

BRIDGING THE SCIENCE–POLICY INTERFACE: A NEW ERA FOR SOUTH AFRICAN RESEARCH AND THE ROLE OF KNOWLEDGE BROKERING

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ABSTRACT

Government departments and agencies are faced with issues of increasing socio-ecological complexities around environmental sustainability and global change, which require them to make decisions that have the potential to impact greatly on society and economies. As a result, they are under increasing pressure to develop policies that consider a wide spectrum of scientific and indigenous knowledge. It is acknowledged that in South Africa, as elsewhere, a gap typically exists between the scientific or research community and the policymaking community, due to a number of underlying reasons at both ends. This gap often results in a unidirectional ‘push of evidence’ by researchers to policymakers, with a hope that policymakers will take up these findings and use them in policy identification, formulation or implementation. To support the uptake of evidence in policy, it is also important to stimulate an environment of ‘evidence pull’ by the policy community from the research community, as well as increasing the dialogue between these communities. A model of knowledge brokering is proposed in this paper as a means to bridge this gap between science and policy and, thereby, ensure the uptake of evidence in policy development and implementation. This model looks at the need for institutional mechanisms, such as knowledge-brokering offices, both within research organisations and government departments. It also highlights the importance of researchers involving policymakers from the onset of their research process, with a continuous dialogue between the two parties, both during and after the research, as a means of increasing the likelihood of research uptake.

INTRODUCTION

*People are becoming more demanding, whether as consumers of goods and services in the market place, as citizens or as businesses affected by the policies and services which government provides. To meet these demands, government must be willing constantly to re-evaluate what it is doing so as to produce policies that really deal with problems; that are forward-looking and shaped by the evidence rather than a response to short-term pressures; that tackle causes not symptoms; that are measured by results rather than activity ...*¹

This growing pressure on governments to adopt evidence in support of policy development and implementation is not unique to the European community. South African government departments are under increasing pressure to provide evidence-based policies that ensure the consideration of a wide spectrum of scientific and indigenous knowledge. This is reflected in the address by the then South African Minister of Science and Technology² at the opening of the Symposium on ‘Evidence-based Advice’ held in March 2006.

*This ... symposium on the ‘Nature of Evidence’ and ‘Science-based Advice for the Nation’ has an important contribution to make in exploring the urgency and growing importance of evidence as the basis for making informed policy and practical decisions across the world.*²

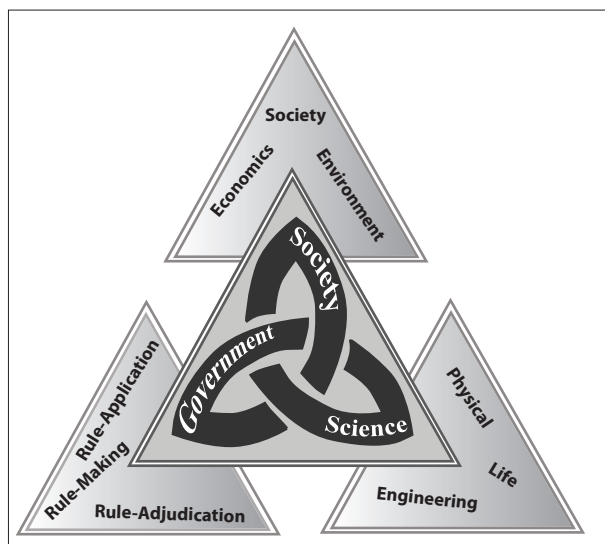
Governments are faced with issues of increasing complexity that require them to make decisions that have the potential to impact greatly on society and economies.³ This growing complexity of issues, as is apparent in the field of environmental sustainability and global change, requires a greater need for evidence in the formulation of policy.

*In South Africa there exists significant political will at regional, national and provincial levels to address sustainability issues and especially the threats and opportunities posed by climate change. This includes investment in negotiations at many international forums and with strong cross linkages to trade and other economic negotiations and considerations. South Africa’s and even SADC negotiating positions will benefit greatly from an improved and more coherent science base to inform policy. National to local scale development planning will also benefit if effective channels of communication can be opened to fast track scientific knowledge to policy-makers and implementers.*⁴

The Trialogue Model⁵ (Figure 1) suggests that the increasing complexity and apparently intractable nature of contemporary environmental issues require the establishment of new, closer and co-operative relationships between government, science and society actor clusters.^{5,6} The argument put forward by the Trialogue also suggests that each of the interfaces between the different clusters requires a different type of communication strategy, which, in the case of the interaction between the science and policy actor clusters, also implies improving and deepening existing relations between the actors involved.

