – 1) knowledge shaping policy; (2) politics shaping knowledge; (3) co-production; and (4) as distinct and autonomous spheres of science and policy – are useful in encouraging reflexivity about the understandings, or ontological presuppositions, that may be framing the aspirations and/or practices of research-policy interfaces and knowledge work within an institution.

Another conceptual model comes from Görg et al.'s (2016) review of two idealised (and opposing) governance models: 1) an informal Network model made up of individual members and premised on existing capacities and self-organisation; and 2) a formal Platform model built on institutional membership, institutional commitment and clear roles and responsibilities. These models are based on a detailed analysis of the process involved in establishing what they refer to as a science-policy interface (SPI) focused on biodiversity challenges in Europe. Table 1 summarises the potential governance structure of these two idealised models and Görg et al.'s suggested model.

Table 1. Gorg et al.'s (2016) idealised governance models for a boundary organisation/SPI

Informal network model (idealised)	Formal platform model (idealised)
Membership is made up of individuals	Membership is made up of institutions
Members vote representatives onto the Knowledge Coordination Body (KCB) – May establish working groups	A steering committee – responsible for strategic decisions and is supported by a secretariat.
Secretariat exists	The Knowledge Coordination Body (KCB) focuses on deciding “which requests the NoK [Network of Knowledge] could handle and on organizing the procedures required for the knowledge synthesis-function” (Görg et al.. 2016, 1246).
Formative External Evaluation Body	
Policy Coordination Body where “policy gets organized” (Görg et al. 2016, 1244)	A valuation body comprised of internal and external reviewers to support operations and process change.
Gorg et al. Proposed model	
Membership is made up of individual experts. Institutions & Networks may nominate experts to the Knowledge Coordination Body (KCB)	
Secretariat – separate to KCB, “entry point for all communications, coordination and [administrative] support” (Görg et al. 2016, 1248)	
Advisory Board – additional experts that can act as ambassadors and provide strategic advice to the SPI	
Formative External Evaluation Body	

Görg et al. (2016, 1244) suggest the benefits of the Network model are that it is inexpensive, complements existing structures and is “light on bureaucracy and institutionalization, easy to engage with, while avoiding corruption, lobbying, power imbalances or influence of vested interests”. Alternatively, they argue the Platform model is based on institutional membership to reduce the SPI’s dependence on outside funding. The authors note that this Platform model poses potential threats to openness, the organisation’s independence and is at risk in terms of vested interests (Görg et al. 2016). They argue that their proposed model (Table 1) is open and inclusive, has limited internal bodies, maintains independence from vested interests and allows diverse funding contributions (2016, 1247-8).

DISCUSSION

This Section discusses the overall findings in relation to knowledge work at research-policy interfaces and identifies seven key considerations for establishing institutional arrangements to support this work.

This review has summarised a complex, diverse, rapidly emerging yet still underdeveloped field of research on research impact and work at research-policy interfaces to support more evidence-informed policy. The review has highlighted the ambiguity of key terms and concepts used to describe this work and the challenges of achieving impact in research-policy contexts. These challenges include different ways of framing or understanding problems, that more research may not be what is needed to resolve a policy problem, and complexities associated with the politicisation of research. A further challenge is that this field of academic practice is in its infancy; characterised by experimentation and evaluations of these experiments. Where established institutions do exist, their efforts to inform policy have not been widely discussed in the academic literature. Despite these uncertainties, this review did find agreements on elements of effective knowledge work at research-policy interfaces. These include the importance of:

- achieving and maintaining salience, credibility and legitimacy;
- experimentation, reflexivity and opportunities for blue-sky research and practice;
- relationships and leaders; and,
- structural arrangements that commit to supporting diverse knowledge work in all its complexity and experimentation.

The literature primarily provides insights into the barriers and facilitators of such work, rather than the effectiveness of institutional arrangements to support such work. In part due to the experimentation that characterises knowledge work at the interfaces of research and policy, few studies focused on how to establish these arrangements. This is a clear knowledge gap. Yet the literature emphasises that problem and institutional contexts are vital to knowledge work (Spaapen and van Drooge 2011; Shaxson et al. 2012, 19). Hoppe and Wesselink (2014, 76) suggest, 'successful' organisational arrangements at knowledge-policy interfaces "are those that have adjusted to their context of policy networks and political-cultural spheres". Further, they observe that research-policy interface organisations or projects "may, but not necessarily do, influence their context" (Hoppe and Wesselink 2014, 76, emphasis added).

