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How science informs current thinking in government

Sir Peter Gluckman's address to New Zealand Institute of Agricultural and Horticultural Sciences – Symposium on 'Science in a Post-Truth Era'

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Across the world, there is increasing interest in the interface between science and policy. Exactly three years ago, the first international meeting on the topic was held in Auckland. The organisation that grew out of that meeting, INGSA, which I chair now has over 3000 members in over 80 countries and is heavily engaged globally in workshops, think-tanks, research and training – much of it in partnership with governments, international agencies and NGOs.[1]

The context encapsulated in the overall title of this meeting (science in a post-truth era) arguably gives emphasis to the importance of understanding and developing this interface at every level of government from local to global. As I have previously argued, scientific knowledge well-brokered through science advisory ecosystems will be a critical bastion against the polemic that is implied in this post-truth terminology.[2]

I am not going to dwell on this post-truth descriptor as, while it has come into vogue, it is nothing new. What is new is the ease, the pervasiveness and its increasing impact, which comes about for a variety of reasons but most importantly because of the change in the way people receive information. It is often filtered and magnified by the echo chambers of social media, and the inevitable impact of access to unmediated and uncontextualised information.

What I want to focus on, instead, is the role of science as an institution in a world where trust in institutions, in elites and in experts is in decline. This, in turn, is largely a result of a much more empowered and information-rich society, fuelled by interest groups, social media and polemic that has replaced dialogue on complex issues.

Science and policy are very different cultures. Science is not a set of facts, but rather a set of processes that have the goal of developing relatively reliable knowledge about the world around and within us. Science is always provisional in its conclusions. Its culture is one of iterative scepticism and questioning. And while science is not values-free, well-performed science tries to identify and attenuate any impact of societal

[1] http://www.ingsa.org/about/partner-organisations/

[2] See for instance: http://www.pmcsa.org.nz/blog/scientific-advice-in-a-troubled-world/; http://www.pmcsa.org.nz/wp-content/uploads/17-06-28-Changing-need-for-science-advice.pdf

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values and biases from the processes of data collection and analysis. The biggest values judgement in science is about the sufficiency and quality of data such that a conclusion can be relatively reliable. What publics choose to do (or not do) with science-derived knowledge on the other hand is inherently values-rich.

Policy-making is largely about choosing between options with different implications for different groups of stakeholders. Policy makers know there is no free lunch and that any choice made has trade-offs and those trade-offs will affect different stakeholders positively or negatively. They also know that whatever choice they make, there will be spill-overs and consequences – some can be planned for; many are unintended. They make decisions all the time on the basis of incomplete knowledge and often on a very short-time base.

The inputs into their decisions are multiple and are values laden – fiscal priorities, diplomatic dimensions, their own ideology, electoral contract, public opinion, time in the electoral cycle, impact on different stakeholders, etc.

So where does evidence fit in? Firstly, we need to define evidence – evidence to a non-scientist or a politician can include belief, dogma, religion, tradition and, most powerfully, it can include anecdote and personal experience. Scientific evidence claims privilege but that has to be earned. This is where sensitive brokerage comes into play.

The role of science and science advice is to assist that process on the assumption that scientifically-derived knowledge can be mobilised to assist the policy makers in making more informed choices between options. Sometimes, this work is not so much about coming to a decision as it is about explaining a complex scenario. Knowledge brokerage seeks to explain what we know and what we don't know, which is a necessary first step in framing of policy options.

And here is one of the biggest challenges: in the very areas of policy where science-derived knowledge is most needed by decision-makers, generally the science is incomplete, often ambiguous and sometimes contested. Yet most policy-making cannot wait for more research to be done. The public expects policy makers to make decisions and there are high expectations on those decisions. It is rare for politicians to acknowledge the uncertainty in their decisions and sadly too often the political polemic stops them doing so.

It is important to understand that the science-policy interaction does not occur in isolation – it is not simply an interaction between science and some formal policy process. Rather it is a more complex set of interactions between science, society, policy makers and politics. These interactions are changing because there is change occurring in all three nodes of this network – change that is full of paradoxes.

Scientific knowledge production is undergoing great change – from linear science to science which is systems focused. These changes are driven by advances in computational, life and environmental sciences. This has led to scientists' ability to contribute to essentially every issue a government faces, from social to environmental to economic. At the same time, these are issues where the science can be best characterised as post-normal and engaged in issues where the boundary between science and public values is blurred and those values are in dispute. The context of its

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application then invites the questioning of the science by those who might dispute its provisional conclusions for political or ideological reasons. In this, too often the science becomes debated as a proxy for what should really be an explicit values-based debate: How much of the climate change debate has really been a values debate about economic interests dressed up by cherry picking the details of very complex climate science? This invites a whole raft of strategies which can lead to excuses to delay and ignore the science as written about by Levitan in his recent book "*Not a scientist; how politicians mistake, misrepresent and utterly mangle science*".

