Alternative System Views of Climate Change in the Central West of New South Wales (Australia)

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EXTENDED ABSTRACT

The interrelationships between humans and nature are an essential element of the culture of Aboriginal peoples. In contrast to 'western' or 'European' utilitarian views of ecosystems, Aboriginal peoples value landscapes in a more integrated and holistic style.

Following European settlement of Australia, policies and actions for natural resource management resulted in fragmentation of people from their landscape and fragmentation in the management of natural resources. This contrasts with the Aboriginal people's holistic view of the land. Holistic system views are more akin to the modern approach to sustainable development of landscapes; however, our understanding and our actions in managing landscapes are still disjointed. Increasingly, the knowledge of Aboriginal people and their approaches to natural resource management (NRM) are being recognised in the governance structures of Australia.

Climate change is an emerging threat to both humans and natural systems, particularly in environments already stressed by past land management practices. In this paper, we present both Aboriginal and non-Aboriginal conceptual understandings of a system under the threat of climate change, and we discuss how Aboriginal knowledge can add to our understanding of climate change impacts in Australia. Our focus area is the Central West of NSW, a system with a developed rural economy and ecological values of international significance.

In order to assist local catchment managers in the Central West with planning for climate change, a study was initiated to develop a decision support system to investigate outcomes of climate change, focussing on the Macquarie River and the Macquarie Marshes (Tighe *et al*. 2007). Two stakeholder workshops were initiated to (1) investigate alternative value systems and how people relate to ecosystems and (2) document different understandings of the potential impacts of climate change in the Macquarie River and Marshes. The outcomes of these workshops are presented here.

In this paper we argue that greater regional engagement of stakeholders is required to better understand, predict and adapt to the impacts of climate change. Future changes in climate are likely to pose serious challenges to environmental management, and the nature of these risks is still poorly understood. As well as changing the biophysical landscape, climate change is going to impact on community values, land ethics (i.e. nonhuman members of the biotic community) and sense of place. In undertaking a regional assessment of climate change, it is important to consider the diversity of values across the community.

In addition to consideration of indigenous values, as part of community values, indigenous knowledge can also play an important role in improving our knowledge of how to adapt to climate change. Many of the climate studies undertaken to date have largely been the domain of scientists. However, local regional knowledge of systems, including indigenous knowledge, can complement many of our scientific understandings and assist in regionalised adaptation strategies and vulnerability assessments.

The information documented in this paper was used to develop a DSS to assess climate change impacts in the NSW Central West. For more details on the DSS, see Tighe *et al.* (2007).

1. INTRODUCTION

The Central West region of NSW, and in particular the Macquarie River area, includes significant agricultural industries, regional urban centres and high value environmental assets (including the internationally significant Macquarie Marshes), which have specific water requirements (Hassall & Associates Pty. Ltd. 1998).

Towards the terminus of the Macquarie River is the Macquarie Marshes, a significant ecological feature recognised as an important bird and animal sanctuary. Part of the wetland area was RAMSAR listed in 1986. Over time, the wetland has become highly degraded, with a reduction in high flows reaching the system due to water diversions (Kingsford 2002).

Over time, land use and past management regimes in the NSW Central West region have lead to a gradual decline in system health. In the Macquarie River (Figure 1) flow regimes are highly altered, water quality has declined and an increase in algal blooms has been observed (Chessman *et al*. 2003).

Climate change in the Central West has been identified as a potentially threatening process by the Central West Catchment Management Authority (CMA) and research groups including the CSIRO (CSIRO 2007).

To assist catchment managers with planning for climate change, a study was initiated to develop a decision support system (DSS) to investigate the impacts and outcomes of climate change, focussing on the Macquarie River and the Macquarie Marshes (Tighe *et al*. 2007). Two stakeholder workshops were initiated to (1) investigate alternative value systems and how people relate to ecosystems and (2) document different understandings of the potential impacts of climate change in the Macquarie River and Marshes. These workshops helped define the scope of the DSS. The results of the workshops are presented here.

