OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE

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

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Evidence based policy: a quixotic challenge?

Before starting, I need to point out that in my somewhat colloquial style, I will use the terms 'science', 'evidence' and 'research' quite interchangeably in this talk. I am aware of the contested understandings of these terms, but today I am simply using them as shorthand to mean knowledge derived from research that employs recognised and commonly held standards of scholarship in its methods and integrity. I am also referring to such knowledge from across the scientific disciplines including engineering and the social sciences. With these caveats, I want to consider the issues of evidence informed policy development and derive some general principles that I think apply. I do so as a practitioner rather than a theorist.

There are a number of issues that come to mind:

- What does evidence informed policy mean and why has there been escalating interest in the topic?
- How does evidence fit into the processes of policy formation and how should it?
- Does it have a different role in policy to other inputs – is it privileged?
- What are the limits of evidence informed policy?
- Who are the stakeholders and how do we engage them?
- What are the potential traps?
- What institutional structures are best suited to support evidence informed policy?
- And this will lead me to consider what common principles might be draw from addressing these questions.

I will tilt at these various windmills over the next 40 minutes or so. In doing so I will inevitably focus on my own experiences and so I must apologize and start by being somewhat autobiographical.

NZ is a small parliamentary democracy with a unicameral proportional representation electoral system. It is also a socially and culturally diverse country, with a strong Maori heritage and important links to the small island nations in the Pacific. In addition, there is rich diversity in the rural and urban character of NZ society. It has sustained a strong social support system over many decades. It is also proud of its environment and environmental

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 **Email:** csa@pmcsa.org.nz **Website:** www.pmcsa.org.nz

values. All these matters are high in the political consciousness. But our challenges are somewhat distinctive. We are geographically isolated and maintain an advanced economy largely by resource extraction on one hand, particularly through primary production, and by tourism that relies on resource conservation. The nuanced trade-offs between the steps needed to create economic growth to support a higher standard of living, versus the maintenance of environmental sustainability, have been a dominant feature of NZ politics over recent decades.

Relative to other small advanced countries NZ's investment in R&D has been relatively low; there is only now a belated and growing recognition that science, innovation and technology are keys to future development. This likely reflects deeply imbedded cultural attitudes associated with being a frontier society with low embedded science capital. The low private sector investment relative to comparator countries also in part reflects this culture and in part the lack of large companies within the innovation ecosystem.

The last contextual point to make is that our system is small; with only 4.5 million people, bridging the distance between the actors is easy. This in turn creates its own dynamic. But being a small system allows one to explore some issues of interest in depth. The principles at work are likely the same as in larger countries. However, they may be easier to identify and demonstrate in a simpler ecosystem.

Four years ago I was appointed as the first science advisor to the Prime Minister. The history leading up to that appointment and my subsequent experiences illustrate points I want to make, and I will use this as a framework for the first part of this talk.

In 2006 the unsatisfactory state of our science system led the Royal Society of New Zealand to establish a panel of senior scientists who wrote a manifesto for saving NZ science published in 2008. The Royal Society of New Zealand promptly disestablished the panel. Perhaps it thought the Government of the day did not appreciate its tone, but the Opposition incorporated it into its policy platform and, as it happens, was elected. One of its recommendations was to appoint a CSA although no detail as to specific terms of reference was provided or indeed considered. I think their early view (and I was a member of the panel) was to see the role as one of simply being an advocate for science and the science system. But that was to change.

Six months later, I was asked by the new PM to be the first CSA and the terms of reference were worked through with the Department of Prime Minister and Cabinet, which is the equivalent of your Cabinet Office.

Some things became very clear in the discussion leading up to my formal appointment. Firstly the position should be independent of either the civil service or political patronage - thus it was established as an advisory committee to the PM. The committee only has one member, namely me. But this was a constitutional way to ensure its independence. I remain a university employee and the Government buys a portion of time from the university. I avoid partisan politics; my small staff has internal processes to ensure we stay non-partisan.

Second it was established that I would report directly to the PM, not to a minister or to a senior civil servant.

Because context matters, it is important to note that in 2008 there had been a Ministry of Research Science & Technology that, in a re-organisation, was now embedded within a larger Ministry for Business, Innovation and Employment. The Minister is a very senior minister and his ministry operates science policy and funding. Thus while the CSA is a sounding board for STI policy, it is not the primary role. Yet despite this clarity there was initial tension with the ministry. Would I be an alternate voice for science in policy making? This tension has largely evaporated but there will always be matters that have to be carefully managed. Certainly, it would be a much greater challenge if the primary role of the CSA were advice on policy *for* science – more difficult still, if oversight of the science system were part of the remit.

