Friday, 16 December, 2011

Dr Peat Leith[1] and Associate Professor Sarah Jennings[2]
1. Research Fellow, Institute of Marine and Antarctic Studies and Tasmanian Institute of Agriculture, University of Tasmania.
2. Head of School, Economics and Finance, University of Tasmania

Barriers to Effective Climate Change Adaptation
Productivity Commission
LB2 Collins Street East
Melbourne Vic 8003

SUBMISSION TO PRODUCTIVITY COMMISSION REVIEW OF CLIMATE ADAPTATION POLICY

Dear Commissioners,

We are pleased to have this opportunity to submit comment on climate adaptation policy in Australia. As social scientists who have worked on various aspects of climate adaptation for many years, our key focus in this submission is on ways to overcome structural and institutional barriers to the application of good scientific knowledge to decision-making for climate adaptation. We recognise that this is only one element that effective climate adaptation policy needs to encompass, but consider it as a fundamental. This submission represents the perspective of the authors and not necessarily the views of the organisations with which we are affiliated.

Overview:

To date, the lion's share of government intervention for climate adaptation has been through funding research, principally biophysical science to reduce uncertainties around climate and related predictions. This intervention is rationalised in the normal way: public investment in such research is warranted because the market consistently fails to provide sufficient incentives for the private sector to produce the socially optimal amount of information, thereby preventing adaption proceeding effectively and efficiently. The argument we put forward in this submission, on the basis of mounting national and international evidence, is that while the quantity of good quality information does present some limitation to decision-making for adaptation, of at least equal concern is the translation of what information is available into actionable knowledge. Addressing this challenge requires a mix of interventions, most importantly an effectively targeted science policy for adaptation. Such science policy would develop appropriate structures and institutions for extension and 'boundary- spanning' both across scientific disciplines and between domains of research and decision-making. A key aim of effective science policy must be to develop capacity to use complex and contingent information to make decisions under conditions of uncertainty. The lack of such capacity is a fundamental limitation on climate adaptation in areas of natural resource management.

Here we draw on examples relating to the management of Australian fisheries to argue that, a key missing activity in many sectors engaged in natural resource management, is effective extension and boundary-spanning. Such work provides a conduit for information and knowledge exchange in both directions across traditional boundaries between science, policy and practice. If well structured and institutionalised such work also enables better articulation of research problems and agendas with societal values and concerns, while developing trust across public and private spheres, and enhancing the value of scientific research among decision-makers.

The argument for improved extension and boundary-spanning as fundamental to action for adaptation is based on empirical and theoretical work and deserves careful consideration in this policy review. The argument is laid as follows:

1. **Scientific information is necessary but not sufficient to enable adaptation decisions**: There are very high transaction costs associated with gathering, analysing, understanding and interpreting scientific information about climate impacts and sensitivities for natural resource management. In fact, much potentially relevant information was never produced to be used by decision-makers. Societal models of what science actually does and potentially can do tend to be skewed, making uncertainty appear as something that can and should be eliminated by more research. Meanwhile, current incentives for science create directed research that does not usually address key societal concerns. Researchers are incentivised mainly to produce peer-reviewed journal articles or deliverables for government agencies. Consequently, activities giving rise to these outputs will be prioritised over those delivering outputs to users. Acknowledgement of this has underpinned success in Cooperative Research Centres and agricultural and fisheries research for decades through the structure of RDCs. It has yet to be successfully applied to adaptation science in a formal and coherent manner.

2. **Climate change is not just a biophysical issue, but a complex social-ecological one**: Climate change is both a biophysical and a socio-political issue which means that science alone is not enough to inform natural resource decision-making. Science needs to dovetail with other societal processes and perspectives in order to deal effectively with such complexity and contingency. This requires, at least to some degree, the resources of large public institutions to review, augment and build capacity in professional consultancy and among decision-makers. It also suggests a strong imperative for trans-disciplinary climate and adaptation research, and the need to embed these skills in scientific education and training curricula and courses.

3. **The need to develop adaptive capacity across governance systems:** There is a lack of societal capacity to deal with complex and uncertain information to make decisions about the future. Risk management tends to be a based on probabilistic predictions, but many local and regional scale climate impacts are too uncertain or indeterminate to allow probabilities. The ability to develop capacity for decision making about controversial societal issues in the face of such radical uncertainty needs to be considered in any adaptation policy development.

The remainder of this submission details these points via evidence and examples. We suggest that these issues, taken together point to a need for greater consideration of the interface between policy initiatives, particularly the interactions between extension and science policy for adaptation.

Scientific information is necessary but not sufficient to enable adaptation

Science by itself does not enable good decision-making. It is obvious that decision-makers need to be able to access scientific information in forms that are accessible and useful. Yet too often the incentives for scientists in public institutions encourage them to engage in a conversation largely with one another through the peer-reviewed literature. Action to engage decision-makers in the process of research is often in spite of, rather than because of, the incentives in place. This is a key reason that Research and Development Corporations in Australia are set up with lines of accountability to primary industry and to government. Such structural arrangements create an imperative for extension and thus ensure that a greater proportion of science is informed by the so-called 'needs of end users'.