2. CLIMATE CHANGE IN THE CENTRAL WEST

Current knowledge relating to the Central West region suggests that climate change is likely to result in: decreased annual rainfall, warmer and drier summers and winters, increased evaporation, increases in extreme heat, extreme winds, and fire risk, and less water flowing into streams and rivers (CSIRO 2007). There are concerns that these climatic changes will lead to changes in environmental and ecological processes, rural agricultural productivity, human wellbeing and values. For more information on climate change in

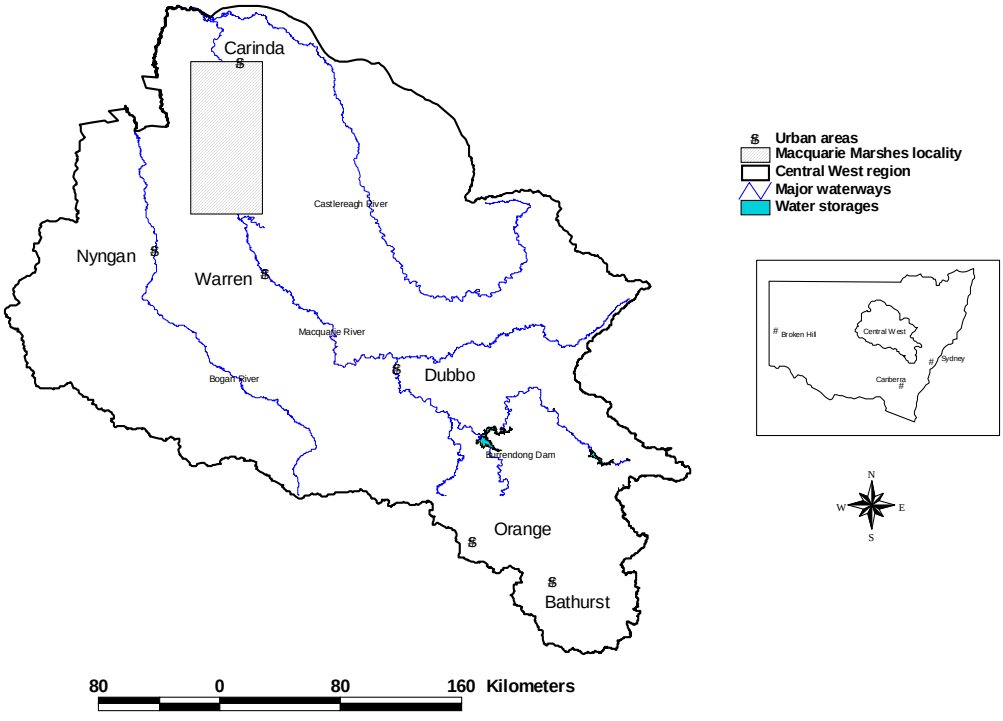

Figure 1.Study area in Central West of NSW.

the NSW Central West, see Tighe *et al*. (2007).

Assessments of the adaptation potential and vulnerability to climate change are largely the domain of scientists. Few studies have used the knowledge and concerns of broader stakeholder groups on how climate will impact regional natural resources to compliment scientific understanding.

3. NATURAL RESOURCE MANAGEMENT

Before European settlement, indigenous people had a role as environmental modifiers in the Australian landscape. Indigenous people were known to modify aquatic environments to catch fish, and played a role in the ecology of rivers, wetlands and lakes (Humphries 2007). The influence of Indigenous people on the abundance and diversity of animals has been widely debated. Much evidence exists to demonstrate that in the European post-settlement period, aquatic (and terrestrial) resources have declined in extent and health. For example, native fish stocks became severely depleted in freshwater systems of the Murray Darling Basin due first to commercial fishing (see Humphries (2007)) and later because of river regulation.

3.1. Non-indigenous perspectives

Conventional knowledge systems for NRM practices are based on the assumption that the inherent variability of our natural systems can be brought into a state of equilibrium. As a result, the focus of natural resource management has been on establishing a steady state (such as regulating river flows) in order to maintain a predictable (Kingsford 2000) and highly productive agricultural system.

