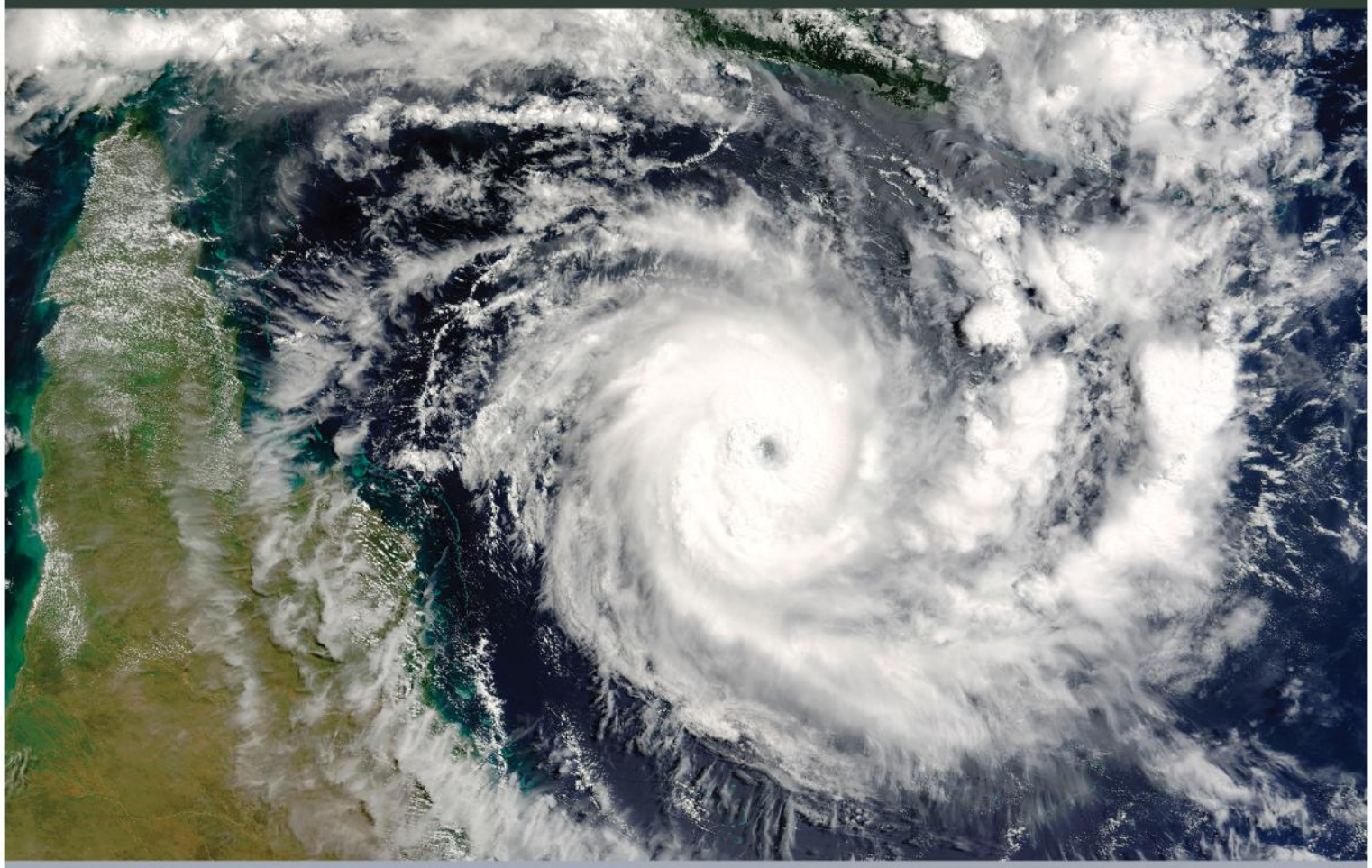
WET TROPICS
NRM CLUSTER

CLIMATE CHANGE IN AUSTRALIA

IMPACTS & ADAPTATION
INFORMATION
FOR AUSTRALIA'S NRM REGIONS



Adaptation Pathways and Opportunities for the Wet Tropics NRM Cluster region

Volume 2. Infrastructure, Industry, Indigenous peoples, Social adaptation, Emerging planning frameworks, Evolving methodologies and Climate adaptation planning in practice.

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6. Adaptation pathways and opportunities for Indigenous peoples

Rosemary Hill and Pethie Lyons

IN A NUTSHELL
• Climate change impacts in many Indigenous communities in the WTC are compounded by pervasive issues of justice and well-being resulting from historical disadvantage, as well as by the remoteness and challenging environmental conditions associated with many communities. Effective adaptation strategies will address this context. • Indigenous people have an inherently high capacity for resilience through their traditional, adaptive knowledge systems. Formulating suitable adaptation pathways requires Indigenous-driven approaches that engage different Indigenous people and groups, their knowledge systems within their unique context, and builds synergies with scientific and other practitioners' knowledge. • Improved land tenure security, governance and technical skills can contribute to the formulation of successful adaptation pathways for Indigenous people. Cultural brokers are likely to be important in enabling genuine engagement in formal adaptation planning processes.