The mechanics and structures of knowledge production have undergone change internally as well – it has been industrialised, and the incentives on scientists have led to behaviours and practices that can undermine confidence in science. Indeed the whole enterprise is based on career path, resources, funding regimes and bibliometric and promotion exercises that undermine the confidence in the system. Some talk about the 'crisis in science'. As the scientific community speaks more and more to society, how that conversation occurs can either enhance or break trust in the scientific enterprise in ways that ultimately impact on credibility and thus usefulness to policy makers.

Society now has much more access to information but more of that information is unfiltered, unreliable or even manipulated. The internet has been a great tool for providing access to information, but the echo chambers of social media, media outlets and various forms of manipulated information have created opportunities for great polarisation. People filter information according to their pre-existing cognitive biases and worldviews (which cannot be overcome by just providing more or different information). Expertise is a casualty of this increased access to information, which has created a sense that experts are no longer needed and that information alone is enough. This is a dangerous assumption. Information needs analysis, contextualisation and interpretation. Yet the dynamics of digitalisation, open access and social media are changing attitudes to expertise and knowledge, which have been simply lumped with power elites and rejected as part of "the establishment". Associated with this is a growing sense of distrust in institutions of all types from democracy itself to science as an institution. Yet paradoxically this changed milieu has created expectations on policy institutions and the policy process to find simple solutions to complex problems – because everyone has an answer.

The reality is policy makers often lurch to issues driven by external factors and move on if the solution is too hard. For policy change to occur, the confluence of three elements is required: the problem gets on decision makers' radar; a viable policy solution is at hand; and there is a window of opportunity to make a change.[3] These conditions are rarely met in unison. Indeed, science often highlights the problem but science in isolation is not always very good at providing policy acceptable solutions.

[3] Kingdon, John W. *Agendas, alternatives, and public policies*. Longman Pub Group, 2003.
Howlett, Michael, Allan McConnell, and Anthony Perl. "Moving policy theory forward: connecting multiple stream and advocacy coalition frameworks to policy cycle models of analysis." *Australian Journal of Public Administration* 76.1 (2017): 65-79.

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Add to this the issue that perceptions of risk vary: scientists may think in actuarial terms and probabilistically, while publics most often perceive risk through experience or proximity, and politicians see risk electorally.

All of this means that policy-making is complex and messy. It is not the neat cycle sometime described; rather it is a complex and ill-defined set of interactions between formal and informal players that form a network of allies, adversaries and experts that coalesce around specific issues. All of this takes place within the context of existing political structures, and one must distinguish the roles of the executive and of legislators in this process. In New Zealand's system, policy direction is largely established through the executive, well ahead of parliamentary scrutiny.

So where does science fit in? The answer is everywhere, and not just with the core actors. There is sometimes a dogmatic view held by scientists that scientific knowledge will reveal the only true and right course of action, and that policy will thus follow. Or conversely, a view from the policy community that it is simply a matter to turning to Wikipedia or a favoured expert.

These beliefs highlight the complexities in policy-making and thus the need for an ecosystem-based approach at the interface of science and policy. There is not just a single interaction between science and policy, but rather multiple forms of interaction and multiple and distinct scientific roles. These are knowledge generation and knowledge synthesis, both of which require deep domain expertise, and knowledge brokerage which requires understanding of both the processes of science and the processes of policy. This is essentially a translation process that operates bi-directionally.

Knowledge brokerage is about stating what we know, what we do not know, the limits of knowledge, the caveats on what we know, the inferential gap between knowledge and conclusions, and the implications of each option. It is not about advocacy for a particular conclusion or course of action. It is about ensuring an understanding of the knowledge context in which policy choices are made.

The major elements of the science advisory ecosystem in NZ are:

- Well trained scientists
- A robust university system
- Government scientists in CRIs and agencies
- Strong regulatory agencies like EPA and PHARMAC with scientific expertise
- A wide range of advisory committees
- Professional bodies and scientific societies
- Our national academy – the Royal Society Te Apārangi
- The departmental science advisors
- The PMCSA

Each is a necessary but not sufficient part of the entire system. Importantly it is the multivalent institutional nature of this ecosystem and its maturity that give it integrity. But we also need to look at the functional dimensions of science advice to understand why all these components are needed.

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The first dimension is that of the nature of the interaction: is it technical advice, is it regulatory, is it policy advice? Different types of advice require different functional components of the ecosystem.

