Journal & Proceedings of the Royal Society of New South Wales, vol. 151, part 1, 2018, pp. 91–101. ISSN 0035-9173/18/010091-11

The role of evidence and expertise in policy-making: the politics and practice of science advice

Sir Peter Gluckman ONZ FRS

Chief Science Advisor to the Prime Minister of New Zealand
Chair, International Network of Government Science Advice

E-mail: pd.gluckman@auckland.ac.nz

Abstract

What is the role of the institution of science in a world where trust is declining? How do we ensure respect for scientifically derived knowledge in this environment, and particularly for policymaking? How do we ensure that policymakers are more likely to take into account the role of scientifically derived evidence in their decision-making?

Introduction

I'm going to focus on three questions, which, in many ways, follow on from Emma Johnston's talk (Johnston 2018). What is the role of the institution of science in the world where trust is declining? How do we ensure respect for scientifically derived knowledge in this environment, and particularly for policymaking? How do we ensure that policymakers are more likely to take into account the role of scientifically derived evidence in their decision-making?

Post-trust, post-elite, post-truth

I'm not going to dwell on the post-truth, post-trust, post-elite, post-whatever world we're in now because others have addressed this. Let's just remember that the manipulation of facts and evidence is not new: it's been going on since religion was invented, since various forms of power structures developed ten thousand years ago in villages and in cities. What we have rather is a massive amplification of the effect because of the powers of digitalisation, which have got many effects which I won't go into now. It's also had this dramatic effect of changing the positioning of the different publics in relationship to the policy community and it is increasingly affecting the way the policy community operates.

The science-policy nexus

For virtually every government at any level, every issue they face has a scientific component to it. I must emphasise I'm using science in the broadest definition you can imagine to include the knowledge-based humanities as well.

We also need to remember that science will never alone make policy, which is why I've eradicated the words "evidence-based policy making" from my lexicon, because, while evidence can inform, it cannot be the only construct in which policy was made.

And where science is of most use is actually where the science is most contested. Governments are usually making decisions in situations where the science is not complete; it can never be complete and it's often most contested. And we now face this challenge that the science of the most interest to governments is actually in areas which are most contested in terms of public values.

The issue is: how do we ensure that the science is reliable, robust and how will it be used? Will it be used well or will it be misused or ignored altogether?

What is evidence?

I think we need to remember that science is not the only form of evidence. For most people, science is not their primary source of evidence. For them, evidence is tradition and folk knowledge, evidence is the knowledge that's within their peer community: it's religion for some people and it's anecdote, experience and observation. And certainly, for most politicians, anecdote and observation are the primary things that influence them. So where does science sit in that hierarchy and how do we work to ensure privilege for science in that hierarchy?

Science and values

As discussed by other speakers, science is defined largely by its processes. Science is not a collection of facts; science is a collection of *processes* which are defined to eliminate bias to the extent they can. That's not to say that science is value free, as Nick Enfield spoke about, of course there are values involved in what we choose to study and how we study it. But in the context of my talk the most important value judgement within science is the sufficiency of evidence on which to reach a conclusion. We will come back to that, because I think many of the debates that we have are really over the quality of evidence and its sufficiency on which to draw a conclusion.

As Heather Douglas (2009) wrote about in her brilliant book, it's this inferential gap between what we know and what we conclude which is of so much importance in policy space. And within all this we are really talking about the changing nature of science.

The changing nature of science

Science has changed dramatically in the last 50 years and it's going to change much more in the next decade or two, as we see the shift from linear to complex science, from deterministic to probabilistic science. And from normal to what Jerry Ravetz (2005) calls post-normal science, that is science where we're dealing with systems, where it's complex, there are many unknowns, and no matter how much science we do there'll still be unknowns left at the end of the day, and residual uncertainties.

Science should not be a proxy for values debates

Here the stakes are high, decisions are urgent and it intersects dramatically with community values, and those community values are in dispute: climate change, environmental matters, public health matters. Virtually every contentious issue that government considers actually falls into this definition. It's complex, we don't have all the answers, it intersects with public values, which are in dispute and of course that's where a lot of the conflicts emerge and where the difficulties of how policy and science intersect are so great.

And now we're seeing a new phase of development, which again was talked about by Nick Enright (Enright 2018). How do we address these conflicts? The emergence of extended peer review involving the community rather than just professionals to review science. The true development of co-design and coproduction are all part of the solution. But that's not my talk for today, that's another talk.