The transfer of research outputs from universities and science councils has, in the past, been linear and unidirectional,⁷ with research communities ‘pushing’ their research to policymakers, with a hope that policymakers would take up these findings and use them in policy identification, formulation or implementation (Figure 2a). It is proposed that, to strengthen the science–policy relationship, there must be a stronger ‘pull’ of research by policymakers to support policy questions, or a push–pull, multidirectional relationship between these communities (Figure 2b).

Researchers have questioned why ‘some of the ideas that circulate in the research/policy networks [are] picked up on and acted on, while others are ignored and disappear’.⁸ In the South African context, a



Source: Turton et al.⁵

FIGURE 1

Trialogue model depicting the interfaces between the government, society and science actor clusters

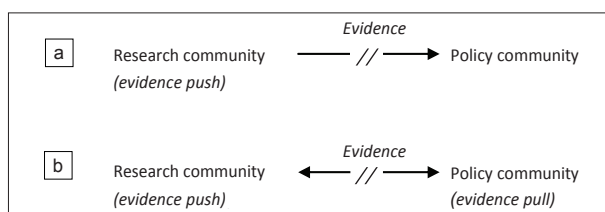


FIGURE 2

Model for the (a) unidirectional and (b) multidirectional push of research findings to policymakers

recent study conducted on research dissemination and uptake in South Africa⁹ indicates that researchers at universities and science councils often feel frustrated when conducting research for government departments because they are not given feedback about what happens to their research outputs once these have been completed and submitted. This points to a lack of communication and cooperation between the research and government sectors in South Africa. While researchers are given the mandate to produce knowledge, as identified by themselves or the government departments that provide research funding, their engagement with the policymaking process often ends with the submission of a final technical report. This further highlights the current trend of ‘unidirectional evidence push’ thinking by researchers, which entails that policymakers understand the relevance of the research findings, know how to use these findings, and implement these findings within policy.

In terms of the science–government interface of the Trialogue Model,⁵ it can be said that policymakers are tasked with prioritising values and making strategic trade-off decisions on behalf of society. However, the potential and real roles of scientific evidence in informing such trade-offs, are, as yet, unclear. Scientists working in the environmental sector often assume that the new knowledge and technology they develop is sufficiently linked and relevant to national political objectives and that it is likely to influence policy and decisions that are made at the national political level. However, this is often not the case, as many money- and time-intensive research projects are not implemented in a practical manner that would solve society’s environment-related problems. As a result, these projects serve no immediate purpose other than the production of knowledge and the creation of researcher and organisation profiles within the research community. This research may be a valuable addition to the particular field in question, but does not necessarily contribute (in the short-term and, often, not even as a

useful long-term building block) to the role of science in making a direct and positive impact on society.

To support the uptake of evidence in policy, it is important to stimulate an environment of evidence pull by policymakers from the research community, as well as increasing dialogue between the communities. The following sections focus on, (1) the way in which policy is informed by evidence, (2) barriers to evidence uptake and (3) one key model that can be used to overcome these barriers.

POLICY INFORMED BY EVIDENCE

Policymaking is typically shaped by a number of factors, including the social and political context of the country,¹⁰ with evidence, and research in particular, being only one component of policy development and decision-making.^{7,11,12} There is currently divergence in the literature regarding the definition of ‘evidence’. Some authors consider ‘evidence’ to include only science or research,¹¹ while others believe it includes various sources of knowledge in addition to science,¹³ such as indigenous knowledge, expert knowledge and public opinion. The last two decades have seen an increase in the use of evidence internationally in support of policy,⁸ with a strong emphasis on evidence-based policy in the United Kingdom (UK), Canada and Australia, typically as government has become more receptive to the role of evidence in policymaking. According to the Overseas Development Institute (ODI)¹¹, ‘evidence-based policy should be based on systematic evidence; that is, research-based evidence’, where researchers are considered the evidence generator and evidence provider.¹⁴ The Organisation for Economic Cooperation and Development (OECD) separates research into three categories: basic research, applied research and experimental development. Basic research is thus defined as: ‘experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.’¹⁵ Applied research is defined as: ‘also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.’¹⁵ Finally, the OECD defines experimental research as:

*systematic work, drawing on knowledge gained from research and practical experience that is directed to producing new materials, products and devices; to installing new processes, systems and services; or to improving substantially those already produced or installed.*¹⁵

The UK government has, however, adopted a broader definition of evidence. According to their Cabinet Office, evidence can comprise, but is not limited to

*expert knowledge; existing domestic and international research; existing statistics; stakeholder consultation; evaluation of previous policies; new research, if appropriate; or secondary sources, including the internet. Evidence can also include analysis of the outcome of consultation, costings of policy options and the results of economic or statistical modelling.*¹³

This paper focuses specifically on the role of research as evidence and, in particular, on the role of applied and experimental research, both of which are directed towards practical outcomes, such as uptake for policy. This is not to say that there is no place for basic (blue skies) research. Blue skies research still needs to be encouraged and supported, because while the impact of such research may not be realised immediately, the potential for future impact does exist.