It is important key to appreciate that the role is that of Chief Science Advisor, not Chief Scientist, where providing advice to the Executive on a broad canvas of issues, and overseeing the public science system, are quite distinct roles. If the CSA has both responsibilities the risk is that a broad-based role for public policy becomes secondary and the *de facto* focus of activity is on managing the system.

Some observers, mainly in the science community, think that the primary role of science advice is to drive the policy advice for science and technology. Clearly I can contribute to that area but I would insist that the main intent of a CSA is to ensure the *use of science* and research-informed evidence across the whole of government. After all, science and technology pervades every aspect of a society's risks, challenges and opportunities. While a CSA must be an advocate for science, to be primarily focused on being a lobbyist for science and scientists, would undermine the role's credibility and be seen as a conflict of interest by the officials and politicians to whom I provide advice. There is indeed a delicate balance.

So how would I describe my role? It has evolved as the role has matured. Briefly, my responsibilities can be grouped as follows:

- Science (Advice) for Policy
    - To promote understanding of science to the elected officials, public servants and the general public including addressing issues of high public concern such as climate change
    - To improve the use of evidence and science in policy formation and evaluation across government

- Policy (Advice) for Science
    - Advise on policy for science and innovation, but primarily as a sounding board but not managing the system as I have explained

- Science for Diplomacy
    - We have come to understand how much science can do to advance our national interest. This role has grown enormously and is a lecture in itself.

- Science (Technical) Advice
    - It is relatively rare to be asked to give specific technical advice; that generally occurs within ministries.

- Special Tasks
    - I do undertake some agreed projects with the PM, generally ending with a public report
    - There are other specific tasks and coordination roles (China council, Chair of the SAB of the temperate agricultural section of the Global Research Alliance on Agricultural Greenhouse Gases, the Defence Technology Advisory Board, The Families Commission, etc.)
    - The role has a large ambassadorial component to Universities research organisations, companies, etc.

- Risk Management
    - The one responsibility that is now emerging, and which I believe is critical and has been shown to be so in other jurisdictions, has to do with dealing with risk and – should they arise – crises. Risk identification and management are clearly linked to the understanding of probabilities and this requires a scientific skillset to communicate properly to officials and to the public. This work is distinct from crisis management which also requires a singular and trusted voice. I will return to this at the end of this talk.

Given that my job was new and its construct was somewhat different to that in Australia and the UK, which are countries that NZ traditionally observes closely with respect to public service structures, both senior officials in the Cabinet Office and I spent a lot of time reflecting on what the job was, and what it was not. We needed to consider how science advising fits in, both with political realities and with public decision-making.

All said and done, science advice is not generally a matter of dealing with the easy issues that need technical solutions. Rather it is largely sought in dealing with sensitive matters of high public concern and inevitably associated with uncertainty and considerable scientific and political complexity. Nearly always this has been set against a background of urgency. This is the mix which Funtiwicz and Ravetz identified in 1991 as "post-normal science".

I saw that a key task was to gain the trust of elected officials, public servants and the general public rather than projecting primarily as a lobbyist for the research community. That of course does not mean that I have no interest in advancing the science community, indeed I certainly do; it is certainly underfunded and I spend a lot of effort making the case. But the issue I am addressing here is how to best attend to the science community's interests and utility *within* a broader context.

To get the trust of these multiple constituencies, I had to explain how science and evidence are related to policy and decision-making, that is: ***both*** the place of science and evidence within public policy formation ***and*** what James Wilsdon calls "Policy for Science for Policy",

where public policy can be used to create an environment that supports scientists' work as a pipeline of evidence for assisting public policy development.

From the outset I had to be sure to encompass the full gamut of science within both the natural and social sciences. Much of what government is interested in is its large expenditure in the social sector. However, the evidence that is often used to inform this sector within government was of variable quality, when it was sought at all. All too often, social science is wrongly dismissed as something that can be done quickly by analysts, or is seen as a lobbying effort by academic advocates of a cause. These attitudes have contributed to a misplaced scepticism about the place of social science, and I was keen to demonstrate that social science could be as robust as any other science in regards policy formation.

That research can be so easily be interpreted by politicians as advocacy is a problem that has long worried me, and here I must admit to being heavily influenced in my thinking by two writers: Roger Pielke Jr. of the University of Colorado and Heather Douglas of the University of Waterloo in Canada.

