**OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE**

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

## Towards better use of evidence in policy formation

An address to the Institute of Public Administration New Zealand/Institute of Policy Studies

Sir Peter Gluckman

Wellington, 1 June 2011

Thank you for the opportunity to speak to you this evening.

It has been a somewhat busy day. Earlier today I released a major report on adolescence entitled *Improving the Transition: Reducing Social and Psychological Morbidity During Adolescence*. That report represented the culmination of 18 months of work by a highly involved academic and professional taskforce. But it is not the content of the report I want to highlight tonight, but rather the pathway to its release, which I think is rather unusual by New Zealand standards as it has important implications for what I do want to focus on in the main part of this talk.

The report was commissioned by the Prime Minister essentially on the following premises: he sensed that there is major public concern about adolescents and young people in New Zealand, that it is clearly a complex problem, and that it is not clear what pathways should be followed to address it. Rather than follow the more traditional New Zealand route of setting up a committee with multiple vested interests on it which inevitably produces a report reflecting political, ideological or self-interests, he asked me to consider how my Office would address it. I suggested that the appropriate route was to establish a panel of academic experts, not to come up with recommendations but to consider the published literature, interrogate the evidence and by summation provide the basis for policy formation. This was the path that was followed.

I appointed an academic co-chair with expertise in the domain, Professor Harlene Hayne from the University of Otago, who is soon to be its Vice-Chancellor, and together we identified about 15 other academics from across the range of disciplines and invited them to join a taskforce. We agreed on the following rules: we would only use the peer-reviewed scientific literature, not the grey literature, and the discussion would be kept objective and not biased by values-based outcomes. We agreed on an approach and identified a number of chapters to be written by experts from within the taskforce, supplemented by other authors as appropriate and peer-reviewed from within the group. As gaps were identified



**Mail:** PO Box 108-117, Symonds Street, Auckland 1150, New Zealand **Physical:** 2-6 Park Avenue, Grafton, Auckland 1023
**Telephone:** +64 9 923 1788 **Facsimile:** +64 9 373 7497
**Website:** www.pmcsa.org.nz **Email:** csa@pmcsa.org.nz

more chapters and authors were added. From that a Synthesis Report was written and subjected to external and international peer-review. The comment from those experts was that this represented the most comprehensive discussion to date of what is a critical issue for all western societies.

That report was released today. It is an attempt to have an unbiased and relatively values-free (and I will explain what I mean by that later) summary of the issues from a scientific perspective. It deliberately does not attempt to make specific recommendations — that is not the purpose of scientific advice, except with respect to relatively uncomplicated issues concerning what I call 'linear science'. In general my view of scientific advice is that it provides base knowledge on which other perspectives need to be overlaid as policy is formed. I will return shortly to the issues of linear versus complex science, and the nature of scientific advice.

Why have I used this example? First, it represents a new approach by Government recognising that in complex areas of policy formation, an unbiased perspective in generating the knowledge base is desirable, if not essential. The challenge is now for the policymaker and the politician to use that knowledge appropriately in policy formation, because certainly the issue is one that will not be resolved in just one or two electoral cycles. However a careful read of the report highlights a number of areas where policy action is possible, logical and cost-effective if a long-term view is taken.

But the bigger issue is highlighted repeatedly in the report. To quote, "Our research suggests that many programmes have been introduced albeit with good intent, that are unlikely to succeed as they are not supported by the evidence base, whereas other approaches likely to be effective have not been implemented. A key challenge is to ensure that all programmes are appropriately monitored to ensure that they are effective and cost effective within the New Zealand context, allowing better use of scarce resources to support our young people".

It is interesting therefore to note that in Minister Bennett's recent announcement of a green paper to look at the issue of vulnerable children, she established a process by which a scientific reference group would independently review the work being done by officials. I chair that group and I can tell you that its initial meeting to review the work done by officials was constructive but robust in ensuring that the appropriate questions are asked in dealing with this particularly challenging issue. But equally, I think the officials found it very refreshing to see a group of scientists looking at the issue from a knowledge base perspective rather than coming with an established ideological perspective. Again the issue soon emerged: what do we know is effective, and what do we know about what is not effective? What elements make a programme effective and how are they assured?