3.2. Indigenous perspectives

Indigenous or traditional knowledge systems are based on a cumulative, collective body of knowledge, experience and values held by societies with lifestyles that were once or continue to be subsistent (Berkes et al. 2000; Ellis 2005; Horstman Wightman G.; Kendall 2005). This knowledge and information in the form of myths, practices, values and beliefs was gathered over generations (Berkes et al. 2000). The holistic conceptualisation of the relationship between humans and the environment in which they live, and the spiritual connections and cultural beliefs that are explicit in indigenous knowledge systems is a major point of difference between indigenous and non-indigenous ways of thinking. These constructs are receiving more attention and have an important and growing role in environmental decision making processes that strive for a more cooperative approach (Ellis 2005; Kendall 2005).

Furthermore, the structures and applications of traditional knowledge are quite unlike those of the modern scientific knowledge model (Kendall 2005). Not only is indigenous knowledge inherently holistic in its outlook but it is often adaptive in nature (Berkes *et al*. 2000). However, many traditional practices are regarded as unsubstantiated from an ecological viewpoint based on current scientific knowledge.

4. METHODS OF ENGAGEMENT

In the past, decision analysis was considered a complex, technical, scientific-based exercise and decision-making was the domain of government bureaucrats and managers. Modern decision analysis and decision making reflects on-ground processes which are increasingly sensitive and supportive of value-based dialogues (Failing *et al.* 2007).

Two workshops were conducted in the study region. The first was held with non-indigenous landholders and agency staff in the region, and the second was held with indigenous representatives and agency staff in the region. Workshops were designed to elicit participants' perceptions of the impacts of climate change on regional values, and their ideas about the type of information needed to enhance / improve management responses to climate change. These two workshops allowed us to gain alternative perspectives of climate change in the study area.

The approach taken in each of the workshops was to define system values (environmental, social and economic), identify existing activities that currently threaten these values, and discuss the implications of climate change for the study area.

Workshop processes were structured around three questions:

- *What do you consider to be the important values in the Macquarie River and the Macquarie Marshes?*

- *What activities do you believe threatens these values?*

- *Considering climate change, what changes in the Macquarie River and Macquarie Marshes are you most concerned about?*

By asking participants to articulate values within the NSW Central West region, the endpoints of

concern for conceptual frameworks were identified. The activities and processes that were seen as threatening these values formed the causative factors. This formed the structure of the DSS (Tighe *et al*. 2007).

5. SYSTEM VIEWS

A dialogue based on the three questions above was initiated in workshops. Graphical representations of the dialogue are shown in Figures 2 and 3.

5.1. Non-indigenous view

Two system perspectives were developed in the non-indigenous workshop. The first was a biophysical view of the system (Figure 2a), and the second was focussed on social and economic components of the system (Figure 2b).

Given the predictions of climate change in the NSW Central West (CSIRO, 2007), the primary concern of stakeholders was water availability, and how reduced water availability could affect on-farm sustainability and community viability.

A biophysical view of the system, focussing on climate, water quality and water quantity, was developed in collaboration with the stakeholder group. This conceptual framework had a scientific / technical focus, and formed the basis of the DSS, detailed in Tighe *et al*. (2007). It was the wish of the stakeholders to develop a separate social and economic view, rather than adding detail to the biophysical view.

The social and economic view reflected the concern that climate change and variability is going to threaten water security, affecting productivity and reducing the sustainability of farming in the region. Coupled with an aging population in the Central West, the proliferation of other industries and declining workforces was seen to threaten community viability.

In this workshop, Indigenous knowledge was recognised as having an important role in improving land management, and improving the resilience and adaptability of farming systems with the assumption that this will improve regional sustainability.

5.2. Indigenous view

Workshop discussions, as summarised in figure 3, centred on several themes: land use, land, water and vegetation management and regulations, water quality and quantity, vegetation, animal life, loss of traditional practices and cultural heritage sites.