Precis

The culture, history and geography of Indigenous peoples in the Wet Tropics NRM cluster region underpin both high resilience and high vulnerability to the impacts of climate change. This chapter addresses the issues and options for generating adaptation pathways and opportunities that take account of this context, with some Case Examples (Boxes 6.1–6.4) from the Wet Tropics cluster region. We discuss how to support Indigenous knowledge and culture in adaptation, and the conditions, methods and tools that enable these to be integrated into policy, land-use and land management decisions. We synthesise findings about how to simultaneously build desirable resilience and reduce vulnerability by addressing barriers to adaptation, and monitor outcomes. We conclude with some international and Australian Case Examples.

The key messages associated with each of the topics addressed in this chapter are:

TOPIC	KEY MESSAGES
Indigenous vulnerability and resilience	114. Indigenous culture and knowledge influence the application of impact-specific, disaster risk-reduction and adaptation-planning measures and outcomes (e.g. sea walls, housing designs). 115. Generation of adaptation pathways and opportunities with Indigenous peoples benefits from linking vulnerability-reducing and desirable resilience-building responses in a joint

TOPIC	KEY MESSAGES
	approach.
Indigenous knowledge systems as the basis of adaptation	116. Indigenous peoples' knowledge systems are typically adaptive and provide a primary basis for generation of adaptation pathways and opportunities. 117. While Indigenous groups frame and perceive climate change based on their world views, collaboration with science based on ethical processes supports adaptation strategies that integrate different types of knowledge.
Indigenous culture as the context of adaptation	118. Recent Indigenous cultural change in Australia is towards a general resurgence of traditionally-derived culture—and in NRM, towards increasing formal involvement of Indigenous peoples and their culturally-based knowledge systems. 119. Indigenous culture impacts on all three areas required for successful adaptation: knowledge-based technologies; decision-making tools; and adaptation institutions. 120. Strengthening 'traditional ways' and building cultural cohesion are identified as key adaptation pathways for some Indigenous groups. 121. Institutions engaging on climate adaptation require intercultural skills to understand and work with perceived risks to culture that shape the capacity and will of Indigenous groups to adapt.
Integrating Indigenous knowledge and culture into policy, land-use and land management decisions for adaptation	122. Integration of Indigenous knowledge and culture into policy, planning and management can be supported by: – Indigenous governance and co-governance; co-management that engages power-sharing; and cognisance of social contexts – Intercultural "knowledge-bridgers/brokers" that undertake joint agenda setting and knowledge co-production – Indigenous-driven and cultural planning frameworks that recognise interlinkages between people, place, plants, and animals; and bridge scales by considering issues across the whole of an indigenous people's territory – Visual and spatial tools including: seasonal calendars; maps of cultural sites, use and occupancy and incorporating art; narratives; and cultural keystone species.
Building adaptive capacity through reducing vulnerability	123. Adaptation planning that prioritises respectful Indigenous partnerships and explicit commitment to address issues of justice and well-being can reduce vulnerability arising from barriers posed by colonial history. 124. A sustainable development approach, that addresses wider social and economic needs (e.g. infrastructure, health services) can reduce vulnerability arising from socio-economic disadvantage. Comprehensive Community Planning is an interesting Canadian First Nations example.
Building adaptive capacity through strengthening desirable resilience	125. Indigenous peoples seek adaptation pathways that focus on empowering communities to identify and implement their own responses to climate change. 126. Building sustainable local economies through climate adaptation opportunities (e.g. carbon credits) requires secure land tenure and rights to carbon to foster desirable resilience. 127. Regionally specific capacity-building strategies are required to support Indigenous organisations to gain the governance, technical and other capabilities that enable

TOPIC	KEY MESSAGES
	brokering across cultures and scales to support desirable resilience. 128. Long-term collaboration with Indigenous groups on structural transformation can help address the deep sources of ongoing inequities and build desirable resilience.
Monitoring adaptation pathways with Indigenous peoples	129. Participatory development with Indigenous peoples of monitoring and evaluation based on program logic, indicators and criteria, can support effective use of these approaches and link them to Indigenous knowledge systems, as shown in the Our Country Our Way Guidelines. 130. Indigenous holistic concepts of monitoring through close observation over time can be supplemented by scientific surveys and technologies like Cyber-tracker. 131. Integrated monitoring approaches that measure health across social, environmental, economic and cultural domains can support the more holistic Indigenous concepts of adaptation.

Introduction

Indigenous engagement in Natural Resource Management (NRM) improves health outcomes for both people and country, and Indigenous roles in managing country provide an important avenue for adaptation pathways in the context of climate change (Hilbert *et al*. 2014). Australian Indigenous peoples have distinctive sources of both resilience and vulnerability to the impacts of climate change—resilience based on their unique knowledge, cultural practices and customary institutions, and vulnerability from their socio-economic and historical disadvantage. This vulnerability is heightened for some Indigenous groups due to their remoteness and the inhospitable and fragile environments they occupy. In this chapter we provide a literature-based synthesis of issues and options for generating adaptation pathways and opportunities that take account of this context. The review we provide responds to two drivers:

- "Climate change impacts and issues for Indigenous peoples" as identified in the earlier science synthesis report (Hilbert *et al*. 2014) which related to:
  - Indigenous knowledge and climate change
  - Indigenous communities and climate change
  - Cultural practices and climate change
- The priority information needs for science to underpin adaptation and pathways as identified by the Wet Tropics Cluster NRM groups (Table 6.1).