According to Davies (cited in ODI)¹¹, evidence-based policy is an approach that ‘helps people make well-informed decisions about policies, programmes and projects by putting the best available evidence from research at the heart of policy development and implementation.’ Evidence-based policy is based on the concept that policy based on evidence produces better outcomes.¹¹ For evidence to be adopted by policymakers, it should be accurate,

TABLE 1
Current role of various sources of knowledge in decision-making within government

Sources of knowledge	Decision-making						Planning	
	Quick		High-risk		Low-risk		Rank*	Rating†
	Rank*	Rating†	Rank*	Rating†	Rank*	Rating†		
Personal experience	1	7	4	6	1	7	3	6
Personal education/training	3	6	4	5	3	6	3	6
Data and information	3	6	2	6	3	6	3	6
Internal specialist knowledge‡	3	6	2	6	2	6	4	6
External specialist knowledge§	4	6	3	6	4	6	3	6

Source: Godfrey¹⁸

*Rank is seen as the prioritising of the sources of knowledge from: (1) most frequently relied upon, to (5) least frequently relied upon.

†Rating is seen as the importance of the source of knowledge for decision-making and planning, varying from: (1) No value at all, to (4) Of moderate value, and (7) Of great value.

‡Internal specialist knowledge indicates knowledge held by colleagues within the same government department.

§External specialist knowledge indicates specialists who are external to the government department (e.g. consultants, scientists).

TABLE 2
Preferred role of various sources of knowledge in decision-making within government

Sources of knowledge	Decision-making						Planning	
	Quick		High-risk		Low-risk		Rank*	Rating†
	Rank*	Rating†	Rank*	Rating†	Rank*	Rating†		
Personal experience	1	7	3	7	1	7	3	6
Personal education/training	2	7	4	5	3	6	4	6
Data and information	3	7	2	7	2	7	1	7
Internal specialist knowledge‡	4	6	2	6	3	6	3	7
External specialist knowledge§	5	5	3	6	5	6	3	6

Source: Godfrey¹⁸

*Rank is seen as the prioritising of the sources of knowledge from: (1) most frequently relied upon, to (5) least frequently relied upon.

†Rating is seen as the importance of the source of knowledge for decision-making and planning, varying from: (1) No value at all, to (4) Of moderate value, and (7) Of great value.

‡Internal specialist knowledge indicates knowledge held by colleagues within the same government department.

§External specialist knowledge indicates specialists who are external to the government department (e.g. consultants, scientists).

objective, credible, generalisable, relevant, available, rooted and practical.¹¹ Ideally, policy should be *evidence-based*¹⁴ (i.e. have a strong foundation on evidence) rather than *evidence-backed*, where policymakers use data to justify preconceived policy options to suit their own political agendas.¹⁶ According to the ODI¹⁷, research uptake is dependent upon three broad areas, (1) the political context, (2) the credibility and communication of the evidence and (3) the influence and legitimacy of the link or interface between the policy and evidence environments.

Shaxson¹⁰ noted that evidence is needed by policymakers over different time scales; in response to time-sensitive requests, as well as in support of strategy and policy development over the long term. Research conducted by Godfrey in South Africa in 2005–2006¹⁸ explored this notion by assessing the sources of information and knowledge most frequently relied upon by policymakers in the field of pollution and waste, over the short term (for rapid, high-risk and low-risk decision-making scenarios) and for longer-term planning scenarios (Table 1).

Results presented in Table 1 are the median values obtained from a questionnaire administered to 11 managers within government who are responsible for pollution and waste management in South Africa. The results indicate that, in instances of quick or low-risk decision-making, managers rely less on input from external specialists and more on personal experience. In instances of high-risk decision-making, a shift away from the use of personal knowledge to one of evidence (data, information, specialist knowledge) becomes evident; however, there is still little reliance on external specialist knowledge. What is interesting to note is that this reliance on specialist knowledge does not change from current practice to desired practice (Table 2). Even in the case of desired practice, government officials still place a lower emphasis on the knowledge of specialists in the field and, in particular, specialists external to the organisation. This observation is not unique to South Africa. However, internationally, things appear to be changing, as there is evidence of growing reliance on specialist knowledge by government departments in the decision-making and policymaking processes. Advisory groups made up of specialists in their field are evident, for example, in the Department for Environment, Food and Rural Affairs’ (DEFRA) Science Advisory Council and the UK Waste and Resources Research Advisory Group.