These related examples reflect what is, to me, a refreshing approach and they are relevant to a discussion paper I released a few weeks ago entitled *Towards better use of evidence in policy formation* and which will be the focus of the second part of my talk. That report arises



**Mail:** PO Box 108-117, Symonds Street, Auckland 1150, New Zealand **Physical:** 2-6 Park Avenue, Grafton, Auckland 1023
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from the first discussion I had with the Prime Minister after taking up my role as his science advisor, and in turn following discussions I had with past and recent chief scientists and science advisors elsewhere. For example, when I asked Lord Robert May — formerly Chief Scientific Adviser to both the Blair and Major governments and a former President of the Royal Society of London — what was his most important achievement as chief scientist, he said it was starting a process that his successors continued of improving and formalising the way in which science advice is incorporated into policy. He had the challenge of moving those governments away from the misuse of science as seen in the way the mad-cow disease outbreak and the first foot and mouth epidemics were handled. This created opportunities which he had grabbed.

The way science is incorporated into policy is a more complex issue than meets the eye. It has three distinct elements:

- Do science and knowledge have a privileged place in policy formation?
- Does the changing nature of science affect the way in which science advice is provided?
- How should science advice be incorporated into the New Zealand policy and political framework?

Before turning to the last question, which is the subject of my discussion paper, let me make some brief comments about the first two.

Democratic societies make decisions and policy based on many inputs, including fiscal considerations, societal values, prevailing public views, and the ideals and vision of the government of the day. But underlying all of that is the question of what kind of decisions do governments want to make. I think that all democratic governments, while staying within their ideological framework, want to make good decisions. My view is clear: to put it quite simply, the use of high quality information and evidence should be at the base of such decision making. Decisions made in the absence of informed background material are, by definition, made on the basis of belief and dogma; they are less likely to be effective and efficient, and can entrench policies which may be of little value. Further, without evidence as to whether policies are working, governments can become constrained by earlier policy decisions that are not easily reversible because there may be a popular or political perception that they are effective when, in fact, they are not.

Again, to use an example from the adolescence report, the synthesis statement quotes from a recent OECD report about New Zealand saying, “New Zealand spends considerable amounts on single parent benefits which last until children are into their teens with the notion that this promotes child well-being. There is an international consensus that there is little to no evidence that these benefits positively influence child well-being.” This is of course a reference to the DPB. This statement may well be correct. But it could also be wrong, although that is less likely, because we just do not know within the New Zealand context whether this prolonged payment is of value to the child or not. The research has not been done. The programme was never set up to be evaluated *de novo* and thus any decision



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to extend or contract it has to be belief-based. Given that, it becomes untouchable, because the default position of most people seems to be to assume that it does help, despite the OECD analysis suggesting otherwise. Yet a policy that is expensive would be better placed if the public saw unequivocal evidence that it worked and was value for money. Or, if the opposite was correct and there was unequivocal evidence that extending the payment for so long had negative effects, the public would be more supportive of a review of the policy. This is the problem — without knowledge we fall back on dogma, and rational decisions about scarce resources cannot be made.

To take another example: it would appear intuitive that formal driving education within the school curriculum would reduce the high rate of road accidents that teenagers experience. Indeed there has been much advocacy for such programmes over the years in various countries, from politicians, families of road victims and insurance companies. But when such programmes were introduced in both Europe and the US, it became evident that these initiatives either had no beneficial effect on, or even actually increased, the accident rates of young people. Formal evaluation with controls showed that driver education does lead to earlier licensing, but it provided no evidence that driver education reduces road crash involvement; instead there were suggestions that it may lead to a modest but potentially important increase in the proportion of teenagers involved in traffic crashes. An earlier study from New Zealand in the 1980s reached similar conclusions. This negative view of such programmes was initially vehemently rejected by some advocacy groups, but the scientific view became compelling and has been integrated into policy. The data do not even support driver education as a rationale for accelerating the passage through graduated licensing systems. Why does this counterintuitive outcome occur? In part because it leads young people to wanting to get their driver licence at an earlier age, and in part because it can lead to over-confidence in people who are already at a stage of their lives when they are most likely to engage in risk-taking activities. This is a classic example of why an evidence base is desirable even when what seems like 'obviously sensible' new programmes are introduced, and of why programmes should be introduced in a pilot fashion capable of evaluation. The assumption that formal driver education would be of value led to investment in programmes which in fact did more harm than good.

