



OFFICE OF THE PRIME MINISTER'S CHIEF SCIENCE ADVISOR

Professor Sir Peter Gluckman, ONZ KNZM FRSNZ FMedSci FRS
Chief Science Advisor

Science advice: A bastion against the post-truth/ post-trust torrent?

Sir Peter Gluckman ONZ FRS

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What is the role of science as an institution in a world where trust in institutions, elites and experts may be in decline? How can we ensure respect for the place of scientifically derived knowledge, and for ensuring the distinction between fact and opinion, and how can we ensure policy makers are appropriately taking knowledge-informed evidence into account?

I discuss these questions from the perspective of having being the Chief Science Advisor to the Prime Minister of New Zealand for the last 8 years. My primary role has been to enhance the use of evidence in policy. I also chair INGSA, which is the global network focused on the science-policy interface. INGSA has members from the science, policy and practitioner communities in over 70 countries. Often INGSA has worked in partnership with the JRC and the Commission.

I am not going to dwell at length on the term 'post-truth': in part because others on this programme are better placed than me to comment but also because the post-truth phenomenon is really nothing new – politicians and interest groups have, from time immemorial, manipulated facts, observations, and information to their ends. But what has changed is the pervasiveness, connectedness and speed of communication such that it is now much easier to wilfully or unintentionally distort science and facts with widespread impact, to the extent that sometimes we are no longer are sure what a 'fact' is.

The impacts have included major shifts in the relationships between the component parts of our collective decision-making processes because of the much more empowered and information-rich society, fuelled by interest groups, filtered and amplified by social media and reinforced by populist polemic.

One paradox of the greater transparency in society has been some erosion of trust in the very institutions that are needed for a cohesive and yet diverse society to function.

While such movement towards transparency has properly led to greater expectations by citizens of its government, at the same time it has paradoxically made it harder to achieve the policies that fulfil them. Declining institutional trust can also be impacting on the institution of science.

Given this pervasiveness, the potential for harm generated by manipulated or misinterpreted science is now greater and the capacity for considered societal debate on the complex and urgent issues we face is now much more problematic.

Regrettably, in the currently emerging socio-political environment, there is the threat that policy-making can easily become reduced to whose 'truth' is more popular, is more pervasively and quickly framed, and provides the most convenient fit for the polemic, for celebrity endorsement or twitter.

It is perhaps understandable – yet ironic - that the post-truth concept has exploded at a time of unprecedented access to scientific information. But as the internet puts the fruits of research at our fingertips, in doing so, it also has led to a growing belief that expert interpretation and contextualisation is no longer necessary – many feel competent to reach their own conclusions and are empowered to do so by newly accessible networks of like-minded peers.

But in exploring this interaction between science, society and policy we also need to be cognisant that people and politicians see evidence in much broader terms than science alone; religion, tradition, personal observation and anecdote are all taken to be forms of evidence. Further citizens in any society will have a variety of worldviews that can create their own truths – reinforced by peer pressures, cognitive biases and the echo chambers of media.

My thesis is that that well-brokered scientific knowledge directed to the policy maker and society can be a bastion against the excesses that are implied in the post-truth concept. This is definitely not an esoteric and academic discussion: Rather it is an urgent and necessary conversation about the production and dissemination of scientific knowledge, its interactions with society and with the messy and iterative processes of policy-making that ultimately affect all our lives.

We need to start by recalling what science is and is not (and I am defining science in the broadest sense, better encapsulated in the German term *wissenschaft*). Science is much more than a collection of technical facts. Rather it is a mode of thinking encapsulated in the work of people ranging from Francis Bacon to Karl Popper and Thomas Kuhn. From this it has evolved into a set of processes aimed at obtaining relatively reliable understandings of the world around and within us, though these are subject to constant revision. In short, science institutionalises a distinct form of critical

thinking and verification. It is this that gives science any claim to privilege against other forms of evidence.

The processes of science are not values-free, but good and robust science minimises the effects of personal and societal values on the collection and analysis of data. Values inherent to science include choices about the research agenda, the methods employed and most critically the sufficiency and quality of evidence on which to draw a conclusion.

In contrast, the societal *use* of science including policy making itself is based on values-based judgements. How should we apply new knowledge and technologies, if at all? How will social license to be achieved? These judgements must be made within the framework of a wide range of worldviews, cognitive biases and social values and where there are widely different perceptions of risk and precaution, benefit and cost. Where worldviews differ, science alone generally will not bring convergence.

Science is a socially embedded and evolving institution that has also changed dramatically in recent decades. Nation states increasingly see science as a tool of national development. As public funding of science has increased, so too has the complexity of interactions between science and politics, via myriad stakeholders, advocacy and pressure groups. Public science is now incentivised through the instrument of money (grants, contracts or employment and reward) and through the pressures of performance measurement, bibliometrics, and the quest for societal and industrial impact. Inherently, these pressures have the potential to undermine trust in science as an institution and due to perceived or actual conflicts of interest and the potential to affect the behaviour of individual scientists. This is the multidimensional 'crisis in science' that Andreas Satelli and others refer to. The challenge we now face is how to ensure the value of science at its interfaces with societal needs.