The links between NRM practices and how these affected the land, were clearly articulated by workshop participants. For example, the change in climate cycles and lack of water in the region was linked to vegetation clearance in the region. Water regulation and management practices reflected the lack of recognition of ecological values, with the focus being on agricultural productivity. The lack of water delivery to the natural components of the system was seen as a major problem.

Many of the traditional practices, such as spear fishing and access to traditional food sources and medicinal herbs, were declining as a consequence of lack of water. Private land regulatory regimes and management practices prevented Indigenous peoples accessing culturally important sites and were leading to eradication of important herbs used for food and medicinal purposes.

The group emphasised that environmental management practices had to be responsive to the land, taking cues from the environment. Sedentary practices of modern day farming were leading to the land becoming stressed and worn out, and areas such as the Macquarie Marshes were being placed under greater stress as a result. The significance and greater use of the cultural practice of vegetation burning, which encourages ecosystem renewal processes, was also emphasised.

Rather than just engagement, the group expressed the need for greater participation of Indigenous peoples in environmental management in the region.

5.3. Comparisons between views

Cultural values, both indigenous and non-indigenous, are important spheres of human concern and often underpin the adoption and success of NRM policies and sustainable regional development (Jackson *et al*. 2005).

Different perspectives were given by groups in the narratives of climate change. The non-indigenous narrative placed greater emphasis on developing strategies to lessen the impacts of climate change on humans, whereas the focus of the indigenous narrative was how humans can adapt to a changing landscape.

Indigenous values and practices can assist decision-making by focussing on land stewardship and respect for the land (Ellis 2005). Indigenous knowledge is also sympathetic to and accepting of climate cycles and seasons (Jackson *et al*. 2005).