Then there is issue of response time. For example there is a big difference between knowledge needs of decision makers in an emergency and their needs in technology forecasting. An increasing part of my role has been in crises and emergencies – not in providing technical advice (though sometimes convening the expertise to provide this) but more often my role is in ensuring that there is a clear understanding by decision makers of what the science is saying and what it is not saying. It has extended considerably to issues of risk assessment and in some cases to risk communication. Indeed risk-related matters now would represent at least a quarter of my Office's effort.

Also on the issue of response time, there is an important distinction between advice in the form of a thorough report, which I call formal or deliberative advice, and what I call informal advice where the interaction is usually immediate. By this I mean engagement in discourse and brainstorming with policy makers. Formal advice requires time and domain expertise. Informal advice is more about informing what a scientific perspective means, how it might be convened to inform options, about quality assurance on how the science is used as policy ideas are developed. In reality this is the type of advice that the executive branch of government often needs.

In a sense, the concepts of formal and informal advice overlap with another framing: that of input which is external to the policy system and that which is internal. These are very distinct types, both in opportunity and in role. Academies are external, science advisors are internal, but both are part of the ecosystem.

In the NZ science advisory ecosystem the most recently added component are the science advisors. I was appointed in 2009 and the first departmental science advisor was appointed in 2013.

The position of CSA has been set up to be apolitical and independent – secondment of a practising scientist being the chosen model. Admittedly, the initial process of appointment was largely informal because no one knew what the position should look like. Almost a decade on, there is an opportunity to formalise the role and the process and I hope that this will be the case for my successor.

The role is very much focused on the brokerage function and in those aspects I alluded to before as being both internal to the system, informal, and urgent. But as I will discuss the core challenge is that of establishing and maintaining trust.

In articulating this role and its vision for evidence informed policy-making, my Office has produced three successive reports on improving evidence informed policy processes. The latter two were informed by extensive assessment of departmental attitudes and processes. The appointment of DSAs arose out of these.[4]

[4] Gluckman, P. Enhancing evidence informed policy making (2017) http://www.pmcsa.org.nz/wp-content/uploads/17-07-07-Enhancing-evidence-informed-policy-making.pdf

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The PMCSA's terms of reference give emphasis to:

- Evidence for policy: that is undertaking activities aimed at improving the uptake and use of evidence at all stages in the policy process.
- Brokerage: that is being a trusted connector across the interface.
- Science diplomacy: I will not dwell on this role today – it is a major discussion in its own right but this is now effectively a second fulltime job – using science to promote NZ's multiple interests and responsibilities globally.
- Crisis assistance: this has emerged as a major role; not just the issues of acute crisis management but also the broader issues of risk identification and assessment. The issues around the understanding of risk and ensuring connectivity to science organisations in emergencies both domestically and internationally is a critical role.
- Informal advice: similar to my counterparts overseas the dominant part of this role is the informal interactions with policy makers and politicians often early in the exploration of a policy space and such discussions are not particularly technical.
- Science and society: as my earlier remarks make clear the role is also outward facing. Some of our work has that as the primary focus – for example our work understanding risk, on understanding the evolution of mental state after the Christchurch earthquake, my climate change report, etc.
- A newly emerging strand is to work with the other CSAs to identify the evidence base for strategic frameworks against which policy may be developed. The recently released mental health narrative did exactly that. We were asked by the Crown to prepare a narrative based on evidence to look at the issues in mental health beyond simple capacity issues and thus provide a template on which multiple agency sourced initiatives could be built. This proved highly successful and will be an ongoing model in the next budget round.
- Addressing cross-departmental issues of a scientific nature: the work on citizen-based analytics and the role of big data in government is an example of such work, which is largely policy directed rather than technical in nature.
- The Office seldom undertakes deliberative reporting directly – rather it does so by convening expert groups as in the case of our reports on teenage transition, climate change, and freshwater. These tend to be informative in nature rather than directional towards specific recommendations, reflecting the context of knowledge brokerage. A

Gluckman, P. The role of evidence in policy formation and implementation (2013) http://www.pmcsa.org.nz/wp-content/uploads/The-role-of-evidence-in-policy-formation-and-implementation-report.pdf

Gluckman, P. Towards better use of evidence in policy formation (2011) http://www.pmcsa.org.nz/wp-content/uploads/Towards-better-use-of-evidence-in-policy-formation.pdf

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few more technical reports like that on fluoridation are written more directionally and these have been done as joint projects with the Royal Society Te Apārangi according to an agreed protocol.