So my early endeavour was to establish for myself some principles for how to approach science advising. I should say that I will focus on the main principles governing my approach here, but in a forthcoming publication, I have distilled the bulk of what I'm talking to you about today into a more formal set of principles that I think are generally independent of the various structural models of science advice. I am very conscious that forms of public reasoning vary across jurisdictions and cultures and this influences the structures of science advice. I am less convinced that they affect the underlying principles. The other point to make about principles is that it is easy to state things in black and white but the nuances of practice mean they are more like guidelines than absolute edicts.

The first principle to emphasise is that <u>science does not make policy directly</u>. Here one has to address the hubris of the science community and their frequent and naïve assumption that science can lead directly to policy. It would be exceptionally rare for a single scientific finding to directly inform a complex policy position. Science informs policy by providing a base of relatively values-free knowledge on which to build policy options. But the choice between policy options must still be made by policy makers and politicians on the basis of a large number of values-based inputs including public opinion, electoral contract, financial considerations, diplomatic considerations etc. and of course this creates its own quixotic challenge.

Whether we like it or not, democratic governments have the right to ignore scientific advice. Whether they *should* do so is a totally different matter. But it is worth remembering that plain scientific hubris often means that scientists forget to observe the limitations of their own knowledge with respect to the complex questions for which science advice is most often needed and sought. Scientific uncertainty coupled with highly charged values-driven issues often mean that the best that science can do is to nudge and perhaps help to channel public policy in a certain direction.

So my argument has to focus on a second principle**,** which argues for a privileged place of evidence-informed knowledge amongst the other inputs into policy making. I recognise the multiple epistemic cultures that inform policy development and that science itself is a culture, but a privileged one. That privilege comes from its set of standard operating procedures that limit the place of values in the knowledge it produces. I say 'limit' because it is clear that values come into play in the way questions are framed, in the metrics and measurements chosen and in the conclusions drawn. But the procedures of science are aimed at reducing these effects to help to make the knowledge derived more robust. Other inputs into policy are, by their nature, much more value-laden - and rightly so.

The changing nature of science is one reason for the growing imperative of science advice. When science was focused on a rather linear form of enquiry, advice was essentially technical and needed little by way of formal structures other than a capacity of the policy system to find the engineer or scientist able to address the particular issue. But as science engaged in more sophisticated ecological, biological, environmental, health and social questions, there came greater awareness of complex and nested systems, feedback cycles and time scales, and related uncertainty with respect to the limits of what is known or can be known with currently available methods. With this, was the emergence of ways to approach such complexity, particularly through growing computational power that radically changed statistics and modelling. Thus the ways in which science can contribute to policy formation have changed greatly. These more sophisticated questions are the very ones over which policy makers and elected officials prioritise and agonise.

This brings me to my third principle: the need to recognize the limits of science, despite its privilege. There will always be a large number of unknowns in the very areas the public and officials want answers. Scientists must not overstate what is known or what can be known. This philosophical shift from seeing science as a source of certainty to a source of probability can cause major issues. Not least is the frustration and confusion it can cause among decision-makers and the public. Decision-makers usually must act quickly and they can easily be frustrated by imprecision that exists in modern science to the point that some will denigrate the role of science altogether. I have heard more than one politician claim they can find a scientist to back any position on an issue – a frightening cliché in its misunderstandings of science, but one that is surprisingly broadly held. This takes me back to my earlier point about the importance of explaining what science can do and what it cannot. So what does science advice do in these situations? It can help identify and meaningfully constrain policy options, but it may not provide the certainty that would be politically expedient.

A key issue that Heather Douglas pointed out in her book *Science, policy and the values free ideal* is the need for the science advisor to consider the consequences of the inferential gap between what we actually know from the science and the conclusions that are drawn. Critically, there is the danger that the inference may be wrong. This is a key consideration in the development of science advice – judgment as to the sufficiency of evidence. This is of course a value judgment and is where science and values collide. It is easy for bias to creep in, whether through the scientists' lack of critical awareness about methodological choices, or through personal passion for a subject (which might describe many a researcher). Indeed

many scientists are advocates for their area of research – arguably more so in areas where the values perspectives are inevitably important such as in conservation and health and social domains. However, this creates a real difficulty, namely: when is advice really advice and when is it advocacy? The distinction is often blurred and both the policy and science community must remain vigilant.

So what can these emerging principles contribute to how we think about the actual practice of science advice?