BARRIERS TO THE UPTAKE OF RESEARCH

There are a number of possible reasons for the low reliance on specialists by government officials. These include: being unaware of who the information providers are,¹⁹ low levels of trust with regard to the evidence provided by external specialists, perceived issues of source credibility^{5,11,20,21} and limited understanding of the value of evidence.¹¹ According to Nutley (cited in ODI)¹¹, the interaction between researchers and policymakers is limited, due to a divergence that exists between two very different worlds. ‘They use different languages and have different priorities, agendas, timescales and reward systems.’¹¹ The result is that a communication gap exists between policymakers and researchers.

It is always important to bear in mind that ‘knowledge’ is relative and mutable. That which may be considered certain and fixed in science at one point in time, may be overruled by new discoveries at a later stage.²

This changing or shifting knowledge base, or possible contradictions within the same knowledge base, often makes it difficult for policymakers to define a ‘fixed knowledge point’ on which to base policy or decisions. This is evident, for example, in the fields of climate change or the human health impacts of nanotechnology, where scientists can hold differing views on scientific processes and outcomes.

The UK National Audit Office²² lists five reasons why research results are not easily accessible to the policymaker. These include, (1) a poor understanding of policy questions by the researchers, (2) poor communication of the research results by the researchers, (3) poor understanding of research results by policymakers, (4) no direct, short-term relevance of research results for policy and (5) a lack of resources for dissemination activity. It is also acknowledged that research is often a long and seemingly slow process of delivering evidence, often too slow for the requirements of policymakers. According to Bielak et al.⁷ policymakers think that science is ‘too slow and too expensive, and invariably answer questions that no one has asked, usually accompanied by requests for more funding.’

Bielak et al.⁷ identify the following three obstacles that affect the ability of staff within the Canadian Government Department,

Environment Canada, to bridge the interface between policy and science, (1) a difficulty in obtaining information on the activities and priorities of 'the other side', (2) receiving little feedback about the use of science within the policymaking process and (3) a lack of awareness about where to direct a particular science question. In addition, Bielak et al.⁷ note that the high turnover of officials within government departments makes it difficult to strengthen the science-policy relationship. This is a significant factor in South Africa as well, where the turnover of officials remains high and posts often stay vacant for months or even years. According to the South African Department of Science and Technology, there are

*considerable human capital challenges which constitute the primary implementation constraint for enhancing South African effort in global change related science and technology. This national lack of capacity impacts on the ability to both implement the research programme (i.e. funding researchers) and to implement research outputs (in the state departments). Notwithstanding important efforts to build capacity, particularly amongst blacks and women, these efforts remain ad-hoc with the existence of considerable barriers for scale up.*⁴

Watson-Wright²³ identified the following seven challenges to bridging the science-policy interface: different time scales, different jargon/perspectives/culture, complexity of inter-related issues, tolerance for uncertainty, quantitative versus qualitative engagement of stakeholders, and building on research/keeping it relevant.

The UK government notes that

*policy-makers' ability to access evidence-based advice is constrained in a number of ways. For example, the demand for quick fixes means policy-makers often do not have time for in-depth research. Where time is not a constraint, the sheer volume of research material available can be daunting. There is a danger of information 'overload', compounded by a shortage of people with the skills needed to act as an 'intelligent customer' for research and to understand or interpret available information. And, of course, in many cases evidence can either be incomplete, contradictory or inconclusive, adding to the difficulty of taking informed decisions rather than reducing it. Finally, the growing emphasis on cross-cutting policies increases the need for cross-cutting information and research if either duplication of effort or information gaps are to be avoided.*⁵

Thus, the UK Cabinet Office¹³ suggests that '[w]here technical and scientific research does exist it is important to ensure that it is in a form which is accessible to generalist policy-makers.'

Using the Trialogue Model,⁵ Godfrey points out that there are several possible reasons²⁰ for separating science and government within a young democracy such as South Africa. These include:

- the value that science can bring to the discussion, which is often not fully understood by government or society
- the fact that science typically does not communicate with government in a manner that is easily understood, particularly for government officials with a purely political rather than a technical or science background
- realising that the issues facing society are a lot more complex and the environment in which society lives a lot more uncertain. A decline in the level of confidence with which science can predict changes in, and to, the environment and the resultant risks of such changes, has resulted in society being sceptical of the role of science.