- The Office has only a sounding board function concerning the research system policy. This is as it should be given where ministerial responsibility lies. However an increasingly important and valuable role of my Office has been in sponsoring the development of research roadmaps, because of the obvious connection between the type of scientific advice policy makers will need and the type of science we produce in order to meet that need. Two such roadmaps have now been developed through extensive processes – in the primary and conservation and environment spaces – and more can be anticipated.
- And now a major role is both chairing the committee of science advisors and leading the cross-agency engagement of these advisors.

The roles of the departmental science advisors are about ensuring the quality of science inputs into policy within their departments. They help ensure that analysts use data and science well in their work, that departmental research is well conducted or contracted, and much of what the DSAs do is working together sectorally in clusters across traditional departmental silos.

Currently we have nine science advisors in eight ministries. There are two new vacancies (for the Social Investment Agency and for the Ministry for Vulnerable Children Oranga Tamariki), one to be advertised soon (Transport), and at least two remaining gaps. It is important to note that the appointments of science advisors are the decisions of individual departments. TPK indicated a year ago they would make an appointment but have not yet done so. I have also made a case for a DSA for digital transformation and technologies.

The formal Committee of Science Advisors includes my Office, the DSAs, plus the chief scientists of MBIE, Margaret Hyland, and Defence, Hema Sridar, and the Government Statistician (Liz Macpherson). The President and CE of the Royal Society Te Apārangi attend meetings regularly to ensure coordination and information sharing. A Deputy State Services Commissioner and the government Chief Economist also attend regularly. The committee functions both informally and more formally particularly when working on ministerial requests such as research roadmap development or dealing with budget matters.

The system has arguably two further possible components. One is that there is no Science and Innovation Council as many countries have. These are generally chaired by the PM and have both public and private sector scientists and innovators on them. They are supported by the CSA. I have advocated for such a committee over several years without success.

In addition, we do not have a separate parliamentary office of science and technology, which is a common construct especially in Europe in those constitutional systems where the parliament has a stronger scrutiny role through select committees. In the UK, POST provides deliberative information to parliamentarians – a role conducted in NZ through the scientists employed in the Parliamentary Library. There is an argument for strengthening this function.

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Finally, given the topic of this meeting, I want to make some comments on the core issue of trust from the perspective of the advisory ecosystem.

The system cannot be effective if it is not trustworthy. Indeed the key challenge for a CSA (or anyone at the interface between science, policy makers and publics) is to maintain multivalent trust where players have different expectations. This requires not only trust of the political executive but also trust of politicians across the spectrum so the office is not politicized. It must have trust of the civil service and its policy makers or else it is operating in a vacuum. This means not undermining their role in evaluating the values based dimensions and the various trade-offs of potential policy decisions. Rather, the core role of practitioners of science advice is one of knowledge brokerage. It means sustaining the trust of the media and publics that can be very important in situations such as emergencies; it means having a trustworthy relationship with the science community who may be frustrated because the role is not that of resident lobbyist for science funding.

But there must also be trust in the whole ecosystem and perhaps the most vulnerable part is trust in the institution of science itself.

Let me end with some thoughts on why trust in science is at risk. Firstly, the way in which the scientific enterprise has evolved has encouraged competitive behaviours that can have very perverse effects on the integrity of science. In other cases, there are conflicts of interest, whether real or perceived – that can undermine public trust if they are not properly managed.

Secondly, there is the issue that the much of the science that is most needed for policy-making is always going to be viewed by some as contentious by virtue of its intended application. This is post-normal science, where the public interest is high, societal values are involved and these are in dispute, the knowledge is almost always uncertain or incomplete and decisions are urgent.

Thirdly, in this post-normal environment there is the changed public access to knowledge but much of that knowledge does not meet the test of reliability. But many regard their direct access to knowledge as obviating the need for expert. Friedman points out the paradox that transparency tends to reduce trust where it reveals internal debate and squabbles, but there is a growing demand for transparency in the name of building trust.[5] Because most systems are messy and science is a messy institution, peering into them will inevitably provoke questions and, unless the scientific process is fully understood, can create mistrust.

The knowledge broker and science advisor, to be effective, must deal with these pressures. We must recognise the danger of being seen as a lobbyist for science as opposed to being a lobbyist for the use of evidence, even when the evidence, by definition, is provisional. Decision-makers in a democracy will weigh many factors in reaching a position. This must be a given within a science advisory ecosystem, but if the ecosystem is well constructed, we hope that better quality policy might result.

[5] Friedman, T. (June 2017) Where did 'We the People' go? In *New York Times* https://www.nytimes.com/2017/06/21/opinion/where-did-we-the-people-go.html?mcubz=0

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