In Australian fisheries, the traditional model of the relationship between science and management has been oriented by the regulatory role of government. Thus, research agencies conducting work on specific fisheries have tended to have strong links with the government regulator. The governing

system is often seen as removed from the system to be governed – the fish and fishers. Yet, with increasing emphasis on co-management (in part driven by governments trying to recoup the costs of fisheries regulation) the fishers, primarily through their representative bodies, are increasingly integral to management and management decisions. Governance of fisheries is also becoming more distributed through the increasingly active role of NGOs through, for example, market campaigns and engaging in policy deliberations.

In a series of round table dialogues about the key priorities for climate adaptation around Australia[i] this notion of distributed governance of fisheries was an underlying theme. In order to build capacity for change and a polity for the acceptance of action on climate change, participants most often suggested that increased levels of engagement between scientists, public and private sector managers and fishers themselves was the key priority. Communication, education and consultation were cited as central concerns.

Climate change is not just a biophysical issue but a complex social-ecological one

In his book *Why we disagree about climate change*, Hulme (2009) demonstrates some of the many aspects of climate change which make it a difficult issue to work with at a societal level. Reflecting divergent societal perspectives on climate change, effective science- resource manager engagement often involves not talking about climate change *per se* because to do so may alienate the audience – who may be sceptical of the reality of anthropogenic climate change. Instead effective science-manager engagement often works from the basis of system dynamism and variability and the potential for system changes, whether these are gradual or steplike changes. For example, the inter-disciplinary work of Pecl et al. (2009) engaged fishers and managers in considering the impact of climate on the broad Tasmanian rock lobster management system, and incorporated perceptions, aspirations and pragmatic decision-stakes of fishers. In doing so, they appear to have successfully contributed to assisting fishers and managers to think more systematically about variability and change in the fishery system and possible strategic interventions that can be used to manage risks and take advantage of opportunities. Such practical scientific engagement builds capacity for adaptation that is often hard to measure and occurs over timescales which do not correspond with specific project funding cycles. The legacy effect of such projects requires greater attention in developing incentives in the context of science policy. Yet, there is also a clear need for the metrics of success for such trans-disciplinary science to be broadened. In the United States a National Science Foundation research program on the Science of Science and Innovation Policy (SciSIP) has gone some way to develop new mechanisms for Science Policy that provides for the incentivisation and reward of science with substantial societal outcomes (e.g. Bozeman and Sarewitz, 2010). Such work points to some of the variety of processes, institutions, structures which can better integrate scientific activity with the demands of decision-making.

A useful ways to describe how such processes, institutions and structures fit into the broader research domain is to make a distinction between 'science for adaptation' and 'adaptation science'. Science for adaptation may contribute to the development of adaptation options or strategies, but is oriented principally to the production of general risk information. It is often disciplinary research aimed at reducing uncertainties or producing predictions, projections or forecasts. For example, climate modelling may inform adaptation options in fisheries but is rarely done specifically for this purpose. Thus science for adaptation must be made applicable to specific adaptation contexts for it to be useful. Adaptation science is work that is undertaken to better understand specific situations and define workable adaptation options or pathways with participants in a trans-disciplinary manner (Meinke et al., 2009). Adaptation science thus draws together and integrates various forms of science for adaptation, and applies these lessons in a participatory setting to specific situations, working collaboratively with specific stakeholders. Its aim is not to predict, but to create adaptation options for

policy and practice that enable. It is an engaged, outcome-focussed, process-oriented, and distributed science that does not privilege lay, scientific or managerial knowledge but seeks to accommodate each through dialogue. Adaptation science is trans-disciplinary, in that it works across traditional academic disciplines and discourses and engages communities of practice, place, or interest in developing useful and useable knowledge (Cash and Buizer, 2005; Buizer, Jacobs and Cash, 2010). Effectively resourcing adaptation science requires institutional design that incentivises adaptation research to span boundaries between science, policy and practice in order to develop research projects and programs which are effectively embedded in the world of decision-makers, and are trusted, relevant, credible and legitimate (Cash and Buizer, 2005). Such organisations are often referred to as boundary organisations.

A practical example of an effective boundary organisation working in the marine environment is Tasmania's Derwent Estuary Program (DEP). The DEP is a partnership between the Tasmanian Government, local councils that fringe the Derwent River and estuary, and a variety of corporate and non-government bodies. A key part of its work is translating science about the state of the Derwent into knowledge that can be understood and used by its partners and stakeholders. One example of such work is its application of complex technical outputs from CSIRO's monitoring and modelling program, INFORMD, to create a basic interpretation of the safety of swimming conditions at beaches on the Derwent Estuary via a stoplight notice board (green – good, yellow – caution, red – not safe to swim). The DEP coordinates research, convenes meetings among partners and stakeholders, enables volunteer programs, translates science to partners and builds a greater societal awareness of the issues that affect water quality in the Derwent. These 'boundary spanning functions' build capacity across science, policy and society by creating opportunities for different groups to be informed about different needs, knowledge and perspectives. In fisheries management, management advisory committees can serve a similar role as they often include diverse stakeholders and perspectives. However, they tend to lack the extension capacity that enables societal learning which in turn facilitates related voluntary action. Evaluation of outcomes from such work is much harder to quantify than typical research outputs, largely because it includes impacts on social capital and increased capacity of governance networks. Nevertheless, work on evaluating the success of these projects in ways that are salient to the state are developing (Innes and Booher, 2004).