I use these examples to make an important point: while information and evidence do not and should not themselves make policy, good information and evidence provide an important base for a rational assessment of options weighed up against those other criteria that politicians and their supporting policy advisors should consider. Those other considerations — I will remind you of them in a moment — are valid for the policymaker but are values-based, and therefore I think that it is reasonable to conclude that scientifically derived knowledge does sit within the policy framework in a different way to other claimed forms of knowledge. I define science as the process by which reliable knowledge and reduced uncertainty about the world are obtained by a set of disciplines. Other so-called forms of knowledge which are not empirically based can only be derived from beliefs of one sort or another. I think that in the 21st century one must be very wary of decision-making



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processes that make assumptions about beliefs, but are not prepared to look at the knowledge base before decisions are made.

But science and knowledge alone do not make for policy. There are other perfectly valid components to policy formation and these can lead to quite different outcomes. Those other components include societal values, public opinion, affordability and diplomatic considerations, and they must also accommodate political processes.

The week before I took up my role as Chief Science Advisor, a furore broke out over the issue of folate supplementation in bread. The science is pretty clear — folate supplementation reduces the incidence of neural tube defects. For various reasons this became controversial and an active programme was launched opposing it. I happen to be an expert in this area and I agree with including folate in bread. But I understand the delay the government agreed to — why? The debate had, unfortunately, become so confused with misinformation that the public had lost confidence in the safety of folate-supplemented food. The medical community had handled its communication very poorly, allowing this confusion. No government can easily or wisely give its public uncertainty as to the safety of its food supply. Here is an example where science advice has to take back-stage to overriding concerns; the proper response here is for the science community to do better in providing the evidence.

The second question I want to address is, does the changing nature of science affect the way in which science advice is provided? We are in danger of underestimating how much the nature of science has changed; it used to be focused on linear questions, those aimed for reductionist precision. For example how much weight will this bridge take; are birds descended from dinosaurs; what are the side effects of this medicine? As a result science was authoritative, definitive and largely accepted by a very different public. In general, science advice on such matters was issue-specific, linear and could be provided by an expert without an interlocutor.

But much science has undergone radical change. Science now increasingly deals with complex non-linear phenomena where certainty is not possible; there remain many unknowns and answers are defined in terms of probabilities and levels of uncertainty. Science can no longer be authoritarian. These are issues of high public concern and political complexity and indeed the very matters on which governments turn to science advisors. Typical examples include food security, the use of genetic modification, dealing with adolescence or the aging population and of course climate change.

Such science is now intimately linked to and intertwined with the values and concerns of the public and body politic. While many scientists deny it, philosophers have pointed out that values have always played a role in what and how scientists choose to study, in research ethics, and in funding decisions. Of course the process of obtaining the results and interpreting any set of observations must be values-free. But an additional factor now arises,



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as the philosopher of science Heather Douglas makes clear in her outstanding book *Science Policy and the Value-Free Ideal*, and this is the issue of how much uncertainty is acceptable when deciding whether the science should form the basis of an action or policy. Such decisions are never values-free. Values do not compete with or replace evidence, but determine the importance of inductive gaps left by the evidence.

Thus the key question becomes: when is a particular body of scientific work adequately 'sound' to serve as the basis of policy? One must ask how much evidence is sufficient; how reliable are the studies underpinning the evidence? How much uncertainty is acceptable? What are the risks associated with an erroneous conclusion in either direction? These are the challenges governments and their advisors must deal with. But this does not mean that the role of science as the authoritative body to which one should turn for knowledge is generally questioned. What is questioned is which science is adequate for the job, or which scientific experts are to be believed by policymakers and the public.

Thus as science plays a more authoritative role in public decision-making, its responsibility for the implications of inductive error in either direction — premature action or persistent inaction — increases. Failure to recognise the implications of this responsibility has generated deep tensions. This kind of science has been given the name 'post-normal science' and is defined as the application of science to public issues where facts are uncertain, values in dispute, stakes high and decisions urgent.

Because of this intertwining of values with knowledge, a further complexity arises. Science can become the proxy for a values debate which is essentially independent of the science. The most current example is the apparent debate about whether or not there is anthropogenic climate change. Most of that debate is not really about the existence of climate change; rather it is a proxy for a public and political values debate about economics and intergenerational equity. As scientists get drawn into such a debate, they can lose their role as unbiased advisors and risk loss of public trust. Complicating the matter, complex science is based on variable data and advocates for any one position may choose selectively from this to make a point. The potential for values, beliefs and science to thus become conflated is almost inevitable and the public and policy debate becomes confused.