Science and society have a changing relationship. Hopefully we are seeing the end of Polanyi's 'Republic of Science' that saw science as separate and independent from the society that supported it. Today, it is recognised that most of the policy issues involving science now relate to interactions with public values that are often in dispute. The extent and nature of such disputes are now made much more complex by the filtering and echo chamber effects of social and polarised media. Science can no longer pretend it stands outside of these discussions and indeed must be part of them.

Yet there is a paradox here; many of the issues that give rise to societal and policy disputes have their origin in advanced science and technology. Industrialisation and the massive expansion of the global population have ultimately led to climate change and many of the issues encapsulated in the sustainable development goals. And now we have to confront the digitalised world; it is having radical effects on how we live our

lives and communicate with each other; it is threatening the power of the nation state and the autonomy of individuals.

Better policy is more likely to emerge when robust evidence is used wisely. And so the challenge becomes: first identifying 'robust evidence' and second communicating it in a way that offers the best potential to be taken up by the policy and political communities and is accepted by the publics. This is not a simple task. It is the job of the boundary organisation and individual evidence brokers who need to understand that success is dependent on the quality of interaction between science and society, and in turn between society and the political processes. And we are living in an environment of post-normal science where complex and incomplete systems science interacts with values which are in dispute, but yet policy decisions must be made and with some urgency.

So how can scientific thinking and brokerage assist the policy community?

Firstly: it should lead to better understandings within the policy community of inherent systemic complexities and thus inform better definition problem definition. This is not a trivial statement. The importance of systems thinking has become central to government policy making in areas as diverse as social support, demographic change, education, environmental management, transport, energy and sustainability; in other words much of what a democratic government is interested in. Inherently this leads to much contestation over cause and effect and where and how to intervene. Normative argument often fails, yet is often at the base of both political rhetoric and opinion.

The advent of big data and data analytics is helping to support systems analysis in areas such as environmental and social policy. This capability is also helping to explain likely causal pathways and how to best intervene. But the issues associated with such approaches are multiple and complex and it would be a diversion to discuss them today. Suffice to say that data without expert interpretation can be misleading and can be misused; brokerage is necessary.

In those emerging issues where governments need more than straight technical advice, the science is often incomplete and ambiguous. Almost certainly it is diffuse and of variable quality and relevance. It is this that invites cherry picking and intentional or naïve misuse or proxy debates where science is used as a proxy for a primarily -values debate – too often politicians have misused science in this way – think climate change.

Secondly, policy-making is the process of making choices between different options that bring to effect different ranges of possible outcomes that may themselves be unclear and are likely to have spill-over impacts of uncertain nature and affect different stakeholders differently. When robust evidence is used to inform the decision maker

about the evidence base and the impacts of each option, then the choice of option is more likely to have the hoped for beneficial effect. Further, the policy maker is more likely to be informed of the implications of each option; this is the core assumption of science advice.

Note; I am not saying that evidence makes policy and indeed I avoid the somewhat arrogant term evidence-based policy making in favour of evidence-informed. Policy will always be made based on many other values based dimensions such as political ideology and electoral contracts, fiscal and diplomatic considerations. It is important that knowledge is provided in a way that does not usurp the ability of policy process to consider these broader dimensions: otherwise trust in advice can be lost as it becomes perceived as advocacy.

Thirdly science can help to model then monitor and evaluate the intended and unintended effects of any policy position.

Policy making itself is experiencing unprecedented change. The policy process is messier, faster and more open than ever. The cacophony of media and social media voices reduces the opportunity for carefully analysed and robustly evidenced decisions. A science advisory ecosystem can assist both the policy maker and politician to understand what the evidence is saying and what it is not and reduce the risks of counterproductive policy decisions.

To have an effective science-policy interface, science itself must have integrity – not only in how it is done but how it is communicated. And here is a challenge; there are problems within the institution of science. The emergent nature of perverse incentives in the science system can fuel bad science in many ways. Institutions may over-hype their science, individual scientists can use their scientific standing to make claims well beyond the evidence and their expertise. The size of science enterprise is now enormous and of highly variable quality.

Building trust in science must start with building science capital with effective relevant science, technology, engineering, maths and creative education, and engaging communities in science. This engagement cannot just be through citizen science, but through deeper public involvement in the institution of science itself: framing questions, setting agendas, reviewing results or in other words better understanding of the concepts of co-design, co-production and extended peer review. These concepts and practices challenge the traditional processes of the publically funded scientific institution. The training of scientists must extend to areas such as the philosophy of science, the relationship between and society, science communication and societal understandings. Natural sciences need exposure to the social sciences and humanities and vice versa.