Climate adaptation has evolved into a jargon-rich, multi-disciplinary research and practice arena, often burdened, but also enriched, by debate and confusion over meanings (Preston and Stafford-Smith 2009). Parsons (2012) provides a useful and simple (but not simplistic) framework through which to consider adaptation strategies with Indigenous peoples. This framework identifies four essential strategies:

1. Impact specific adaptation: for example, in relation to the impacts of sea level rise, adaptation options include seawalls, raised houses, beach replenishment, and relocation
2. Disaster risk reduction: for example, in relation to heat wave disasters, adaptation options include early warning systems, social networks, housing design, improvements to household and workplace infrastructure
3. Mainstreaming: for example, incorporating climate change adaptation into local government policies and community plans
4. Vulnerability reduction: for example through community based adaptation—community-led process, enhancing livelihood options, increasing access to information and services, preventing and

managing conflict over scarce resources, incorporating local values, prioritises, and needs into decision-making.

In this report, adaptation options for Indigenous peoples in response to specific impacts and disasters (such as sea level rise and cyclones) are considered in the relevant chapters including Biodiversity (Chapter 2), Infrastructure (Chapter 4) and Industry (Chapter 5). Indigenous communities across the Wet Tropics Cluster face many such impacts relevant to NRM including: coastal erosion; changes to availability and seasonality of plant and animal species; extreme weather events including cyclones, floods, droughts and heat waves; changes to fire regimes including through changed fuel loads, fire weather conditions and other factors. The emerging NRM frameworks for disaster risk reduction and mainstreaming adaptation through plans and policies, addressed in Chapters 9 and 10, also have relevance for Indigenous peoples and communities in response to these factors.

Here we provide a lens through which Indigenous-specific considerations can be incorporated into the impact-specific, disaster-risk reduction and 'mainstreaming' adaptation pathways. We do this by identifying how Indigenous knowledge, culture and socio-economic contexts influence adaptation outcomes. We also focus attention on the fourth strategy identified by Parsons (2012) as "reducing vulnerability" through the perspective of the recent vulnerability-resilience model for building adaptive capacity (Maru *et al*. 2014). The chapter addresses the majority of priority needs identified by the NRM groups, but we found little information on identifying "what aspects of community culture support adaptation and what aspects impede adaptation" (Table 6.1).

In the remainder of this chapter we: first present the linked vulnerability-resilience model; second the influence of Indigenous knowledge and culture on adaptation pathway-generation; third the approaches to integrate Indigenous knowledge in policy; and fourth, methods to reduce vulnerability and build desirable resilience. We include Case Examples drawn from the Wet Tropics Cluster region throughout, and also provide a final section that presents national and international Case Examples.

Table 6.1 Priority science needs related to Indigenous peoples and adaptation pathways and opportunities from Wet Tropics Cluster NRM groups, and relevant sections in this chapter.

PRIORITY SCIENCE NEEDS FOR THE CHAPTER IDENTIFIED BY THE NRM GROUPS	RESPONSE
Specific communities/aspects	Four boxes with case examples from specific communities in the Wet Tropics Cluster included.
• building general community resilience	Included in the *Building desirable resilience* section; introduced in the section on *Indigenous vulnerability and resilience a linked approach.*
• building sustainable local economies	As above
• identifying key drivers of change to culture	Included in the *Indigenous culture as the context of adaptation* section
• identifying what aspects of community culture support adaptation and what aspects impede adaptation	Little information available; some material on the limitations of Indigenous knowledge-derived processes included in the *Building desirable resilience* and *Indigenous knowledge* topics
• improving cultural knowledge integration into policy, landuse and land management decisions	Included as a separate topic
Local, regional, national, international examples/case studies	Included as a separate topic
Key considerations/principles for monitoring whether particular actions have intended adaptation outcomes	Included as a separate topic
Barriers to potential adaptation actions. Potential strategies to surmount barriers or enable adaptation	Included in a separate topic
Local, regional, national, international examples/case studies	Included in the *Reducing vulnerability* section

Indigenous vulnerability and resilience: a linked approach

Indigenous culture and knowledge influence the application of impact-specific, disaster risk-reduction and adaptation-planning measures and outcomes (e.g. sea walls, housing designs).

Generation of adaptation pathways and opportunities with Indigenous peoples benefits from linking vulnerability-reducing and desirable resilience-building responses in a joint approach.

The linked model of building adaptive capacity through vulnerability-reducing and desirable resilience-building responses in a joint framework provides the foundation for understanding adaptation pathways in the context of Indigenous peoples (Figure 6.1). Here we consider resilience as the capacity of a system to absorb disturbance and still maintain its same controls and key structure and functions, and refer to “desirable resilience” where this characteristic of persistence supports desired social goals and values (Maru *et al*. 2014). We recognise that “desirable resilience” sometimes includes transformational change. Resilience approaches often look at links between longer-term drivers or slow variables and rapid changes, such as flooding or change in political leadership. Vulnerability analysis focuses on human agency and hazards, actor- and issue/impact- based analysis usually with much shorter timeframes (Nelson *et al*. 2007).