First, it is absolutely crucial for the science advice practitioner to maintain *the trust of all key constituencies* including the public, policy maker and politician, that *advice is given as values free as is possible.* Trust can only be maintained if the science advisor upholds the principles and generally acts as an honest broker of knowledge not as an advocate (concepts I borrow from the work of Roger Pielke). When structured science advice (whether from an academy, a committee, or an individual advisor) is perceived as advocacy, then trust in that advice and advisor is degraded, even if the advice is accepted. This is a lesson that the science community needs to consider.

This issue of the social responsibility of science and of responsible public communication of science is a matter that is worth much more consideration. Some important tenets in this regard are now encapsulated, rather bravely perhaps, in the recently updated (and in my view ground-breaking) Code of Conduct for Scientists, published by the Japanese Council of Science. Quotes from it are on my website www.pmcsa.org.nz

Second, this discussion informs what a science advisor is and is not (or perhaps ought to be and ought not to be). The role is not that of a technical expert. It is about establishing science brokerage within the policy-making machine, it is about enhancing both the demand for and supply of evidence for public policy. Indeed when I deal with climate change deniers or sceptics for instance, the first point I make is that I know little about climate science. But what I do know about is the scientific method, the nature of scientific consensus, the interpretation of complex science, how to critically appraise scientific output and thus how to identify trusted experts. This, in turn, enables me to address effectively a number of issues on the implications of climate change.

A third lesson is about the distinction between giving advice and making firm recommendations. I only make recommendations when very specifically asked for them. The role of advising is to help develop options and to allow the decision-maker to determine the path ahead based on weighing a large number of trade-offs that are generally values based. Policy makers jealously guard that role, they do not devolve this responsibility to science advisors – nor should they. Indeed, my values perspective is no more valid than those of any other citizens.

This has been a rather cerebral set of arguments so let me illustrate it with a project that I undertook quite early on in my appointment, and which encapsulates many of these considerations.

Adolescent morbidity is a very high public and political concern in NZ. By OECD standards we have high rates of teenage morbidity and mortality and we estimate that 20% of children transition through adolescence with significant residual effects on their lives, such as dropping out of school, traumatic injury, criminal records etc.

Rather than the traditional multi-dimensional stakeholder committee approach which can sometimes lead to suboptimal compromises in policy development, the PM and I agreed that what would be more valuable in the first instance, would be a very strict scientific review of what we know in order to inform subsequent policy formation. I set up a team with an academic co-chair that ultimately involved some 30 academics from a variety of disciplines. They were charged with considering only the peer-reviewed literature and excluding values-based biases in their syntheses. The report took 18 months to complete but included an interim report before we had a 300-page internationally peer-reviewed report. It had a considerable impact both with the media and with the policy community. The PM then set up a senior officials' taskforce to take the report and identify specific actions; these were then reviewed by a subgroup of academics, and this led to some 22 initiatives being funded. What was unique was in announcing them, the PM acknowledged that there were large knowledge gaps and we did not know which initiatives would work and which would not, so the interventions would be accompanied by an evaluation process. This lack of political hubris is rather unusual in our political culture. This highly public exercise illustrated the principles of how evidence can assist the policy process in complex areas without threatening its autonomy.

As I gathered some confidence in my approach, I released a discussion paper that canvassed many of these issues. That paper highlighted a number of concerns. There was a need to point out how science could play a role in informing policy without claiming it could override the role of the policy maker. There were at least anecdotal issues about the quality of departmental research for policy; how internal and external research was commissioned and evaluated with little quality control; inappropriate or uninformed selection of experts; and the unclear standing of the departmental scientists, where such expertise existed within departments. Protocols for advisory committees and for seeking advice were not explicit except in one department. The result of this exploration was a discussion paper not a report but it served the purpose of starting a dialogue.

One aspect got traction: I had highlighted the need for the social policy ministries to think about their research needs as a sectoral group. As a result, in 2012 the Government brought in legislation to establish a Social Policy Evaluation and Research Unit as a standalone entity with governing board, of which I was appointed a member and with a scientific advisory board to develop research and evaluation practices. This unit is slowly gaining momentum and in the next few weeks, at the request of the deputy PM, I will be chairing the first of a series of dialogues intended to bring together relevant ministers and their CEs with senior academic social scientists to consider how and where their research could better contribute to the policy process.