Now finally let me turn to the mechanics of the science-policy interface:

Science and policy making are inherently different cultures with different visions, goals, timeframes and languages. Thus interpretation in both directions is needed. Multiple components are needed and we need to think in terms of a science advisory ecosystem, part of which is a robust science system, and part of which are boundary organisations and brokers operating at the interface. There is now absolutely no doubt that operating at this interface requires a distinct set of skills and is emerging as a distinct discipline.

Brokering scientific input must make sense of the morass of data and scientific claims in an objective manner and distil it into understandable information. We cannot expect the politician or policy maker to be a scientific referee. But it is not for the science advisory system to demand a particular solution, for all options involve values based trade-offs. The job is to define what we know, the state of scientific consensus, and equally what we do not know, the caveats on statements, the options that emerge and the likely implications of any option – this is the skill of brokerage. It is not the role of a broker to decide the option to be followed. A broker must be conscious of the values dimensions that policy makers must consider and point towards them, without usurping their role in doing so.

There are many institutions that would envisage a role at this interface but few that can do so in an effective manner. While many institutions are knowledge generators and a number are knowledge synthesizers, fewer still are knowledge brokers? More often we find organisations that are advocates trying to shape a particular decision – some think tanks are obvious examples. For an organisation to sit at this interface, it must be careful not to become an advocate for anything but the *use* of scientific evidence. Academies can play a particularly valuable role here.

Generally inputs at this interface at a national level come through formal or informal means. Formal advice can be generated in multiple ways; from a scientific academy, from an expert committee, it can be solicited or unsolicited. These distinctions matter in terms of how it will be likely received. Are they answering the question the policy maker puts? Is the question properly framed? Are they doing so in response to a well-brokered request for which there is clarity as to the purpose of both the question? Or is the advice unsolicited? In the latter case there may be no audience. Too often academy reports are focused on academic demonstration rather than meeting policy needs or answering an unasked question..

The timeliness of advice influences structural needs at the interface too. Is the advice needed in an emergency, or is it part of the normal policy process? Is it about horizon

scanning and long-term agenda setting? Each involves different skills, arrangements and types of interaction.

External inputs, such as from an academy, have carry a risk of being misinterpreted because they essentially can only impact at one point in the policy process and from that point on the integrity of such advice cannot be assured. The one mechanism that can reduce such risks is the presence of knowledge brokers embedded within the policy system who can engage repeatedly in the process. Such brokerage is a core role of individual science advisors. Their role is of particular value at several points. This includes brain storming between policy makers, politicians and others. Such activity sets policy in motion, can clarify the evidence base on the options being considered and the extent of evidential support in the decision-making processes. These individuals must also have the skill and engender the trust to be able to deliver the 'inconvenient truth' to the policy maker. This is likely to be more effective than simply confronting such truths in the public political arena. Of course this assumes that the policy makers and politicians accept the importance of receiving robust advice and this is far from assured and INGSA is focused on ways of addressing this challenge.

A science advisory ecosystem gets its integrity from its multiple components both internal and external. Indeed it seems logical that all major policy agencies should have access to both informal and internal input. Should that apply to the EC's directorates? This is beyond my competence to comment on.

None of this is particularly insightful. However, the reality is that few countries have multidimensional and fully effective scientific advisory ecosystems and when we look to the trans-national level they are even more inchoate. There is essentially no connection between global science advisory inputs to multilateral policy agenda setters and those within jurisdictional domains. The need for direct and coordinated contact between these levels of scientific input into governance is obvious. Science diplomacy is critical in this interaction and there is a clear need for there to be quality input of science into foreign ministries as these have major decision-making roles in multilateral relationships. In spite of this, perhaps only 10 countries structurally connect science into their foreign ministries. INGSA is working with foreign ministries to increase this number.

Some core principles operate at the science-policy interface. Critically brokerage must always leave space for other considerations from the policy maker and politicians. Even when the science is very clear, there are always options for the politician and policy maker. Once the science advisor becomes an advocate for only one solution their usefulness becomes limited.

Individual scientists, professional and scientific organisations too often exhibit hubris in reflecting on policy implications of science. This arrogance can become the biggest enemy of science effectively engaging with policy - the policy decisions inevitably involve dimensions beyond science. Equally though policy makers need to appreciate that Google and Wikipedia are nowhere near replacements for proper scientific input.

But most important and highly relevant principle is trust. There must be trust between the politician, policy maker and the advisory ecosystem and this requires that there is also trust between the science advisory ecosystem and the public, which in turn is influenced by public's opinion of the institution of science. Maintaining trust in the science-policy interface requires individuals with deep understanding of the processes of science, an understanding of the relationship between science and societies, an understanding of the policy process and diplomatic skills. INGSA is currently codifying these principles.

While the terminology and the range of institutions that form part of the advisory ecosystem may vary by country, a competent coherent science advisory/brokering mechanism which has a high level of trust and which includes an internal component is a critical part of protecting the integrity of policy making from the worst excesses of the post truth world. None of this is a panacea but it should be at least a partial inoculation.