Similarly, the South African Minister of Science and Technology in 2006 stated that:

*[t]he significance and contribution of 'evidence-based' information in the policy-making discourse is not difficult to understand. However, given the complex relationship between research and policy, the culture of academia and the funding practices of commissioners of research, the current ethos of 'evidence-informed' public policy poses many technical, methodological and epistemological challenges.*²

THE SCIENCE-POLICY GAP

The underlying blame for lack of evidence uptake, therefore, appears to lie squarely on both the side of researchers as well as policymakers. To bridge the gap between the research and policy communities, Bielak et al.⁷ refers to the need for knowledge transfer at the interface of science and policy. The use of the term 'interface' ('a surface forming a common boundary between two things' or 'where interaction occurs between two systems') implies that these two worlds touch at some point, or that a point of contact exists between policymakers and researchers. It is suggested that there is currently a weak interface between these two role players in South Africa and that, in general, a large gap exists between policymakers and researchers (Figure 3).

The following section looks at one key way in which this gap can be bridged to increase the value of research and support evidence uptake by policymakers. What Bielak et al.⁷ refer to as 'drawing science into policy'.

A MODEL FOR KNOWLEDGE BROKERING

*The use of evidence-based knowledge is especially vital in developing countries where resource constraints preclude chances of entertaining any dubious solutions and experiments from elsewhere which might result in harmful consequences. Evidence-based advice therefore requires closer co-operation between government, research-based organisations and national academies of science to ensure that policy-making and planning draws on the best available information.*²

The past year has seen society critically question and challenge the apparent lack of inclusion of evidence in government decision-making and planning. South Africa has seen a number of media headlines highlighting environmental and developmental crises facing the country. Society has questioned why there has been a lack of forward planning and insight to medium- and long-term environmental and developmental challenges by government departments, resulting in immediate crises, such as the energy crisis, municipal wastewater treatment crises, water supply crises and food security crises. These media articles have raised questions as to why evidence, provided