While I had written this discussion paper, I felt there was still a need to understand what government agencies were actually doing with respect to use of evidence. Thus, with the

support of the head of the Cabinet Office and the head of the civil service I engaged in a survey of government departments and their practices and attitudes with respect to evidence informed policy. We developed detailed structured interviews for key-informants, who were generally the deputy head of each ministry. This time, because the exercise sought to question how to improve the system, I was quite comfortable in making specific recommendations.

I recommended, for instance, that Departmental (in some cases, sectoral) Science Advisors should be appointed to help provide internal science leadership in policy shops and to lift staff capabilities to engage with science; I recommended that protocols for sourcing evidence should be codified and training provided so that policy staff can better assess the quality of the evidence they are using; I also made recommendations regarding better alignment with the national research funding system so that strategic (as opposed to discovery) research dollars can be better targeted to policy needs. The report was publically and positively received by the PM. I am now engaged with several departments that are seeking to appoint DSAs and the civil service head is working with me to establish protocols of operation for science advice.

Let me spend a few moments considering some of the areas that pose the greatest challenge to science advice. Doing so can help point the way to the most conducive models for providing advice in various contexts.

The role of science in risk communication and crisis management should seem obvious but it is neither consistent nor easy. Indeed the strengthening of the UK system only came following the concerns over Foot and Mouth and CJD outbreaks. Regarding risk, there are two separate aspects for science advising. One is about dealing with (that is, foresighting as well as communicating) natural or systemic risks, from earthquakes to infectious outbreaks, for instance. The other aspect to risk is to consider the risk *taking* that we do as a society in order to advance our goals - for instance, the adoption of new technologies. Both require us to make choices on the basis of probabilities rather than certainties; otherwise it wouldn't be a risk. But the public response to *facing* natural risks and *taking* technologically driven risks can be quite different indeed. The presentation and discussion and political dimensions are quite different.

Let me tell a story about the former understanding of risk. On Feb 22 2011 Christchurch experienced the second of two major earthquakes to hit the area within a 6 month period – this time with devastating consequences including nearly 200 deaths and with effects on our second city and economy which will last another decade.

This earthquake was unusual in its seismic characteristics. It led to an unfortunate outbreak of seismologists publicly competing in the interpretation of the nature of the fault lines and future risks. I realised this was out of hand when officials themselves became confused and it certainly was having an impact on the public. It took a month of negotiating with the scientists for them to understand the need to provide simple and consistent communication, and to accept that highly erudite academic geological issues do not belong on the front page

of the paper every day. Rather, what was needed was communication of what was known and unknown.

More concerning was that the earthquake happened on the day of a full moon and, with that, an astrologer popular for his fishing forecasts got prime time TV coverage predicting an even bigger earthquake a month later when the moon and sun would be in alignment. Some panic understandably set in, families left Christchurch, children were sent out of town, and the city's general recovery was impeded. We faced a real challenge of how to calm the public, while acknowledging that earthquakes can happen at any time. With the Science Media Center, I conducted a series of media briefings and this, plus the actions of some civic leaders, led to things settling. But I had my fingers crossed on March 20th – there was no big quake that day!

Turning now to the second class of risk: what risks is society willing to take. Here there are emerging issues that are inevitably highly contentious, although there is an interesting diversity across jurisdictions as to what becomes contentious. Often the issue is about social license for a technology. Obvious examples have been GMOs, fracking, and climate change and I guess in this country, badgers. How these are confronted is interesting: is scientific advice best provided by a committee or by an individual? There is clearly a role for an academy, in particular to organize and oversee the technical input of various experts that can be used to inform any deliberative dialogue or public consultative processes that policy makers may put in place to elucidate the values components of these types of questions. But there is also a role for a science advisor in assisting in interpretation of the scientific issues to the decision-maker especially if these situations become acute.

But either way, it is important to ensure adequate technical advice and input. CSAs must know how to reach out into the scientific community. This was the model that I invoked in developing my recent report to the PM on climate change and how it will impact our regions and economy. I convoked an expert committee to provide the technical input. The committee members and affiliations were named for transparency, but at the end of the day, I was the report's shepherd, and took public responsibility for it.

There will inevitably be situations when science advice runs counter to the government's chosen course. I have faced this issue in an area in which I have personal technical expertise - that is the issue of folate fortification within the food supply, intended to prevent neural tube defects in newborns.

NZ and Australia have a joint food regulatory regime. In 2007, this regime agreed to introduce folate into commercially produced bread in 2009. But while in Australia folate was introduced, in NZ the food industry lobbied against fortification, citing cancer fears based on now questionable research. They got more than equal time in the press, which raised the level of public concern. Others had more philosophical concerns regarding the medicalisation of the food supply, which is an understandable and necessary values-based debate.