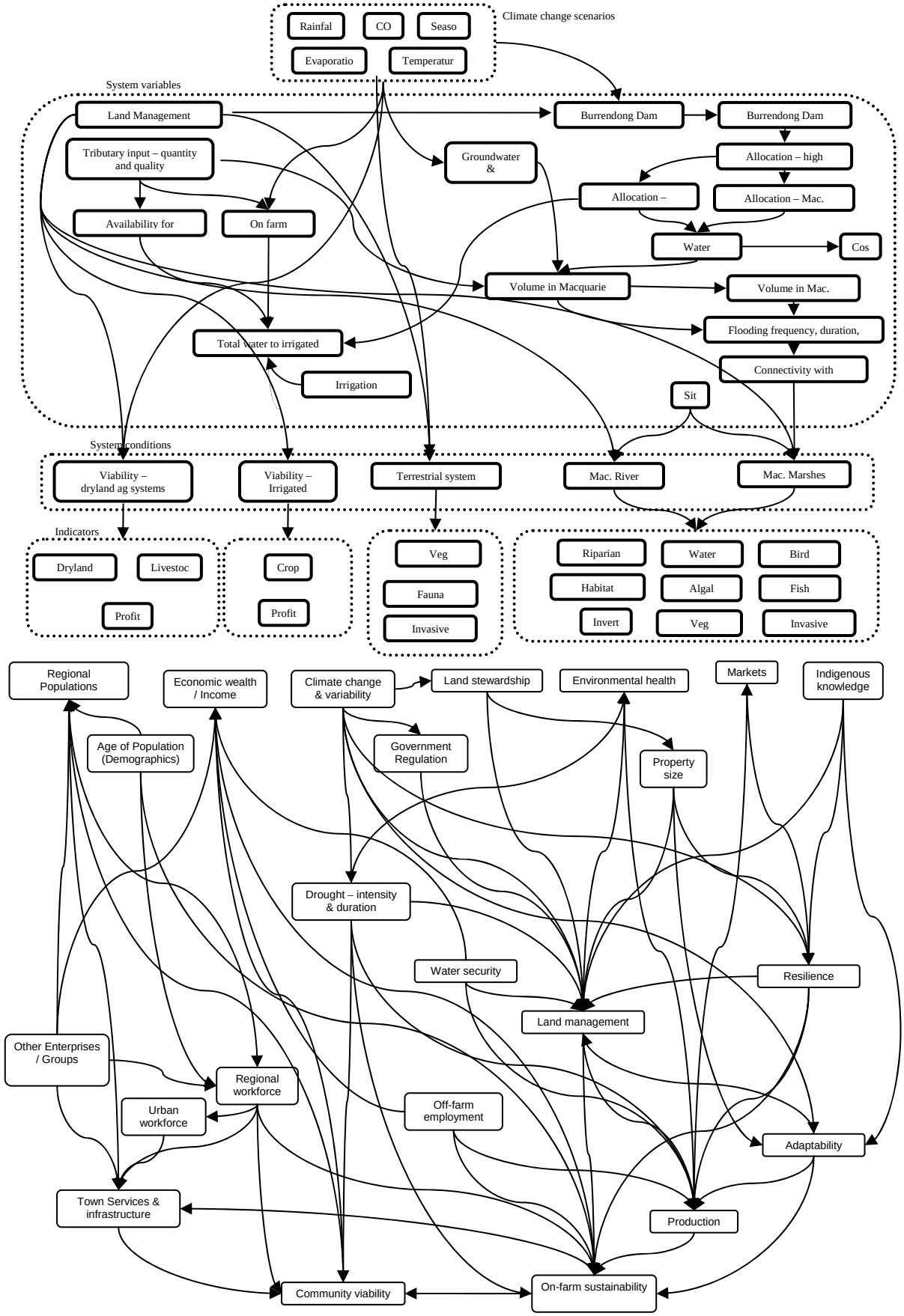

Figure 2: Non-indigenous perspective of climate change A. Biophysical view B. Socio-economic view.