Attributes of desirable resilience in the context of Australian Indigenous societies include their experience and knowledge of environments and environmental change. Governance systems arising from rights and interests of country imbue the sense of cultural confidence, self-determination-based independence and community self-reliance in the face of variability and uncertainty. The many faces of current vulnerability correspond to symptoms of the loss of this self-determination-based independence and community self-reliance, associated with the history of colonialism and hostile policy settings producing the contemporary context of socio-economic disadvantage and chronic poor health. These conditions occur even where interventions have resulted from well-intentioned social and economic policies to support 'development' (Howitt *et al*. 2012; Maru *et al*. 2014).

Strategies to build adaptive capacity with Indigenous peoples and communities through this linked resilience-vulnerability perspective require two complementary approaches:

1. Reducing vulnerability through addressing its immediate causes and the barriers faced by Indigenous communities from the context of colonialism and persistent socio-economic disadvantage
2. Increasing desirable resilience through strengthening the influence of relevant attributes of including knowledge and culturally-based governance systems, and self-determination based independence and community self-reliance.

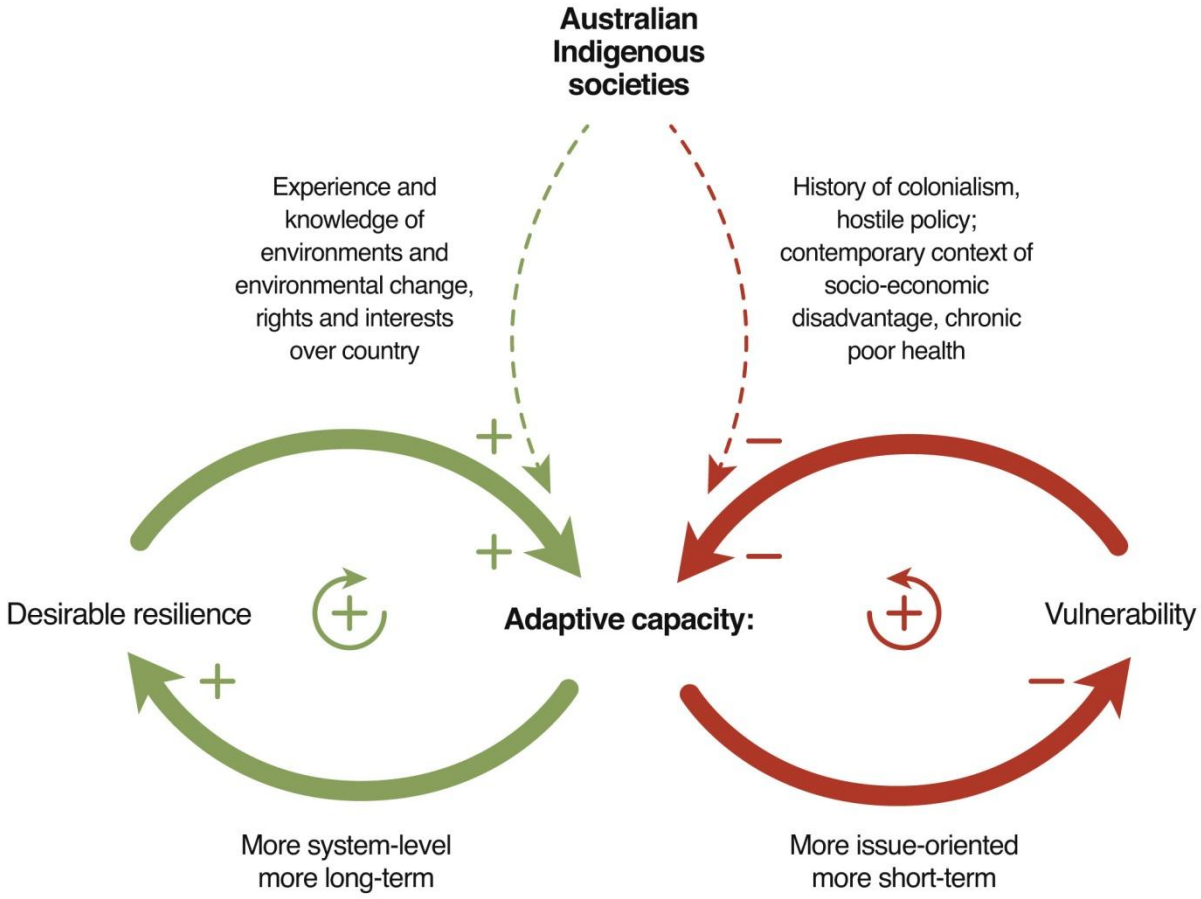

Figure 6.1 Linked vulnerability-resilience model for adaptive capacity: Australian Indigenous societies

Box 6.1 Poruma (Coconut Island) case example from the Torres Strait

Poruma (Coconut Island) and adaptation pathways in the Torres Strait

Torres Strait Climate (http://torresstraitclimate.org/) is a web-site promoting knowledge sharing and raising awareness about impacts and adaptation for climate change in the region. In January 2014, they reported that king tides have again swept across the low-lying islands in the Torres Strait, flooding homes, roads and other infrastructure. "Poruma residents gathered at the seafront this month, calling on all levels of government to protect their island from coastal erosion and flooding. They held placards, some of which read "Help" and "What about us", indicating a desperate cry for urgent action. While king tides are an annual occurrence in the Torres Strait, residents are finding it harder and harder to deal with. Federal and state government funding for the Torres Strait Coastal Protection Works (Seawalls) Project is still pending, leaving many residents concerned about the next king tide." They summarised their message as "We are part of Australia and our people are Australian citizens so please help us." While the Australian Government confirmed $12 million in funding for the Seawalls Project in February 2014, work is yet to begin on the construction and repair of seawalls in the affected islands.

