OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE

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Sir Peter Gluckman's address at the 1st Annual Meeting of the New Zealand Greenhouse Gas Research Centre, Palmerston North

'New Zealand science and our international connections; science 'globalisation' is the future'

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Thank you for this opportunity to speak.

The GHG consortium is the centerpiece of a major New Zealand commitment to take its global citizenship obligations seriously with respect to those issues associated with climate change. It of course has multiple dimensions. As a small nation we must compete hard to maintain our relevance in a world where we can easily be forgotten. We have to demonstrate that small countries can indeed, make a difference. As a country that has such a high proportion of its GHG emissions associated with agriculture, taking such a lead is pre-emptively protective in assuring that we are not put at any trading disadvantage by misinformation in our major markets. Significantly, it also demonstrates that research led from New Zealand can assist many less-developed countries that are struggling with their own commitments to reduce GHG emissions. Indeed, it is research such as that which we are doing that will allow many such countries to feel more able and comfortable in joining a global undertaking. Such effort for New Zealand is not entirely one way; almost certainly there will be commercial advantage to our food and farming and agritech sectors brought about by the new technologies we will develop based on New Zealand research expertise in pastoral and forage agriculture, which is without peer. In this way, through research with a translational focus, we can be certain that we can ensure vibrancy despite the inevitable growth in public concern about the costs of impacts of climate change.

This engagement in climate change research is but one example of the increasingly significant nexus between science, diplomacy and globalisation. Much of my time is now spent on that interaction as co-chair of the Prime Minister's International Science and Innovation Coordination Committee. I returned yesterday from a round of meetings in Washington and at the United Nations on this very topic. I want to spend a few minutes expanding on this topic before returning to some key issues relating to climate change.

There are multiple dimensions to this nexus.

Diplomacy has of course helped science for decades. Many big science projects such as the international space station and widespread disease eradication, for example smallpox, campaigns have only come about because of the efforts of diplomats in supporting scientific

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progress. Many scientific collaborations are assisted by diplomatic processes. For example, the European Union framework grants arose from such diplomatic process in creating a new form of grant. The New Zealand government supports our membership of many international scientific organisations such as International Council for Science, set up in 1931 and its constituent parts.

But conversely, there is increasing interest in the role of science for and in diplomacy.

It is no accident that, science has now become part of nearly every bilateral agreement New Zealand enters into. All nations see science and innovation at the heart of future economic growth and as international relationships are developed science often plays a major role. In our case, in the past decades, the role of Antarctic science strengthened our relationship with the USA when there were other sources of tension. But science can also help build new relationships with countries such as China. Here the science has multiple values. It creates links at the personal level but also because science leads to innovation, such activity creates economic and trading opportunities.

For New Zealand this is increasingly important because, as a small country, we must work to protect our interests and maintain our presence on the world stage. Science has an increasing role in this. Our science is good and we now have scientific collaborations with nearly 100 countries, both developed and underdeveloped. Such connections build bonds as well as create opportunities for other sectors of the economy and in turn create employment and well-being. It is anticipated that the Square Kilometre Array telescope project may reflect such benefit.

Science also serves diplomacy in other ways. For example, the science of nuclear verification is the key to modern arms treaties. In this vein many of the activities of the Greenhouse Gas Global Alliance will serve to support whatever international agreements are implemented to help to reduce greenhouse gases emissions. The nature of international aid is also changing. We now see science-based programmes at the centre of much agency and foundation aid and much of my time last week in the USA was spent discussing how we in New Zealand can pursue science in cooperation with our partners to advance the lot of those nations that we have a moral and political obligation to help. As the issues of food security, water security, adaptation to climate change, and dealing with the burden of non-communicable disease get greater in the Asia-Pacific region generally, we must increasingly use science to respond to these challenges.

So what should drive our international science priorities?

The answer is clearly multi-dimensional. It is a complex matrix and the drivers for scientists, businesspersons and diplomats are all different, yet science has a central role to play irrespective of the perspective. In general, scientist-to-scientist relationships need little encouragement at least with our traditional partners, but New Zealand's future is likely to be increasingly in Asia and we need to build more bridges with that part of the world. In this regard it is pleasing to see the number of Asian countries that have joined the Global Research Alliance. However, it is also important to ensure we are partners in various funding and internal infrastructure programmes – such as the synchrotron which we share with Australia.

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The Global Research Alliance itself is where New Zealand is taking a lead role in ensuring that international collaborative research occurs. Already some pilot grants are in place.

Throughout such consideration, a key priority must be to use science to create truly innovative partnerships that will drive opportunities for us to export value-added goods. Take the UK for example. We have extraordinarily good relationships with this country at the scientist-to-scientist level, but we have not realised the full potential of these networks to move New Zealand more towards innovative and knowledge-based exports. As we develop closer links with the international science, innovation and business communities, such opportunities are essential.

Knowledge is global and it is the use of such knowledge to add value to our production that will strengthen our economy and protect our social and environmental development. By being strong in science and innovation we protect our position in the world and our relevancy.