But to go back to what I see as the key question for a science advisor in such a situation: when is a particular body of scientific work adequately 'sound' to serve as the basis of policy? What are the risks associated with an erroneous conclusion in either direction? Let us look at the question of anthropogenic climate change through the lens of that question. If the scientific conclusion on the question is that there is a significant risk to the human and planetary condition through global warming, and actions are taken but the conclusion turns out to be incorrect, what are the costs of the incorrect decision? A change in the economic picture with costs incurred, but there are collateral benefits in terms of moves to sustainable energy, new technologies, and less environmental degradation. If on the other hand the conclusion reached from the science was that no mitigation was needed because



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anthropogenic climate change was of minor significance, then the consequences of error if the conclusions turned out to be wrong would be so much higher — the human condition as we know it would be threatened. Clearly the outcome of which decision is taken is asymmetrical. So if we take this example of post-normal science, given that the view of most scientists is that the world is warming at a rapid rate due to anthropogenic climate change, the decision to advise action is unequivocal. There remain values components to the matter which are not for the science advisor but for the politician and policymaker, such as how to balance intergenerational equity, although here the view might be influenced by advice on the likelihood of successful mitigation by technology. But again one suspects that that is largely used as an excuse to avoid decisions, to create political confusion, and also to avoid the far more complex and real issue for the global community of the tragedy of the commons.

In these matters of post-normal science the role of the science advisor as a communicator with both the policymaker and the public becomes critical. Science advisors must be explicit about the assumptions, limitations and uncertainties underlying the evidence and must present technological options in ways that allow the full range of their possible benefits or adverse effects to be appreciated. Remember, no science advisor is expert in everything they must advise on — indeed that is not their role. They must act as a broker between the science community and the policy framework. It is how that brokerage is conducted that is itself a key issue.

Roger Pielke in his book *The Honest Broker* distinguished between two kinds of advice about complex science: that of being the issues advocate and that of being the honest broker. The former is what it sounds like — the advice is proffered with the scientist having the goal of getting a specific outcome, and that is an inappropriate role for a person like myself. Issues advocates abound in science on either side of many complex debates: genetic modification is safe, genetic modification is not safe. Such advice is already conflated with the other ideals that policymakers must deal with. The honest broker on the other hand takes another approach. The evidence is summarised in a values-free way, insofar as that can be achieved: this is what genetic modification means; this what we know and do not know about GM food from the perspective of human health; this is what we know about the impact of genetic modification on ecological systems; and so forth. Values perspectives of what is natural or organic or clean or green and so forth are not directly for the science advisor, although how science is communicated to the public will influence the values the public consensus reaches at any point in time.

The science advisor must be honest in admitting the limits of knowledge but also be informative about the implications of what is known and unknown. This must include definition of the limits of knowledge and where biases could exist in evaluating and defining the range of options that arise from the analysis. At all times the advisor must be conscious of where values can enter into consideration and where they do not. In the end the key is to



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provide the scientific basis for options and to provide the basis for the policy process to proceed.

The science advisor must also acknowledge that many decisions that governments have to make are developed in an environment of limited available information, or where the use of science is unable to resolve competing policy options. There can be a seductive trap of being drawn into matters where science cannot provide answers. The classic example is the US debate over stem cells which has become conflated with a debate about perspectives on when life begins — not a matter open to scientific answer, at least in the framework in which that debate occurs.

The advisor must remember that science cannot be authoritarian and does not make policy; it informs policymaking. A purely 'technocratic' model of policy formation is not appropriate in that knowledge is not, and cannot be, the sole determinant of how policy is developed. In a democracy, governments have the responsibility to integrate into policy formation the other dimensions that I have already discussed, including societal values and public opinion. Advice must be phrased in such a way as to give confidence and authority to the policy advisor without usurping their role. The science advisor must be honest about the values dimension and act as an 'honest broker' providing options. It is how that is done that determines whether the advisor has the trust of the public and the policymaker. It requires skill from the advisor and a good understanding and integrity of bureaucrat and politician as well. But it must be achieved, for at the end policy formed in the absence of knowledge or without considering relevant knowledge is simply dogma and cannot serve the public well.