Indigenous knowledge systems as the basis of adaptation

Indigenous peoples' knowledge systems are typically adaptive and provide a primary basis for generation of adaptation pathways and opportunities.

While Indigenous groups frame and perceive climate change based on their world views, collaboration with science based on ethical processes supports adaptation strategies that integrate different types of knowledge.

Indigenous knowledge systems are based on their management, observations and experience with their environments and with environmental change, accumulated over time (Berkes *et al*. 2000). These systems are typically adaptive, so responses such as adjusting the times for carrying out traditional burning (in response to changed humidity and rainfall for example) are already occurring (Head *et al*. 2014). For indigenous groups, indigenous knowledge and its use provides an important foundation for adaptation, resilience and natural resource management (Nakashima *et al*. 2012; Parry *et al*. 2007; Petheram *et al*. 2010). Indigenous knowledge is place based and prioritises elements in the community that sustain local livelihoods and well-being (Herman-Mercer *et al*. 2011; Nakashima *et al*. 2012).

Indigenous knowledge and skills can be strengthened through collaborative arrangements that actively engage indigenous groups to develop their strategies for change, as co-researchers or co-managers of natural resources, through the integration of different types of knowledge for mutual enrichment. Strengthening traditional knowledge of the past, through inter-generational knowledge transfer programs, and its use and inclusion with science, supports traditional resource management institutions, and cements the evolving culture of the group (Adger *et al*. 2013; Nakashima *et al*. 2012; Petheram *et al*. 2010). Adaptation for some groups is contextualised in terms of strengthening 'traditional ways', requiring continued access to country to sustain and transfer Indigenous knowledge, as well as engaging other types of knowledge (Memmott *et al*. 2013; Wiseman and Bardsley 2013).

Indigenous peoples recognise that knowledge partnerships are critical to developing climate change adaptation pathways. Trusting information on climate change provided by 'experts' and allowing knowledge contributions from local Indigenous community members were matters identified by some respondents to a recent national survey as necessary components of the relevant knowledge needed for a carbon offset adaptation pathway (Robinson *et al*. 2014). Some Australian Indigenous peoples describe their approach as the 'two-toolkit' way to look after country,

combining the best of Indigenous and western scientific knowledge and decision-making (Green and Minchin 2012; see also Aak Puul Ngantam case example in Box 6.2). While Indigenous communities are keen to have their knowledge taken on board, participants at a national meeting about Indigenous knowledge for climate change adaptation highlighted the troubling history where their information has been taken without proper permission, been inappropriately transmitted, and without benefits flowing on to communities. The legal regimes for protecting Indigenous knowledge are deficient, and new legislation is needed to properly protect Indigenous knowledge. In the mean time, collaborations need to be based on cultural protocols and clauses in contracts that protect intellectual and cultural property rights (Griggs *et al*. 2013). Ethical Guidelines set out the research collaboration processes required (AIATSIS 2012).

For example, the Ltyentye Apurte Rangers in Australia recently worked with a group of CSIRO scientists to bring climate science knowledge into their work, based on ethical research processes. They collaborated to develop presentations of the science of climate change and its likely impacts on country in central Australia. These presentations consisted of English language powerpoint slides that were presented in Arrernte and English by the Rangers, and were very well received by their community audiences. People reported hearing about climate change often on the TV but not understanding what it was about. Work is currently underway to bring some changes into their Ranger work plans for management of erosion, which is rapidly increasing in response to more frequent and higher intensity rainfall events (Mooney 2014).

Indigenous culture as the context of adaptation

Recent Indigenous cultural change in Australia is towards a general resurgence of traditionally-derived culture—and in NRM, towards increasing formal involvement of Indigenous peoples and their culturally-based knowledge systems.

Box 6.2 Aak Puul Ngantam Cape York case example

Wik and Kugu people and adaptation pathways in Cape York Peninsula

Aak Puul Ngantam (APN Cape York), based in Aurukun, formed a partnership with team of researchers from the University of New South Wales and the University of Western Sydney to support generation of climate adaptation pathways. The project supported field trips to film Wik and Kugu traditional owners going back to country. The interview process has been developed in partnership with Wik and Kugu people, via the APN steering committee and Traditional Knowledge Recording Project. The interviews offer a rare insight into Wik and Kugu people's connection with their country, their memory of what it used to be like, and how these changes relate to their perception of their own well-being. APN supports a 'two-toolkit' approach to looking after country, combining the best of indigenous and western scientific knowledge and decision-making. The goal of the climate change project is show how cultural practice and knowledge of country still remains with these Wik and Kugu Elders and consider how it may be relevant to climate adaptation policies. Options include encouraging the return to living and working back out on country, and the re-investment in families returning to live for some of the year on their outstations, where the connection to country can continue to be strengthened (Green and Minchin 2012).