But because we are engaging in science which engages with disputed public values, science can easily become the proxy for debates which are not about science. We've seen that in climate change, where the real debate is an economic debate and it's about intergenerational and north-south economic issues, not about the science of climate change. We've seen it in relation to genetically modified organisms, GMOs; we've seen it in fluoridation of water; we've seen it in the United States about stem cells and about reproductive technologies.

There are many issues in which it's easier for people to debate complex science and cherry-pick the odd observation, rather than deal with the true issues that underlie the debate. In my experience the best way to deal with climate change sceptics has been to challenge them and say, "You know this is not a scientific debate. You know this is really a debate about values and you're not being honest and having a debate that you should be having." And we have now a lot of evidence, particularly from the GMO and from the climate-change literature, of course, that just pushing more science on people with different world views will not resolve the matters and indeed might make matters worse.

Trust in science as an institution?

The issue of *trust* in science as an institution, which two other papers in this meeting also allude to, has become more complex in an environment where science is now dealing with these complex issues where societal values are in dispute. But there are other issues we must acknowledge; some of them have been alluded to. The other side of the endeavour: three million papers last year, seven million authors, many allegedly peer-reviewed journals, and papers which are likely never to be read.

Think about this system. We've had a massive utilitarian transition in public science, which we've all welcomed because it's invited governments to put more money into science, but that science has now been positioned in a much more utilitarian way and that's led to this raft of incentives, particularly on universities, which have led to a "bibliometric disease", which I would love to treat although I'm not sure how.

We're seeing the overt politicisation of science in many places. We're seeing increasing numbers of these proxy debates reflecting the issue of the relationship of science to the publics. If I'd had a chance to ask a question of Nick Enright, I would suggested that a challenge we now have is actually what guidelines and ethics should surround public communication by scientists, because on the one hand as citizens they've got the right of free speech, but on the other hand they're standing up and saying they are speaking for science and there are some real issues there that we may need to grasp. I encourage you to look at the Science Council of Japan (2014) work done after the Fukushima debate to see how they are struggling to deal with this.

And then we have — again it's been mentioned — intellectual silos and the real challenge of trans-disciplinarity. How do we marry the humanities and social sciences with the natural sciences? We say we do it, but very few people do it.

Science and policy making

Science and policy are very different cultures: they have distinct methods and epistemologies. The arrangements between them are influenced very much by societal culture. What has become clearer is that there's a need

for boundary structures to act as translators between these two communities. I spend much time helping countries through my chairmanship of the International Network and Government for Science Advice (INGSA)[1] discussing these issues.

Policy is rarely determined solely by evidence. Policy is really made around a whole lot of considerations, public opinion, political ideology, electoral contracts et cetera. But what science can do, and uniquely do if it's well presented, is deal with the issues of the evidence of need, the possible solutions and the impacts and the multiple impacts of any possible solution chosen.

Science at the policy-society nexus

There are challenges at the interface: too much science of varying quality, the changing nature of science, the post-normal nature of science, the different perceptions of risk that scientists have — which is often actuarial as opposed to the perceptions of risk the public have — and the perceptions of risk that politicians have, which are largely about the ballot box. And as all of this plays out, there are different perceptions of expertise: increasingly policymakers or policy analysts think that Wikipedia or Google searching is enough on which to come to a scientific conclusion. We have hubris on behalf of the scientists, we have hubris on behalf of the policymakers, and there are all sorts of issues at the interface and I could go on. Now I have found that many scientists imagine that policy works through a well-defined cycle as shown in Fig. 1, but it's a total myth.

Figure 1. The 'policy cycle'

Policy works far more like Fig. 2, which is itself somewhat simplified, because how policy emerges is often unclear. It comes from the work of both formal and informal actors, elected and unelected actors that somehow coalesces to influence — in this case — the executive of government. One can see how confused and complicated policymaking really is.