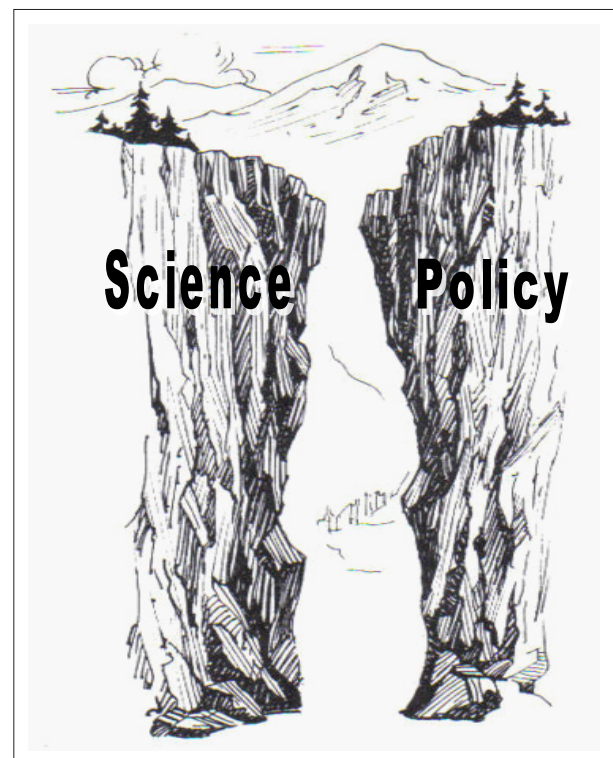


FIGURE 3
The science-policy chasm

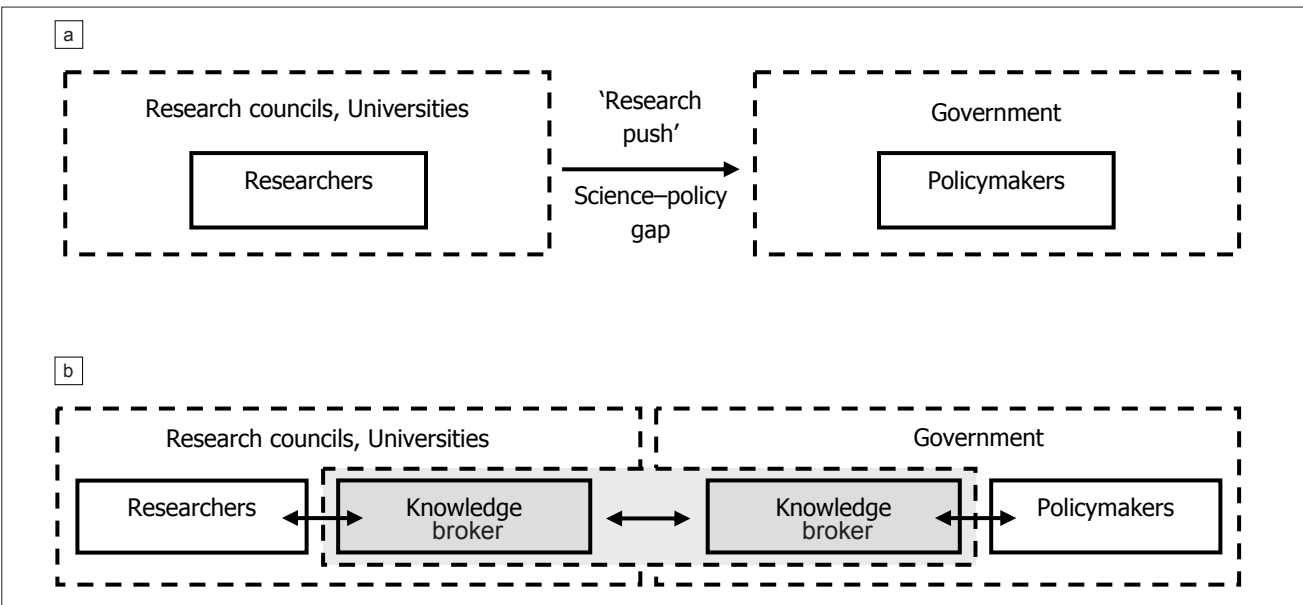


FIGURE 4
Current model (a) of research ‘push’ up to policymakers and proposed model (b) of knowledge exchange between researcher and policymakers

years or decades before problems surfaced, was not taken up by government and adopted into planning or policy. The Canadian Council of Science and Technology Advisors³ refers to this as using science advice to reduce science-related crises of public confidence.

At the same time, government departments responsible for the allocation of funding to research institutions have questioned what impact research is having on society in South Africa, particularly relating to current priority issues facing the country, such as HIV/AIDS, poverty alleviation, job creation, security and environmental sustainability. In order for research organisations to move from outputs and outcomes to impact, however, they are reliant upon the uptake of research by policymakers, industry and society. Knowledge brokering provides an important means of engaging with key stakeholders upon whom scientists are reliant to ensure uptake and ultimate impact.

The fact is a gap exists between science and policymakers, which results in science communication remaining one-sided, as research findings have to be ‘pushed’ to policymakers. In addition, current institutional arrangements in research institutions do little to bridge this gap between research and policy. A reason for this problem of policymakers not using research to feed into the policymaking process is because the links between research and policy have not been sufficiently established.⁹ Uptake of research can only succeed if policymakers and researchers work more closely together by means of established, regular and trusting interaction and dialogue.^{11,14}

Roux et al.²⁴ note that successful transfer of knowledge between researchers, policymakers and resource managers requires the ‘co-production of knowledge through collaborative learning’, which implies a change in the way we think of knowledge; it is not a ‘thing that can be transferred’ but rather a ‘process of relating that involves negotiation of meaning among partners’. Or as noted by the ODI,

fundamentally, there needs to be increased communication and interaction between the research and policy worlds in order to strengthen the integration of policy and evidence. This can be achieved by setting up mechanisms that will facilitate greater use of evidence by policymakers.¹¹

The recent study conducted on research dissemination and uptake in South Africa⁹ showed that, in cases where researchers involved policymakers from the onset of the research process

and a process of continuous dialogue was maintained between the two parties, both during and after the research, the likelihood of research being taken up by government departments was considerably greater. ‘From a one-way linear process, science is evolving to a multi-party, recursive dialogue’.⁷ Researchers in the field stress the importance of ‘creating a robust and durable relationship between the two communities, leading to better uptake and greater impact of knowledge’.⁷

One such model is the institutionalisation of knowledge brokering (Figure 4), thereby encouraging the evidence ‘pull’. This paper puts forward the knowledge-brokering model as a means of bridging this gap, in the hope of furthering evidence-based policy in South Africa. Bielak et al.⁷ define knowledge brokering as a process ‘in which intermediaries (knowledge brokers) link the producers and users of knowledge to strengthen the generation, dissemination and eventual use of that knowledge.’ Knowledge brokers ‘help to ensure relevance’⁷ and the ODI refers to this as building ‘institutional bridges’ between policymakers and researchers.¹¹

Such institutional arrangements for knowledge brokering and knowledge exchange are currently taking hold internationally. Examples of units set up to foster knowledge brokering include: the Natural Environment Research Council’s (NERC) ‘Knowledge Exchange’ Group, the Economic and Social Research Council’s (ESRC) ‘Communications and Knowledge Transfer Unit’, the National Water Research Institute of Environment Canada’s ‘Science Liaison Branch’, the Land and Water Australia ‘Knowledge and Adoption’ Manager (developed as a result of the Knowledge for Regional Natural Resource Management Program), and DEFRA’s ‘Waste Evidence Branch’.