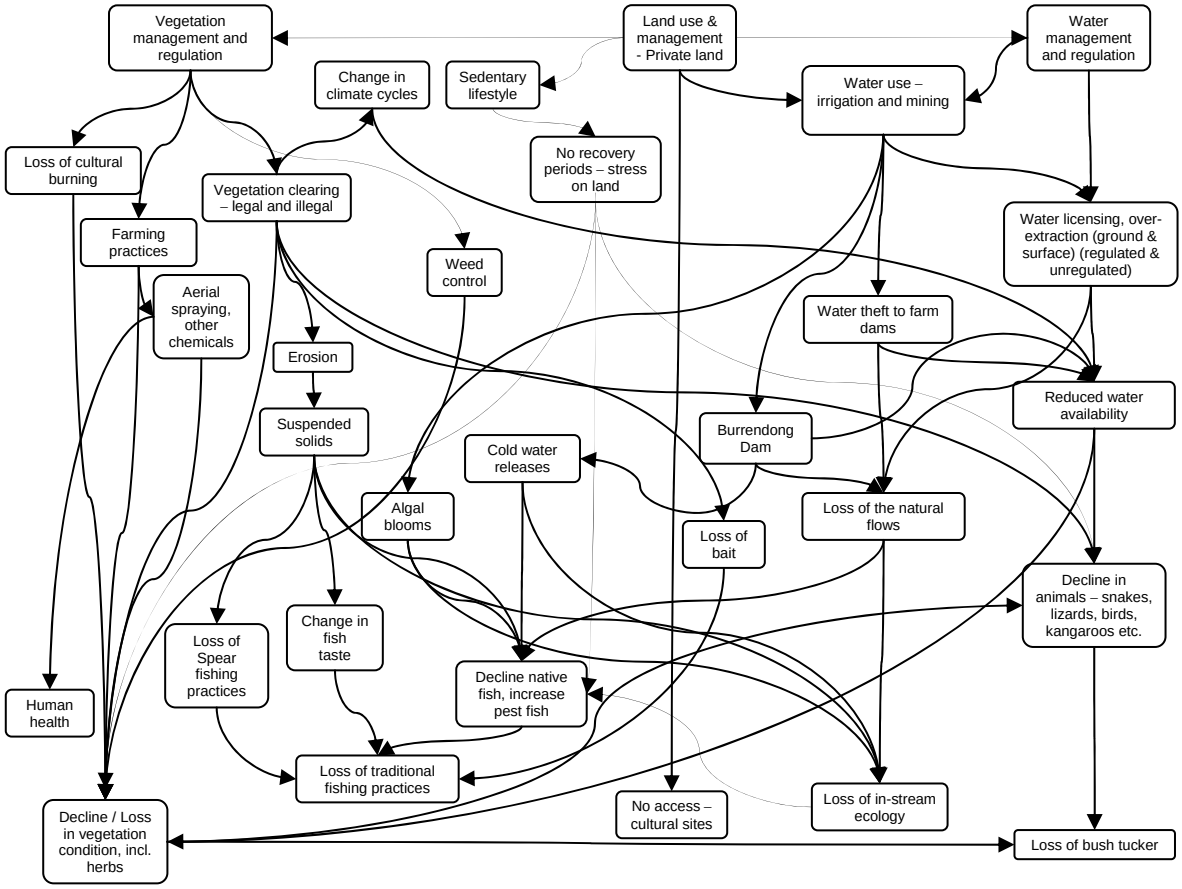

Figure 3: Indigenous perspective of climate change.

Clearly, there was also a distinction between the values of each of the groups, which was expected given the different cultural perspectives. For example, a native plant such as milkweed (*Gomphocarpus fruticosus*) is listed as a weed on agricultural lands, whereas it has a value to indigenous peoples. A process that can give due consideration to different value systems in decision-making processes is needed in the region.

The knowledge base of indigenous peoples was recognised as valuable by non-indigenous stakeholders. To access this knowledge base equitably, greater indigenous engagement is needed in NRM processes. However, this will require greater awareness of cultural sensitivities associated with indigenous knowledge.

6. INDIGENOUS ENGAGEMENT IN NRM

It is widely recognised that public participation in NRM promotes equity, empowers communities and increases the likelihood of management actions being supported and adopted. International and domestic laws and policies increasingly recognise distinctive Indigenous rights and their importance to sustainable development. Despite this, indigenous peoples and indigenous values are often overlooked in decision-making processes and activities for NRM. Where decisions are made, they are frequently based upon European values and scientific evidence.

Indigenous groups are increasingly encouraged to participate in Australian governance structures (Jackson *et al*. 2005). For this to be successful, NRM governance forums need to adapt to receiving and meaningfully considering the various forms of traditional knowledge. This includes consideration of non-scientific forms of evidence and modification of language.

6.1. Climate and adaptation

Traditional indigenous practices allowed communities to readily modify their behaviour to manage and take advantage of climatic conditions, diversify, be responsive and flexible in their resource use and be mobile when needed. The indigenous view of the Macquarie system was sympathetic to changing environmental conditions and the need for societies to adapt to these changes. This view is consistent with adaptive management, where system views of resource and

environmental management are more holistic and integrated (Holling 1973).

Uncertainty and unpredictability are characteristics of all ecosystems and indigenous cultural understandings appear to have a great deal to offer when it comes to responding to such uncertainties (Berkes *et al*. 2000). Furthermore Indigenous communities through their active participation can contribute towards management aimed at adaptation to ecosystem changes.

7. CONCLUSION

Future changes in climate are likely to pose serious challenges to NRM and the nature of these risks is still poorly understood. As well as changing the biophysical landscape, climate change is going to impact on community values, land ethics and sense of place. In undertaking a regional assessment of climate change, it is important to consider the diversity of values across the community. Greater engagement of stakeholders is required to better understand, predict and adapt to climate change.

Indigenous knowledge has an important role in improving knowledge on how to adapt to climate change. Many of the climate studies undertaken to date have largely been the domain of scientists. However, regional knowledge of systems, including indigenous knowledge, complements scientific understandings and assists in regionalising adaptation strategies and vulnerability assessments.

The information documented in this paper was used to develop a DSS to assess climate change impacts in the NSW Central West. For more details on the DSS, see Tighe *et al*. (2007).

8. ACKNOWLEDGEMENTS

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