Indigenous culture impacts on all three areas required for successful adaptation: knowledge-based technologies; decision-making tools; and adaptation institutions.

Strengthening 'traditional ways' and building cultural cohesion are identified as key adaptation pathways for some Indigenous groups.

Institutions engaging on climate adaptation require intercultural skills to understand and work with perceived risks to culture that shape the capacity and will of Indigenous groups to adapt.

Indigenous cultures are highly dynamic and in the Australian context exist within a postcolonial frame in which the nation-state has overarching sovereign power (Smith and Hunt 2008). Nevertheless, the main trend in Aboriginal cultural change over the last decade has been towards a resurgence of traditionally-derived distinctive culture. Key drivers of this general change include the formation of alliances made possible by the advent of land rights and native title, an Aboriginal cultural turn amongst Aboriginal and non-Aboriginal people, and changing (more community-oriented) approaches to regional development (Jones and Birdsall-Jones 2013). In the NRM context, increasing formal involvement by Indigenous peoples is one of four stand-out trends over the last decade (State of the Environment Committee 2011). Six drivers underpin this trend: customary obligations; Indigenous leadership to secure their NRM roles; recognition of Indigenous rights to country; markets for NRM services; increased co-management arrangements; and increased levels of investment (Hill *et al*. 2013b).

Cultural change is also resulting in loss of Indigenous knowledge due to policies of assimilation that prevented transmission of language and traditions, and western/modernity industrialisation-driven changes to daily practices of production of food/clothing/shelter (Nawrotzki and Kadatska 2010). Many languages in Australia are highly threatened and ongoing attrition of Indigenous knowledge threatens the adaptive capacity of Indigenous communities (Hill *et al*. 2013b).

Understanding and action on climate change adaptation are always influenced within the cultural values and practices of a society and community (Adger *et al*. 2013). However, the influence of culture is particularly strong for Indigenous peoples and communities, where culture impacts on all three areas recognised as critical to successful adaptation to climate change (Figure 6.2).

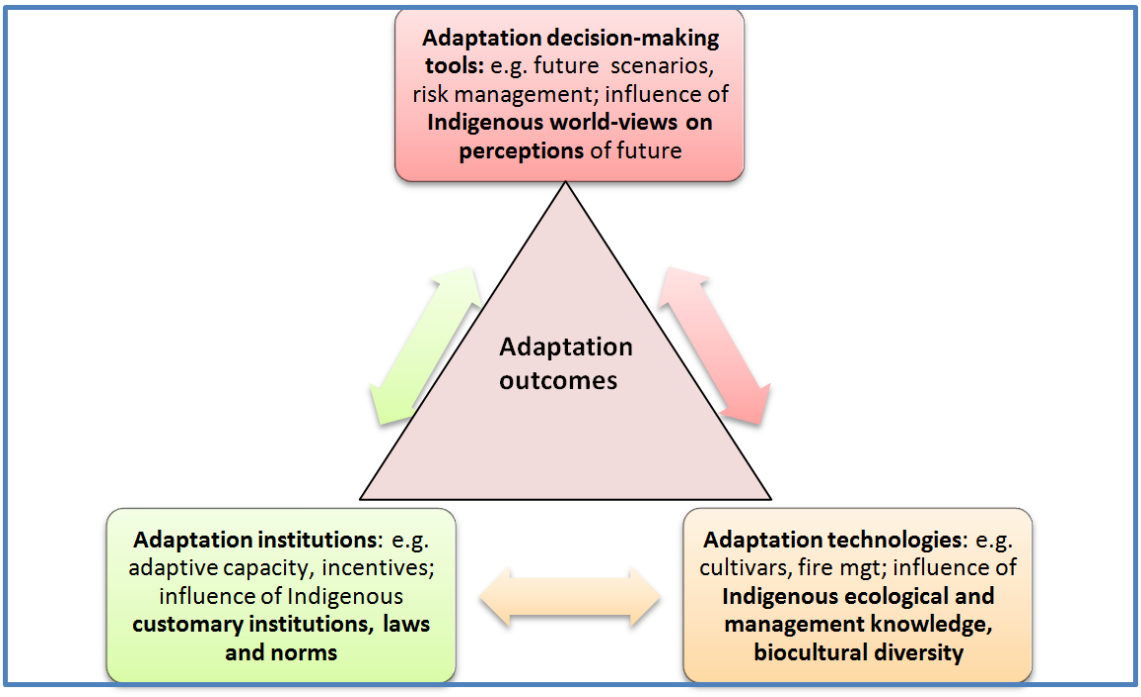

Figure 6.2 Adaptation outcomes and Indigenous cultural influences.

Source: Adapted from Stafford-Smith and Ash (2011)

Adaptation decision-making relies on tools that enable people to evaluate options and make choices—for example, future scenarios of change and risk management models. For many Indigenous peoples' perceptions of change and their meaning have their context in Indigenous world-views (the Dreaming) that supersede and parallel Western scientific discourses of hazard and risk (Veland *et al*. 2013a). For example, changes are related to people's loss of respect for a living environment and weakened awareness of their intricate co-existence with the elements of nature, rather than to climate. Adaptation institutions, the formal and informal rules that determine the decision-making processes, in the context of NRM are strongly influenced by customary institutions for governance—that determine, for example, which people are responsible for decision-making over specific areas of land (Davies *et al*. 2013). Australian Indigenous peoples maintain culturally-based governance systems with distinctive features include an emphasis on networks, nodal modes of leadership within these networks, and dispersed distribution of powers among self-defined social groups (Smith and Hunt 2008). Adaptation technologies relate to the development of specific solutions (technical and other) generally tied to specific threats, such as the adoption of new cultivars that will grow in hotter conditions. Again in the context of NRM, Indigenous peoples' specific solutions are highly influenced by the knowledge of practices such as fire management, and by their management of "biocultural diversity". This term denotes that biodiversity and cultural diversity share common links which developed over time through mutual adaptation and possibly co-evolution (Hill 2013).