All the big challenges we face involve science and technology, and I cannot leave this meeting without saying something about the public perceptions around anthropogenic climate change. Yesterday I spoke in Auckland to the Association of Science Communicators and talked a lot about the challenge of science communication, particularly when dealing with complex non-liner science and the problems of post-normal science.

Science in much of the last two centuries has been dominated by linear observation, hypothesis development, testing and re-evaluation of hypotheses to produce scientific facts that have been associated with increasing certainty. However, since the explosion of quantum physics, biological and ecological science, the science being considered no longer fits that paradigm easily or neatly.

We are now addressing complex systems with many feedback loops and interactions. Reductionist science may identify individual particular processes but the scientific challenge now is to come to grips with the overall systems into which such processes fit. This is not just about simple measurement error; it is about incomplete knowledge of the system and its complexity. The effects of confounding interactions cannot be precisely predicted; rather in such cases science has had to be developed to deal with probability, prediction and risk. Such endeavour is based on the use of models that incorporate what is known and what is uncertain, and are subject to ongoing revision and refinement. Climate change prediction is a perfect example of this.

Post-normal science is a similar concept. It is a term introduced by Funtowicz and Ravetz to describe science which is characterised by complexity and uncertainty, but also where various societal values intersect strongly with how the science is interpreted and used. Thus the issue is deeper than simply describing the phenomenon. The interaction between science and values is complicated, emotive and growing. There is quite a list including – climate change, obesity, food security, GM technology, reproductive technologies, and using nuclear energy to address the carbon crisis. Each of these are examples where science cannot not act independently of community understandings or values. A core principle of such a required process is to conduct

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science in the absence of personal agendas. Yet it is easy to see how these can become conflated within the post-normal paradigm.

A debate about values and a debate about knowledge about the natural world are not the same thing, even though protagonists on either side may wish to co-opt the other. We saw this in the abortion debates in North America and in the GM debates here. Science cannot answer the question of whether abortions are acceptable or not and at the same time it is a cop out to pretend the debate is one about when life begins – life of course, is a continuum over the past 3 billion years. Similarly in the GM debate, no matter what the evidence is about the safety of GM food and even if the ecological concerns were satisfactorily addressed, the debate would remain unchanged between different values ; those who want to preserve certain perceptions of the world as unaltered and those whose who claim manifest advantages offered by the use of the new technology for reasons of food security or economic development. A recent report from the UK chief scientist Sir John Beddington on food security has thrown this debate into sharp focus.

Because complex science is conflated with a values debate, the risk for confusion is manifest. There is a propensity for confusion in the media, confusion in the public and confusion as to the agenda of a particular protagonist. Complex science invites cherry-picking of a particular result, it is wide open to denial or exaggeration because it deals with probabilities and risk.

We have seen all this in the last 18 months during media fueled argument about climate change and anthropogenic warming. No-one who has properly reviewed the scientific literature can deny that the world‘s climate is changing rapidly and that anthropogenic warming is the only explanation. The evidence grows, but the problem remains that it is complex science with unknowns and inevitable gaps in the models. People will only really know what happened in 2050 in 2051. We have undoubtedly seen multiple agendas in play. There are those who wish to push for urgent action on the prudent basis that if we do not act now to mitigate, then adaptation later may be too hard. Conversely others believe that because the science is complex and we can afford to wait. There is also a group that has values or incentives not to make change now because of more immediate interests, generally economic. Often the last group uses scientific-type arguments to obscure their underlying concerns.

The test for scientists is how to communicate to the public within this context and I refer you to my speech delivered yesterday for a discussion on this matter. But a related subject is that of integrity in the science process. A key to this is peer review, but also central to that is ensuring that science is presented free of bias and agendas. Often this is unclear. The recent book, *Merchants of Doubt*, highlights many stories of where science and personal agendas have become entangled. Climategate brought that to the fore. I do not want to rehearse that story, but while the science underlying it was secure, the challenge to the science system to deal with the new world of the blogosphere and open information was and is, very difficult to handle. The result has been total confusion by the public on a matter that need not have occurred. The science at an integrated level is not particularly confusing. Yes the uncertainties are obvious but the likely scenarios are what the public has a right to understand. Again both the scientist and media were at fault and I refer you to my comments yesterday – of course they are on the web!

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There are many issues such as who owns data, how can science cope with open access commentary, how to relitigate data, how to cope with the high publicity given to cherry-picked data and so forth. I do not think we have worked these issues through yet – they are on every science advisor's agenda but the answers are not easy.

Science policy has to deal with such problems. However, it is important to realise that science does not make policy. Politicians have to make their choice amongst options based on the knowledge available, their assessment of risk, assessment of benefit for the public good, and prevailing public opinion and values. We have made other choices on that basis; we allow IVF, we allow abortion, we restrict GMOs and nuclear power, we tax tobacco heavily and so on. But in the case of climate change it is even more complex – for I must return to the first part of my talk – climate change and the associated problems of food security, water security, energy security and population increases are a global problem.

There will be geopolitical consequences if these issues are not addressed as best we can. New Zealand must protect its place in the world, politically, as a free trader, as a voice for reason, and as a smart nation increasingly relying on its brains for innovation led economic growth. The Greenhouse Gas Center is an important part of that effort.

Thank you.

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