In South Africa, knowledge brokering, while in its infancy, is also taking hold. The Department of Science and Technology is currently developing a Science–Policy–Practice Interface Strategy as part of its Global Change Grand Challenge initiative. The aim of the strategy is to improve evidence-based policymaking in the field of global change and to establish a Bureau for Global Change Research that will function as a knowledge broker to help facilitate and improve interactions between different key stakeholders from the science, policy and business domains by means of a strategic, targeted approach that will undergo regular monitoring and evaluation. The knowledge-brokering function will take place in the context of other initiatives within the Global Change Grand Challenge, including a research-based

Centre for Excellence on Global Change and Sustainability, and development and use of the *Risk and vulnerability atlas* as a science communication tool.

The UK Natural Environmental Research Council²⁵ acknowledges the need to ensure that the science it funds influences policymaking, with the intention to provide sustainable solutions to environmental challenges. It emphasises the following points, (1) policymakers need to know about the science, (2) scientists need to recognise policy-relevance in their science and identify which policymakers it is relevant to, (3) scientists need to engage these policymakers in the science from its outset, (4) scientists (or research organisations) must communicate science outputs to policymakers in an accessible form and (5) policymakers must recognise/be shown how this science fits into their political agenda. This thinking is shared by the Swedish Environmental Protection Agency, which notes that

*[i]f research is to be used in policy-making and environmental management, users should be involved throughout the planning and execution stages to ensure the continuing coherence of the research questions and the answers that are needed. The dissemination and implementation of research needs to be properly thought through at the planning stage, and adequate resources and time allocated in project budgets and schedules.*²⁶

The knowledge-brokering philosophy requires institutional changes on both sides – within universities and research councils and within government departments. These institutional changes require the creation of ‘knowledge-broker’ positions or units – ‘research brokers’ within the research environment and ‘evidence brokers’ within government (government departments would need to consider all aspects of knowledge not only scientific evidence or research, hence the reference to an ‘evidence’ broker). Bielak et al.⁷ refers to these specialists that work at the interface of science and policy as ‘bridgers’ playing the intermediary role between the ‘two solitudes’, or ‘knowledge brokers’.^{8,10} The Scientific Knowledge for Environmental Protection (SKEP)²⁶ organisation highlights the importance of these knowledge interpreters and intermediaries in playing

an important role in synthesising results into a useful form, and in providing a balanced overview where there are competing claims to the ‘truth’. They need to put the science into context and in proportion, describing uncertainties in a way which is helpful to the users but true to the science. Interpreters need to develop good relationships with both users and researchers, understanding both and able to see the world through their eyes. Good social skills, a breadth of view, and the ability to synthesise information and communicate it clearly are all key skills for interpreters.

The roles of the knowledge broker are diverse and vary between the research community^{8,10,13} (Box 1) and the policy community¹⁹ (Box 2).

A knowledge-brokering model provides a means for policymakers to better understand the value of evidence, be more aware of what evidence is available and how best to gain access to it, as well as how to directly solicit focused and directed research in support of key policy questions. For a knowledge-brokering model to work successfully within both research and policy communities, the following conditions^{7,8} are required:

- an acceptance of the knowledge broker by researchers within research organisations
- an acceptance of the knowledge broker by policymakers within government
- a new brand of researcher that can translate or package research to facilitate uptake
- a new brand of policymaker that can interpret policy questions into research questions
- a mature relationship between research organisations and government that facilitates open communication and sharing
- a close working relationship between researchers and policymakers.

The UK Cabinet Office¹³ even suggests ‘regular and systematic use of inward and outward secondments of specialist staff’ as

BOX 1

Role of knowledge brokers within research/academia

- Become familiar with the policymakers and the policymaking process.
- Get researchers to ask appropriate research questions (strategic, short- and long-term questions) based partly on expected policy needs.
- Alert researchers to what is coming over the policy horizon – new potential research questions, unexpected or even anticipated policy windows.
- Help establish the credibility of scientists amongst policymakers over the long-term.
- Help formulate approaches to practical research solutions to policy problems, bearing in mind varying time-frames and the partial need for ongoing fundamental research.
- Facilitate translation of science for policy/society – thereby packaging new ideas in familiar theory or narratives, often interpreting very technical research for non-specialist policymakers.
- Help to facilitate links between scientists and policymakers.
- Make sure that evidence (completed research) is available if rapidly sought by the policymaker (evidence ‘store’).
- Promote an overall framework that supports integration across the divide, for example, by promoting transdisciplinarity, promoting explicitly shared or overlapping values.
- Help co-develop the middle ground where both sides of the divide can prosper.