[1] https://ingsa.org/

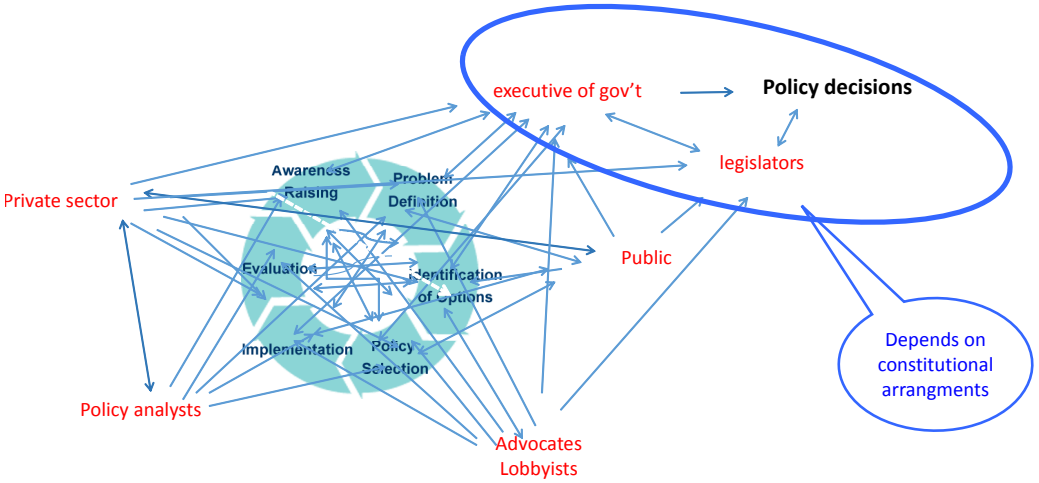

Figure 2.

The issue is: how and where does evidential input work? Well, evidential input has to work all over the place in this system (Fig. 3) and I think this is a really important point, which is often forgotten, that it needs a concerted effort to maintain evidence in front of the policymakers.

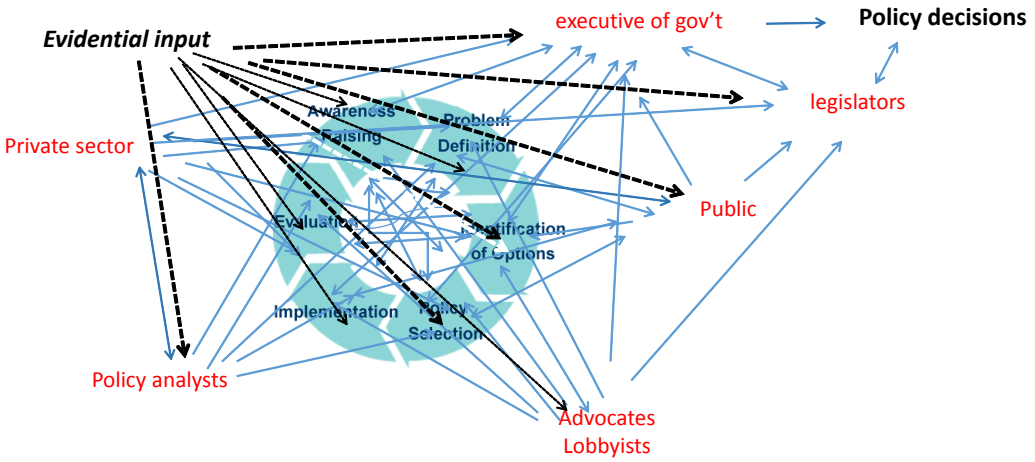

Figure 3.

The primary functions of science advice

What are the primary functions of science advice? First of all, I think it's to help the policy community actually understand a complex system; be it a social problem, be it an environmental problem, be it a transport, an urban issue. Often, they have only seen bits of the system and system thinking by scientists can help in clarifying what can possibly be done.

Scientific input to policy-making

Second, it's about helping policymakers see the range of options that could be applied and understanding the implications of each of those options, because policymakers always have options: they always have the option of doing nothing, which is often their default position. and from that they have got a range of options, each of which will have spill-over effects. Third, there's a role in evaluating policies that have been implemented.

And then there is a distinct role in emergencies. Most emergencies, be they natural disasters or a terrorist event, have a scientific or a technological component. Often there is a need to make sure the policymakers understand what the evidence is saying in such situations.

Then you have the issue of technology assessment and forecasting. Then there is the diplomatic dimension as seen in the global challenges that we face and are encapsulated in the Sustainable Development Goals. Most have a scientific dimension and science diplomacy is going to be critical at both national and global levels in making progress.

Policy makers

At its simplest, policymaking is about making choices between different options which affect different stakeholders in different ways, with different consequences, many of which are not certain. I think that the major role and the core presumption of scientific advice is that it's more likely to allow government to choose between the options in a way that will result in better outcomes. It is not always appreciated that policymakers have limited bandwidth. The policy cycle is short and getting shorter because of the impact of digitalisation. The science they need is usually incomplete and much ambiguous and yet the words "more research is needed" are not the words that help the policymaker.

Governments must make decisions; if they don't have a policy-acceptable solution to them at a point in time, they will usually move on to another issue. And you cannot expect politicians to be scientific referees; you can see contested science being argued in a way that can be very confusing.