Institutions and organisations engaging indigenous groups on climate adaptation will therefore require intercultural platforms and skills to understand and work with perceived risks to culture that will shape the capacity and will of groups to adapt (Adger *et al*. 2013; Bassett and Fogelman 2013). While adaptation is a necessity in the face of climate change, negative consequences for communities can result when the cultural context is not central, and changes underway are narrowly defined within a science or economic argument (Adger *et al*. 2013; Wiseman and Bardsley 2013).

Box 6.3 Bana Yaralji case example from wet tropics country

Kunawarra clan and adaptation pathways in wet tropics country

Bana Yaralji Corporation in south-east Cape York works on behalf of the Kunawarra clan to look after their rich, bioculturally diverse country. Marilyn Wallace and Bana Yaralji have pioneered efforts to effectively integrate Aboriginal lore and ecological knowledge into wider national and international climate change mitigation and adaptive management strategies. Together with the United National University Traditional Knowledge initiative, they produced an Indigenous Perspectives on Climate Change film entitled 'Walking on Country with Spirits'. In this film, Marilyn highlights how the seasons are getting hotter, the country is transforming and traditional foods are disappearing. Marilyn attended UNU hosted Indigenous Climate Change conference in Alaska and presented their film at the Indigenous Perspective on Climate Change Film Festival at the National Museum in Copenhagen at the time of the Conference of the Climate Convention. The groups has established a Climate Change Walk to educate community members and visitors, is seeking to establish an Indigenous Climate Change Watch and facilitate a culturally informed strategy for climate change adaptation and mitigation in the northern Wet Tropics World Heritage Area (Wallace 2012).

In the context of contemporary Australia, many groups are widely scattered across the continent, and not engaged on a daily basis with their country. Arabana people, for example, are scattered around the country. Nevertheless, they have withstood the pressures of colonisation and remained culturally strong with a resilient sense of identity, no matter where they live (Nursey-Bray *et al*. 2013). They came together from all across Australia to Port Augusta to consider climate change, and collectively agreed on an adaptation program based on improving cultural cohesion and strength (Nursey-Bray *et al*. 2013). The Kunawarra clan of the wet tropics similar seek culturally-based adaptation (Box 6.3).

Integrating Indigenous knowledge and culture into policy, landuse and land management decisions for adaptation

Integration of Indigenous knowledge and culture into policy, planning and management can be supported by:

- **Indigenous governance and co-governance; co-management that engages power-sharing; and cognisance of social contexts**
- **intercultural "knowledge-bridgers/brokers" that undertake joint agenda setting and knowledge co-production**
- **Indigenous-driven and cultural planning frameworks that recognise interlinkages between people, place, plants, and animals; and bridge scales by considering issues across the whole of an Indigenous people's territory**
- **visual and spatial tools including: seasonal calendars; maps of cultural sites, use and occupancy and incorporating art; narratives; and cultural keystone species.**

The integration and use of Indigenous knowledge and culture to inform environmental policy, land use and land management is a growing global phenomenon (Robinson and Wallington 2012). However, the interactions between scientific, practitioner and Indigenous knowledge and cultural systems encounter many challenges in practice, and particularly in the context of climate change (Bohensky *et al*. 2013; Head *et al*. 2014). Several conditions have been found to influence integrative goals in the Australian Indigenous context. Integration is supported by: Indigenous governance and co-governance over knowledge integration; evolution of co-management towards a degree of power-sharing; cognisance of the social contexts of integration, and involvement of inter-cultural "knowledge bridgers" (Bohensky and Maru 2011; Hill *et al*. 2012). Integration into planning is supported by frameworks that bridge scales by considering values and issues across the whole of an indigenous people's territory.

New frames that respond to interlinkages of stewardship between people, place, plants, and animals help integration. Examples include: "Anpernirrentye", traditionally-derived worldview of Arrernte Aboriginal people which views plant resources through the lens of dreaming, country and people, each with multi-dimensional inter-related components (Walsh *et al*. 2013); and the "Ngurra-kurlu Framework for Walpiri Indigenous Ecological Knowledge" which centres on country, law, language, ceremony and skin (Holmes and Jampijinpa 2013).

The Kuku Thaypan Fire Management Research project, the Importance of campfires and Firesticks is a collaboration involving Indigenous people from Cape York mentoring with New South Wales people. This approach provides a leading example of an innovative frame to assist knowledge transfer of Indigenous fire management (Box 6.4). The principle of recognition of roles, responsibility, respect and reciprocity apply across the frame for knowledge of fire in three components, each with multiple inter-linked parts: knowing what it is; knowing what it does; and knowing how to do it (Standley and Felderhof 2011).