Despite the array of literature discussing the 'impacts' (or preferably, contributions) of research on policy, this review found that while there are emerging conceptual models and a range of experimental types and forms of research-policy interfaces, there is a major gap in monitoring and evaluating of such initiatives, particularly across multiple organisations and projects, including comparative assessments. Where such evaluations exist, they can be difficult to find, often published as reports by specific initiatives or institutions (e.g. UKCIP and Cooper 2016; Vogel and Punton 2018; Schot et al. 2017) or are dispersed through case study analysis. Posner and Cvitanovic (2019, 144) note that "given the complexity in science-policy processes, it makes sense that the field of [sic] has been slow to move beyond context-dependent case studies that are undertaken after a project is complete." They argue that future research could test multiple methods of analysis and attempt to develop a set of standardised indicators by testing evaluation across multiple research-policy projects.

The present review found very little empirical data examining the establishment and operation of research-policy interface arrangements across the range of institutions undertaking such work. Accordingly, there is much scope for evaluation of

the organisational elements described by Leith et al. (2017) – “the governance, leadership, incentives and cultural set-up within organisations that allow their staff to do boundary work” – across multiple organisations and projects.

This review therefore leaves open the question of how a university might establish institutional arrangements to support different kinds of research to inform policy and policy problems. To evaluate and suggest pathways forward for an ‘ideal’ institutional arrangement requires further empirical and conceptual research. However, such work needs to consider that, as this review found, the literature does not identify a necessarily right way to do knowledge work, nor therefore, to establish institutional arrangements to support this work. We suggest, therefore, a set of questions that individual research projects, programs and review processes need to consider in relation to research-policy engagement programs:

- What is the targeted problem and problem structure the interface organisation/project seeks to respond to – structured, moderately structured, well structured or unstructured (see Hoppe 2011)?
- What is the research-policy relation the organisation/project seeks to achieve – knowledge shaping policy, politics shaping knowledge, co-production or autonomous spheres (see Boswell and Smith 2017)?
- What is the function of the centre, program or project? – Synthesis, research, networking (see Görg et al. 2016), knowledge translation and exchange or knowledge mobilisation (see Shaxson et al. 2012, 2), or other?
- What are the processes and design elements through which the centre, program or project will achieve knowledge work? Put another way, how will the organisation embed knowledge “within governance settings to address problems” – e.g. through objects, actors, relationships, networks or organisations (see Leith et al. 2017, 132)? Do these achieve relational engagement or just transactional exchange?
- What are other criteria relevant to achieving the intended function(s) and outcomes of the research-policy interface organisation, such as timeframes, policy (in)dependence, funding (including funding timelines) and openness and inclusiveness (Görg et al. 2016)?
- How do the responses to the above questions help the project develop and maintain salience, credibility and legitimacy?
- How do the institutional arrangements help the project manage issues of power and urgency (Parker and Crona 2012)?
- How will the organisation’s impact be evaluated in reflexive ways? How will the organisation/ interface arrangements support evaluation of research contributions to policy?
- What is the level of mutual commitment to the research-policy interface relationship? Is this dependent on individual relationships? Is the relationship resourced and sustainable?

CONCLUSION

Overwhelmingly, the field of institutional arrangements for research-policy interfaces is currently effectively characterised by experimentation, given the lack of systematic understanding, with questions yet to be resolved in terms of evaluating the impact or contributions of these efforts (Posner and Cvitanovic 2019), particularly across multiple organisations and projects. The language with which to systematically describe research-knowledge interface work is still evolving with new terms being used to represent the phenomena observed (see Glossary below). Rather than identifying a particular arrangement as best able to assist and enable work at research-policy interfaces, the literature indicates that different arrangements and capabilities are applicable in different circumstances. Thus, existing research on knowledge work emphasises critical reflection, experimentation and ongoing reflexivity by those involved. As Leith et al. (2016, 379) observe about the role of salience, credibility and legitimacy (SCL) in boundary work, the “development and balancing of SCL is dependent on the competency of actors, reflexivity about their role the way they enact it, and the institutional context in which they are embedded”. This complexity speaks to the importance of recognising the institutional, social, policy and research contexts (among others) in any research-policy work and when evaluating the contributions of such work. What is clear is that a university’s institutional arrangements need to support reflexive, experimental and often long-term work, thus often will require non-linear strategies involving persistence and patience.