Scientists and policy making

What are scientists good at? We are very good at problem definition. Climate science has done a great job. We're less so at finding the solutions that the science tells us about because usually it involves different disciplines from the disciplines that define the problem in the first place. Climate change was all about physical scientists, but climate change solutions is about economics, about social science, about different technologies et cetera; it's got a whole different basis to it. Too often scientists approach the policymaker with a fixed solution in mind, one that is not policy-acceptable and are surprised when it is rejected.

Elements in a science advisory ecosystem

There are many potential elements in a science advisory ecosystem. I've listed them in Fig. 4, from the role of individual scientists and universities, research institutes, through to the national academies, the government advisory boards, to science advisors such as myself, the role of parliamentary libraries and so forth. There's an immense number of possible players in this ecosystem and you don't need just one, you need several elements.

Individual academics, universities, research institutes
Academic societies/professional bodies
Government employed practicing scientists
Scientists within policy agencies
Scientists within regulatory agencies
Independent think tanks
What works units
National academies
Government advisory boards/science councils
Science advisors to executive of government
Parliamentary libraries, parliamentary advice units

Figure 4. Many potential elements in a science advisory ecosystem

	Knowledge generators	Knowledge synthesizers	Knowledge brokers	Policy Evaluation
Individual academics	+++	++		+
Academic societies/professional bodies		+		
Government employed practicing scientists	+++	+		++
Scientists within policy agencies		++	++	++
Scientists within regulatory agency		++	++	
Independent think tanks		++		+
What works units etc		+++	+	++
National academies		+++	+	
Government advisory boards/science councils		++	+	
Science advisors to the executive of government		+	++++	
Science advice to legislators		+	++	

Figure 5. Different roles in a science advisory ecosystem

Different roles in the ecosystem

In Fig. 5 I have broken this up into what I think are the four categories of roles in this interface. There are the knowledge generators, the scientists who generate knowledge; there are the knowledge synthesisers such as we heard from in the last talk (Bero 2018). There are scientists and units that aggregate the knowledge and try and make sense of what it means. And then there are the knowledge brokers who have to translate that science to the policymaker and translate the policymakers' needs to the scientists. And then there are the policy evaluators. You can see that you need more than one structure in your interface if it's to be effective.

The nature of science advice

Then you can think about other ways too. You can think of another set of dimensions (Fig. 6): policy for science, that is how the science system operates. Then there's evidence for policy development, implementation and evaluation, and the functions of crisis management and horizon scanning. And again you can see that there's a raft of structures and institutions that can assist and are needed to achieve a fully effective interface.

The concept of brokerage

I've used this word "brokerage" and I want to talk about it a little bit more. Roger Pielke wrote a book, *The Honest Broker* (2007), in which he defined that there were different ways we can communicate. We can be advocates who want a particular solution or a particular outcome, or we can be brokers where we actually transmit the knowledge in an appropriate, reasonably values-free way — because it can never be absolutely values-free — to the policy community, allowing

	Policy for science	Evidence for policy: options	Evidence for policy implementation	Evidence for policy evaluation	Horizon scanning	Crises
Individual academics	+	±	±	±	±	
Academic societies/profess'l bodies	+++	+	+	±	±	
Gov't employed scientists		+	++	+	+	+
Scientists within policy agencies	+	++	++	+	++	+
Scientists within regulatory agencies		+	++	++		
Independent think tanks		++	±	±	+	
What works units			++	±		
National academies	+++	+			+	
Gov't advisory bds/science councils	++	+	+		+	
Science advisors	+	++++	++	++	++	+++

Figure 6. The nature of science advice

them to overlay the values dimensions they have responsibility for. Brokerage is largely about what is known, what the consensus is; if advice goes beyond the consensus, why so? It is also about what is not known. Often the most important thing you can say to a government is, "We do not know." Other caveats may be needed to put on the data, the inferential gap between what we know and what we don't know needs to be clarified, as do the risks involved. What are the options and trade-offs? What are the consequences outside the science that each option might bring? I prefer not to make a recommendation, I'm always talking about what the implications of each option are. It's for the policymakers to make the value judgements, weighing up all those other considerations that come into play.

Internal v. external inputs

And then you have this other classification. People like myself are inside the system. I can talk to the prime minister or ministers any day. I talk to the cabinet office regularly and that means that I can see the many different interactions that are in play within the complex policy process. That is the advantage of science advisors and scientists within the system: they can often see what is possible in a policy sense. On the other hand, they're not as fully independent as an academy or academics on the outside. But the latter are often better placed to do the deliberative reports on complex issues, but here the advisor may still have a key role in ensuring the academy understands the question government is asking. Effective science advice needs a balance between internal and external inputs.