On the day I took up my appointment, the government announced that it would defer folate fortification. Predictably, the media sought my opinion, and my response was that the currently available science strongly supported fortification, but that it was understandable for a government not to follow it if they felt that public concern over either the safety or ethics of supplemented food was high. I was saying the science was clear, but science alone cannot make policy – that became my first public comment as a CSA.

These types of issue of complex science and its interpretation by policy makers, the media and the public are common. It led me to write a report on understanding scientific uncertainty and how to deal with variable scientific reports and data. It also led to a specific recommendation on the need for ensuring much better public access to the available evidence, where public consultation is undertaken.

I believe a Science Advisor is likely to be more effective where there is a strong science academy such as the Royal Society acting independently but in parallel. This is because, despite the independence of the role at least in my case, there are implied limits of manoeuvrability in maintaining the delicate balance of political and public trust. One cannot disturb the political cycle, one cannot lose the trust of the Executive and so even though one is independent there are limits beyond which trust is tested. There are issues for which the Academy is best placed to advise. These tend to be issues that are complex, very strongly embedded in science and where considerable technological inputs are important. A weak Academy undermines the potential for evidence to influence policy.

It is these kinds of challenges and tensions that might inform the structures of science advice – at least in representative democracies. There are generally three models: individual CSAs, advisory committees to the government, and reliance on academies. However, the latter alone cannot, in my view, deal with many of the aspects we have discussed. These models are not mutually exclusive and obviously any system is a product of a country's culture, history, political and social structures and approach to public reason, and there is clearly no singular process but I think the principles are universal.

Some issues, particularly acute ones such as risk communication, may be best fronted by individuals. Also creating culture change of the type I have been describing relies on a level of trust with the Executive that I believe can only be achieved by a one-to-one relationship. However, there is also a risk to vesting such responsibility in an individual: if they lose trust as has happened in some countries in the past, or if they lack the personal qualities and diplomatic skills required to build and maintain essential relationships, the role will fail.

Where there is potential conflict between the evidence and a politically held position, some might think that an advisory committee is better suited, but I think that if the individual advisor can establish and maintain trust, and has policy acumen, political discretion and scientific credibility, he or she is more likely to make progress with the Government even where there is disagreement. Committees can develop their own dynamic that can have an element of bravado or, conversely, be completely ineffectual in seeking to avoid controversy.

For complex and chronic issues, however, advisory committees or academies have a critical role to play, but again the quality of their approach is paramount.

On balance and not surprisingly I see the value in an individual CSA as part of the system; I think the person must have a level of independence and must report to the Head of Government. She or he must have certain qualities to succeed – scientific *mana*, a broad interest in science across disciplines, an understanding of the policy cycle, its exigencies and timelines, an understanding of the political dynamic, a sense of diplomacy and an ability to communicate.

But ultimately I think science advice at the highest level is a matter of trust. The trick is maintaining the trust of multiple, and sometimes conflicting, interests at the same time: the scientific community, the public, the policy maker and the politician.

So am I a Don Quixote? In one sense I have defined myself as one because I have accepted right from the start that science does not make policy in itself. But it can and must inform that policy process. I have said that governments can and will ignore advice. But it is possible to nudge governments and the policy machine to incorporate science more systematically into their deliberations.

I went into the job knowing that a proportion of my advice might have little or no discernible impact, but I also thought that I would be buried in lots of specific technical issues. Instead what has happened is that the national conversation has changed. It's become about the place for science in public life – a much more nuanced and, in many ways, more important conversation. When I accepted this job I knew little about science and policy. By describing my journey and my thought processes I have tried to illustrate what makes for successful inputs and what does not.

Finally a brief advertisement: There is a sense that the principles of science advising are becoming a more studied subject. There is increasing need to not just look at the theory of scientific advice but also its practice. To that end, and in partnership with ICSU, there will be a conference on the topic of high-level science advice held in Auckland next August 28-29 2014 specifically for CSAs, advisory committees, and academics to consider the issues. I hope it may interest some of you.

Mail: PO Box 108-117, Symonds Street, Auckland 1150, New Zealand
Physical: Ground Floor, Boyle Building (505), 85 Park Road, Grafton, Auckland 1023
Telephone: +64 9 923 6318 **Email:** csa@pmcsa.org.nz **Website:** www.pmcsa.org.nz