Developing adaptive capacity across governance systems

The Issues Paper for this Inquiry correctly suggests that irreducible uncertainty is a key impediment for adaptation. However, such uncertainty creates an imperative not only for defining 'no regrets' options but for enabling adaptive management. Such adaptive management treats policies and strategies as experiments to be tested through the rigours of an uncertain future. This reframing emphasises that it may be more useful to think of evaluations of adaptation in terms of how adaptable individuals or groups are, rather than how well adapted they are. The imperative is not to get the answer 'right', but to acknowledge that there is no right answer and that it will be necessary to create structures and institutions that can change as, and when, the need arises. For example, fisheries management systems that have strict quota systems and acrimonious relationships between public sector managers and industry bodies will typically be less nimble and flexible in the face of change than those where a productive adaptive co-management system is in place and there are strong trusting relationships between public and private sector managers, and scientists. Many climate change impacts occur as extreme or unprecedented events, rather than gradual, incremental change. Flexibility and the capacity to negotiate tactical changes may be more integral to successful adaptation than the adoption of specific practices or instruments that are more oriented to specific, predicted changes.

Wrap-up

The policy considerations highlighted in this submission may not be typical of those usually considered within Productivity Commission reviews, but adaptation is not a normal policy problem. Uncertainties about exactly what it is we are adapting to, and the distribution of responsibility for such adaptation across a wide governance network create an imperative to build capacity to adapt. We have historically applied a linear model of science producing information as a public good, and then decision-makers from public and private sectors taking up and applying that information in an appropriate manner. This approach is severely challenged when the level of uncertainty about risks is as great as it is with climate adaptation. In such a situation, the common call from scientific agencies is that we should invest more in science to reduce uncertainties. Yet the reduction of uncertainty, while valuable and necessary, on its own is not sufficient to effectively underpin .adaptation policy in Australia. A key challenge for adaptation policy is to develop information along with effective communication and boundary spanning through which trust can be developed. Thereby information can become relevant and useable to the decisions faced by public and private sector managers. Also through appropriate structures and institutions, negotiation of possible contingencies associated with such decision-making can be evaluated across a broad-ranging field of expertise. Through such work adaptive capacity may be built that will better enable the barriers to adaptation to be negotiated across public and private sector agencies.

We have outlined a case for greater investment in partnerships that enable adaptation through the development of adaptive capacity. This approach is based on pervasive themes emerging from our engagement with key stakeholders in a variety of settings: communication, consultation and education are widespread concerns. Building capacity to span boundaries between sciences, policy and practice is best achieved through institutions and structures which incentivise such work. In particular it requires careful consideration of science policy aspects of adaptation policy to create an appropriate balance between science for adaptation and adaptation science.

Dr Peat Leith

Research Fellow

TIA/ IMAS, University of Tasmania

Dr Sarah Jennings

Head of School

Economics and Finance

University of Tasmania

References

Bozeman and Sarewitz (2010) 'Public Value Mapping and Science Policy Evaluation', *Minerva*, pp1-23

Buizer, Jacobs and Cash (2010) 'Making short-term climate forecasts useful: linking science and action', *Proceedings of the National Academy of Sciences,*

Cash and Buizer (2005) *Knowledge-action systems for seasonal to interannual climate forecasting*, National Research Council, Washington D.C.,

Hulme (2009) *Why We Disagree about Climate Change: understanding controversy, opportunity and inaction*, Cambridge University Press, Cambridge, UK

Innes and Booher (2004) 'Reframing public participation: strategies for the 21st century', *Planning Theory & Practice,* 5, 4, pp419 - 436

Meinke, Howden, Struik, Nelson, Rodriguez and Chapman (2009) 'Adaptation science for agriculture and natural resource management— urgency and theoretical basis', *Current Opinion in Environmental Sustainability,* 1, pp69-79

Pecl, Frusher, Gardner, Haward, Hobday, Jennings, Nursey-Bray, Punt, Revill and van Putten (2009) *The east coast Tasmanian rock lobster fishery – vulnerability to climate change impacts and adaptation response options*, Report to the Department of Climate Change, Australia,

[i] In October and November 2010, the Marine Adaptation Network for Marine Biodiversity and Resources convened a series of focused 'roundtable' discussions with key marine stakeholders around Australia. The objective of these roundtables was to assess key priorities for groups attempting to adapt to climate change impacts on the marine environment. The roundtables focussed on five marine sectors – marine aquaculture, commercial fishing, recreational fishing, marine conservation and marine tourism and were comprised of senior representatives across these sectors and among industry, government, and non-government organisations (NGOs) leaders.