Evaluation is an important yet troubling element of work at research-policy interfaces. While there is much work examining methods and means of evaluating research contributions to public policy, there are few (published) evaluations of institutional arrangements that support a multitude of different research approaches from different disciplines to contribute to public policy. All the above suggests that institutional arrangements need to be robust yet flexible, and must support and enable researchers, research projects, and research programs to explore and understand their context (e.g. different research for different policy problems). Consequently, while this review has identified crucial considerations for institutional arrangements for a research-policy interface organisation, it has found little empirical evidence to guide establishment of ‘best’ or even ‘leading’ practice in institutional arrangements. This significant gap requires further research, including empirical work that documents and assesses current and emerging approaches and practice, particularly across research-policy interface regimes and landscapes.

GLOSSARY

KEY TERMS

Boundary organisation: An entity that induces stability at the boundary between science and policy (from Guston 2001)

Boundary spanners: “individuals or organizations that specifically and actively facilitate” the process of boundary spanning (Bednarek et al. 2018b)

Boundary spanning: “work to enable exchange between the production and use of knowledge to support evidence-informed decision making in a specific context” (Bednarek et al. 2018a)

Boundary work: Pragmatist definition: work at the boundary of science and policy

Constructivist view: “an expression to describe how both scientists and policymakers defended their own space against interference from across the boundary” (Posner and Cvitanovic 2019, 142)

Impact: “The contribution that research makes to the economy, society, environment or culture, beyond the contribution to academic research” (ARC 2018).

K* (knowledge-work): “the set of functions and processes at the various interfaces between knowledge, practice, and policy. K* improves the ways in which knowledge is shared and applied; improving processes already in place to bring about more effective and sustainable change.” (Shaxson et al. 2012, 2)

Knowledge work: Used in this discussion paper as per above. Following Shaxson et al (2012, 2), knowledge is understood “to include both explicit (codified, factual) information and tacit understandings of what that information means and how it can be used. Knowledge can be about both content and process, and can be held individually or communally.”

Knowledge-policy interface: As per van den Hove’s definition of science-policy interface but “suggests that scientific knowledge needs to be placed alongside local knowledge and managerial-political knowledge, recognizing the importance of all of these for informing policy” (Ziervogel, Archer van Garderen, and Price 2016, 2), including traditional forms of knowledge (Béland 2009; Todd 2016).

Policy: “the disposition and deliberate action of government on any and every matter over which it exercises authority. This includes the stated and unstated; action and inaction; the choice of ends and the choice of means” (Fenna 2004, 5).

Research: “the creation of new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies, inventions and understandings. This could include synthesis and analysis of previous research to the extent that it is new and creative” (ARC 2018). In using this definition we view ‘science’ as something narrower than research, and research as narrower than knowledge.

Research-policy interface: Relations between what has traditionally been understood as academic research and policy, including the humanities and social sciences.

Science-policy interface: Used to describe the interface or nexus between the domains of science and policy

Science-policy interfaces: Defined by van den Hove (2007) as “social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making”.

Additional knowledge related terms used by Shaxson et al 2012: 2, Box 3.

- Knowledge Management (KM): the process of ensuring that knowledge is available. It is sometimes used to describe the suite of activities from the storage of information through to its dissemination. However, with the emergence of other terms and greater differentiation between roles, it is beginning to refer more to the collection and storage of different types of knowledge so that they can be accessed when needed.
- Knowledge Transfer: a one-way process of sharing knowledge which can be construed as more of a teacher-student relationship than other knowledge-related activities and perhaps associated with mutual exploration of an issue.
- Knowledge Translation (KT): the process of translating knowledge from one format to another so that the receiver can understand it; often from specialists to non-specialists. KT is sometimes represented as a one-way, and sometimes a two-way, process.
- Knowledge Exchange (KE) or Knowledge Translation and Exchange (KTE): a more two-way process of sharing knowledge between different groups of people.
- Knowledge Brokering (KB): a two-way exchange of knowledge about an issue, which fosters collective learning and usually involves knowledge brokers or ‘intermediaries’.
- Knowledge Mobilization (KMb): a two-way process that makes use of the existing stock of knowledge and co-creates new knowledge to help foster change. The term KMb is most used by the Canadian network Research Impact, which helps translate/transfer university-based knowledge to help citizen groups.

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