So now let me turn to the third question: How should science advice be incorporated into the New Zealand policy and political framework? This is the focus of my discussion paper, *Towards better use of evidence in policy formation*. That paper arose from 15 months of dialogue with officials in many departments in Wellington at both Chief Executive level and with officials who had responsibility for proffering scientific advice. It also benefited from considerable discussion with my colleagues in Australia, the US, Canada, the UK and Ireland and with a number of current and former parliamentarians from multiple parties.

I am not going to try and summarise the whole paper (which is available on the PMCSA website) but I will make a number of salient points which have either been made in the report or which have arisen from subsequent workshops I have had with several ministries as the paper was being discussed.

A key point is that the use of evidence and its formal inclusion into the policy framework is very variable across ministries. Often, evidence is not considered in isolation as a base knowledge; it is considered from the outset in a values-conflated manner in that scientific advice is not sought independent of the end-user. This risks issues advocacy rather than issues brokerage. There are few protocols in place that establish the basis for scientific advice; the most detailed have come through recent work from the former Ministry of



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Fisheries. I believe that it is timely that some generic policies are established across Government. Few departments have a person with the brief to act as science advisor and whose role is to ensure the quality and independence of scientific advice. Yet overseas this is becoming an essential part of policy frameworks. It is perhaps most well established in the UK where all government departments now have a science advisor and support structure; these have an enshrined level of independence and are generally part-time academic positions for a defined term. They report both to the Chief Executive of the Ministry and to the Chief Scientific Adviser. The latter report line is there to assist in ensuring independence and also to create a community of science advisors. This community serves two critical purposes: first, to ensure cross-departmental coordination, and second, to act collectively as a strategic foresighting unit identifying what research the country needs for its own benefit. This is a major deficit in New Zealand where we have no real community of science advisors. Indeed, most who have this sort of role at some level had not met each other until I held a couple of workshops in advance of this paper. Their relationship to management is unclear and their input into the collective research needs of government is non-existent.

Add to this the sad reality that unlike other public services we have very little or no rotation between the state sector, the private sector and universities, and even where there are scientifically qualified staff within departments they are remote from the actual progress within their disciplines. There is little quality control on departmental research. Frustration abounds at the dislocation between evidence and policy formation, and this too is identified in the Scott report.

Government is a significant purchaser of research both through its funding agencies and directly from departments. The funding agencies have little or no connection with the process of identifying the needs of the State as an end-user, even though the Crown itself has a primary need for knowledge in areas such as environmental and resource research and particularly in the field of social research. Departmental purchase of research is haphazard and I make extensive suggestions regarding how we might improve it. There is no standard process for research purchase; there is no register of what research is done; and best practice approaches to peer-review both on starting the research and reviewing its conclusions do not exist. This is particularly evident in the social departments where the relevant expenditure is certainly in tens if not hundreds of millions, but I suspect the same issues hold true in other clusters, e.g. the natural resource departments. Most of our research is of value to more than one department but it is not always available or designed with multiple users in mind.

I suggest some solutions to these issues. As also detailed in the Scott report, a much more joined-up approach is possible. At a minimum I think we need to see major departments or clusters of departments have a chief scientist. I would like to see a community of such chief scientists working to identify the strategic information needs for Government's longer term decision-making and to establish tighter protocols for values-free advice on shorter-term matters. I think the nation would benefit from developing a culture of rotation between



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public, private and academic sectors. I am pleased that the new Statements of Core Purpose for CRIs establish a clearer obligation on them for providing advice in their sectors of expertise.

There is a broad consensus that science and innovation are critical to addressing our productivity gap and in advancing New Zealand's social and environmental conditions. In encouraging me to undertake this project, the Prime Minister was recognising that science and technology are at the heart of every aspect of New Zealanders' lives, the challenges faced and the solutions needed. And it would seem self-evident that all stages of policy formation and evaluation should use knowledge optimally to achieve the best outcomes. This should be true of a government of any political orientation.

It is clear that there are deficits in how Government obtains and uses knowledge and evidence and this must affect the quality of policy formation. My work has suggested a collection of relatively low-cost measures and an attitudinal shift that could, over time, advance the quality of policy advice, and thus assist the capacity of future governments to improve our national condition.

Thank you.

-ENDS-



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