Informal and formal mechanisms

Another way to look at this division is to think about informal and formal mechanisms. Informal mechanisms are what advisors do when they brainstorm with the prime minister or a minister or suggest they may like a report on this, or suggest, "There's a problem with their thinking." Such interactions and challenges rely on trusted relationships between science advisors and the executive of government.

This is distinct from the writing of the formal reports. It matters whether such reports are requested or proffered unsolicited. It is important that reports are not written to show off the intellectual brilliance of the report writers but are designed to answer the questions that policymakers and society need. This realisation is leading academies to change their style of report writing.

Academies and science advice

This brings me to the role of Academies, since this Forum is being conducted by the Royal Society of New South Wales. Academies have a critical role. They are a place at which multiple disciplines can come together and write a critical report, a report on any subject. But sadly too many academy reports are not read and that is because most are not, shall we say, negotiated before they're started with the government of the day to see if the government actually wants to get it. Because if you put a question forward that the government doesn't want to hear the answers to, it's probably not going to succeed. Often even when they are given a question by the government, academies do not always realise what the government will find useful by way of response. There are a

whole lot of other issues and I think academies will have a challenge in this post-trust world of how they'll reinvent themselves, but that's another story.

The skillset needed, underlying principles

Summing up, the skillset needed at the science-policy interface, whether it's outside from academies, from other think-tanks, or whatever, and that needed from those inside the system such as science advisors are compatible but differ in emphasis. I have focused largely in this talk on what I think are really key for those who are inside the system.

I think anybody who's engaged in the interface needs to understand the complexities of policymaking. They need to get beyond single disciplines and realise that virtually everything that a government deals with in science has a social component to it as well as a natural science component. They need to employ brokerage rather than advocacy. Hubris must be avoided. If you go in there saying, "You must do that," you'll find a tribe of policy analysts soon writing briefing papers as to why that's not the case and why the scientists don't understand the nuances of policy making.

It needs diplomacy, it needs policy entrepreneurship, it needs good and trusted communication to the four distinct audiences: the politician, the policymaker, the public and media, and the science community. Humility is the most important skill you can have in talking to a policymaker. You must never try and take their role away from them — they are the ones who are there to judge the trade-offs that each option suggests. They are the ones that need to opine on values and consequences, not us.

One needs to maintain integrity and trust with all four audiences and there's obviously a hierarchy of trust. I can't do my job if I don't have the trust of the prime minister, the ministers, the policymakers but it's also critical to have the trust of the public.

The most important thing academies can do is to maintain the trust of the academic community, otherwise they lose their standing as an academy. So, you see there are different hierarchies of trust involved.

One needs an ecosystem; few countries have a comprehensive ecosystem. Britain does reasonably well, I think New Zealand does very well, I'm not going to comment on Australia.

We have real challenges: what is a fact? Is robust science available? Who decides whether the knowledge is robust and reliable? We have this huge emerging issue of social licence for new technologies. As the innovation and science machine gets faster and faster with the nanotech, biotech, digital tech, geo-tech, wherever it will be, there'll be more and more issues of social licence emerging. The natural scientist community and the innovators need to think more about how to develop and maintain social licence and they cannot do this without engaging social science. I'm heavily involved with the OECD on the issues of what the impact of digitisation will be and all that's associated with it on the concept of human wellbeing. What does it mean at a level of individual, the level of society, at the level of the nation state?

And what I've argued for in this talk is that any effective advisory system needs to have an informal, that is, an internal component, but it cannot work unless there's an effective external deliberative component coming from the broader science community, and particularly from academies.

References

Bero, L, (2018) Influences on evidence: putting the cart before the horse. *Journal & Proceedings of the Royal Society of New South Wales*, 151, this issue

Douglas, H. (2009) *Science, Policy, and the Value-Free Ideal*, Pittsburgh U.P.

Enright, N.J. (2018) Mind, language, and rational discourse. *Journal & Proceedings of the Royal Society of New South Wales*, 151, this issue.

Johnston, E.L. (2018) Why are scientists so quiet? Cultural and philosophical constrainrs on the public voice of the scientist. *Journal & Proceedings of the Royal Society of New South Wales*, 151, this issue.

Pielke, R., (2007) *The Honest Broker: Making Sense of Science in Policy and Politics*, Cambridge U.P.

Ravetz, J.R. (2005) *The No-Nonsense Guide to Science*. Oxford: New Internationalist

Science Council of Japan, (2014) A review of the model comparison of transportation and deposition of radioactive materials released to the environment as a result of the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Plant accident . Tokyo: SCJ http://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-22-h140902-e1.pdf