BOX 2

Role of knowledge brokers within government

- Get policymakers to ask the right policy questions; aligning certain research around policy questions makes it easier to translate research findings for policymakers.
- Drive and oversee research from within government departments.
- Help interpret science for policymakers, for example, by arranging seminars and think tanks on new findings or contentious issues.
- Consider and help facilitate policy alignment around important changes in scientific thought.
- Promote an overall framework that supports integration across the divide, for example, by promoting transdisciplinarity, promoting explicitly shared or overlapping values.
- Help co-develop the middle ground where both sides of the divide can prosper.

a means of brokering the relationship between researchers and policymakers, for example, internships in government departments or agencies by researchers or vice versa. However, this model is not without its risks. In particular, government’s independence in research findings needs to be transparent if they solicit or fund research, to ensure that research results are not swayed in a required direction or censored, if they oppose popular political agendas.

While the knowledge-brokering model requires the establishment of new institutional functions, it is important for this model not to be seen as a new layer of ‘middlemen’ within organisations, which place additional demands and burdens onto researchers and policymakers in organisations that are already strained to capacity. It will be important for South Africa to learn from other organisations which have implemented such models and, through a process of adaptive management, find an approach that provides maximum benefit to both the research and policy communities. If effective institutional mechanisms are not implemented, the possibility exists that the knowledge-brokers will be ignored by researchers and policymakers, making it difficult for them to play their respective roles effectively. Senior organisational support is thus critical in ensuring the success of a knowledge-brokering model and the sustained credibility of knowledge-brokers (respected by the scientist and policymaker), because if this support is not provided, brokers may simply be ignored or isolated within the organisation. According to Bielak et al.⁷ knowledge-brokers should be ‘trusted, valued and respected by both communities’.

In addition to having knowledge brokers within a research organisation, researchers will need to adapt to a changing policy landscape that requires their input. Researchers will need to

*[d]evelop cross-disciplinary capacities in their research teams because today’s environmental and sustainability challenges require inter-disciplinary knowledge, responses and policy solutions [and] have an understanding of the political, social and wider perspectives for their scientific evidence so that it is readily translated into a policy-making context; and policy-makers need to appreciate the converse.*¹⁴

An evidence-based policymaking workshop²⁷ held in Pretoria, South Africa on 19–20 November 2009 concluded with several

key learning points to take forward in bridging the science–policy gap:

- There is a clear need for knowledge-brokering activities to take place to improve links between science and policy.
- A focus on strategic policy objectives could be a useful way of reorienting research, but more thought needs to be given to how the ‘demand pull’ from line departments can be stimulated.
- Mechanisms need to be developed to bridge the gaps between general-interest policymakers and specific-interest scientists.

REWARDING RESEARCH TRANSFER

Historically, scientists have not had to show the relevance of their research and, as such, driving research to the point of impact is often an uncomfortable activity for scientists. UK models show how this behaviour can be incentivised through the application of dedicated funding models for ensuring transfer and uptake. The ESRC refers to this as the ‘Follow-on programme’ where funding is made available to support research projects for which outcomes were not initially planned, but in which resultant findings show potential for impact. Similarly, NERC has the ‘knowledge exchange plan’, where additional funding is made available where there is evidence of potential research uptake.

CONCLUSION

The increasing recognition of the complexity of problems that South Africa faces, particularly with regards to environmental sustainability, requires close cooperation and co-learning between scientists, policymakers and stakeholders, if they are to be adequately addressed. Previous research on science communication within the South African Council for Scientific and Industrial Research (CSIR)²⁸ shows that while enhanced packaging of scientific information improves the comprehension of research results by the general public, including policymakers, it does not necessarily have a significant impact on co-learning between scientists, policymakers and other stakeholders, or on environmental and other political decision-making processes that take place at various levels.²⁹ Therefore, there is a need in South Africa, but also elsewhere in the world, to take science communication beyond the focus of information packaging and unidirectional communication to particular audiences. Here it becomes necessary to include an additional dimension of human-centred learning by means of which science-based information is interpreted and legitimised for political decision-making in the environmental and other sectors through a process of interactive knowledge brokering⁷ and co-learning relating to the dissemination and uptake of scientific information. Conceptually speaking, the model of knowledge brokering between scientists and policymakers fits into the governance Trialogue. If science is to address the fundamental challenges facing society today, a solution to bridging the science–policy chasm is considered a necessary precondition.

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