



OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE

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As the first Science Advisor to the Prime Minister of New Zealand, one of my key responsibilities is to promote an understanding among politicians, officials and the public about the role of science, technology and innovation in the modern world.

We are at danger of underestimating how much the nature of science has changed; it used to be focused on linear questions, which aimed for reductionist precision. As a result science was authoritative, definitive and largely accepted by a different public. But much of science has undergone radical change. It 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, involving food security, genetic modification, chronic disease and of course climate change.

Such science is now intimately linked to 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 them must be values-free. But an additional factor now arises, 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 supplant—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 much uncertainty is acceptable? What are the risks associated with an erroneous conclusion? When is a particular study reliable?

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 policy makers 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 in the understanding of science by modern society.

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 are in dispute, stakes are high and decisions urgent.

Importantly such science requires expert advisors to be more sophisticated in the way that they communicate with policy makers and have a dialogue with the public. They must be explicit about the assumptions, limitations and uncertainties underlying the evidence and present technological options in ways that allow the full range of their possible benefits or adverse effects to be appreciated.

Co-incident with this shift in the nature of science has been greater public access to information of varying reliability via the internet that has resulted in greater expectation by the public to be engaged. A further danger is that science can become the proxy for a values debate which is essentially independent of the science. An 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 losing 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.

What becomes clear is that good communication is essential to deal with these matters. But this is occurring against the background of scientists being poorly trained to communicate, a public with variable scientific literacy, and a media which is increasingly unfiltered and has lost its role of discerning reliable from non-reliable information. A further challenge occurs when science and popular belief and/or folk-wisdom clash. And we have recent examples such as debates over the State funding of alternative medicine which have occurred in the UK, or the issues surrounding the predictions of aftershocks after the Christchurch earthquakes.

This issue of how to position science and the science advisor is challenging; there is a fuzzy boundary which one must not cross if one is to keep the public's trust and thus serve the role which clearly is required in modern democracy. Where the task is about linear science the challenge is generally one of reliable and explanatory transmission. But when it is about post-normal science, 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 when they do not. In the end the key is to provide the scientific basis for options and provide the basis for the policy process to proceed.

It is important to remember that science cannot be authoritarian and does not make policy—it informs policy making. 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 other dimensions into policy formation, including societal values, public opinion, affordability and diplomatic considerations while accommodating political processes. Advice must be phrased in such a way 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 policy maker. 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.