Box 6.4 A co-generative poster outlining the innovative Indigenous led methodology applied through the Kuku Thaypan Fire Management Research Project and documented by the Importance of Campfires research and its mentorship to the NSW Firesticks project. The poster highlights the interconnected knowledge frame of the Kuku Thaypan Elders as it applies to fire management: knowing what it is; knowing what it does; and knowing how to do it.

Source: Standley and Gothe (2011)

Specific tools also help integration of Indigeous knowledge and culture in NRM. Ecological calendars developed through cross-cultural collaborations can effectively correlate climate, astronomy, resource availability, and cultural practices. Robinson and Wallington (2012) describe mapping and narrative tools applied to resolve uncertainties about feral animal management in Kakadu National Park. They reinforced the need for "boundary agents" (bridgers/brokers), people with the capacity to communicate equitably across knowledge systems. Davies *et al.* (2013) also highlight the key role played by brokers in the development of IPA management plans that integrate knowledge. Brokers ensure participation in agenda setting and joint knowledge production; bring Indigenous and non-Indigenous staff together for interactions between knowledge systems; and support production of collaboratively built knowledge outputs (e.g. feral animal impact assessment data). "Boundary work" by bridgers/brokers can help efforts to translate across knowledge systems and across the knowledge-action divide, even when consensus is difficult to achieve (Robinson and Wallington 2012). Cultural keystone species that are also of high ecological significance to science-based NRM can play a strongly catalytic role in supporting integration of Indigenous knowledge and culture in to policy, planning and practice (Butler *et al.* 2012).

Building adaptive capacity through reducing vulnerability

Adaptation planning that prioritises respectful Indigenous partnerships and explicit commitment to address issues of justice and well-being can reduce vulnerability arising from barriers posed by colonial history.

A sustainable development approach, that addresses wider social and economic needs (e.g. infrastructure, health services) can reduce vulnerability arising from socio-economic disadvantage. Comprehensive Community Planning is an interesting Canadian First Nations example.

Reducing vulnerability with Indigenous peoples requires both addressing aspects of material welfare, and aspects of cultural and spiritual welfare. Much of the focus on climate science and adaptation is based on the assumption that climate change is important only when it affects our material welfare (Adger *et al*. 2011). Consideration of cultural, spiritual and non-material well-being is not addressed (Adger *et al*. 2013; Adger *et al*. 2011). The danger for Indigenous groups is that this approach to climate adaptation and the focus only on technical solutions will ignore the cultural and spiritual dimensions of well-being, an action that mirrors colonial policies and programs for change (Bird *et al*. 2013; Cameron 2012). For Indigenous nations, the impacts of colonisation remain current and real, and are their primary concerns in their increased vulnerability to climate change (Veland *et al*. 2013b). Indigenous groups continue to be burdened by a colonial past that has not been addressed nor compensated (Howitt *et al*. 2012). Assessments of vulnerability and adaptation to climate change that do not incorporate and respect the indigenous perspectives can entrench patterns of racialised disadvantage and marginalisation and set in train future vulnerabilities and disasters. Climate risk assessment, preparation, and recovery that prioritises partnerships based on recognition, respect, and explicit commitment to justice is recommended as an appropriate means to reduce vulnerability arising from colonial history (Howitt *et al*. 2012).

Over-arching issues of Indigenous disadvantage, poverty and welfare, were identified as of more concern than climate change in a Northern Territory and in South Australia, highlighting the importance for adaptation pathways that address material welfare (Petheram *et al*. 2010; Wiseman and Bardsley 2013). Historical disadvantage that sustains social and political marginalisation, disease and health-impacts on wellbeing, are concerns that have more immediate impact and will be exacerbated the impacts of climate change (Low-Choy *et al*. 2013). Addressing these challenges suggests a sustainable development approach (Reyer *et al*. 2012; Robinson 2004) that considers wider social and economic needs of Indigenous groups. These include needs for improved housing, water, energy, sewerage and transport

infrastructure, educational opportunities, health and recreation services and for conditions that attract educators, health workers and other skilled people to work with Indigenous peoples in remote contexts (Hilbert *et al*. 2014). Comprehensive community planning approaches that establish a vision for Indigenous societies across all these domains are proving highly effective with First Nations in British Columbia and are worthy of attention here (Andre Grant, Centre for Appropriate Technology, pers. comm. 2013). Based on experiences of a number of First Nations with this approach, the Canadian Government has supported development of a Comprehensive Community Planning Handbook.

Building adaptive capacity through strengthening desirable resilience

Indigenous peoples seek adaptation pathways that focus on empowering communities to identify and implement their own responses to climate change.

Building sustainable local economies through climate adaptation opportunities (e.g. carbon credits) requires secure land tenure and rights to carbon to foster desirable resilience.

Regionally specific capacity-building strategies are required to support Indigenous organisations to gain the governance, technical and other capabilities that enable brokering across cultures and scales to support desirable resilience.

Long-term collaboration with Indigenous groups on structural transformation can help address the deep sources of ongoing inequities and build desirable resilience.

Participants at a national Indigenous climate adaptation workshop identified that responses to climate change should come from within each community, who are in position to determine the best solutions for their unique needs, interests, and circumstances. Solutions imposed externally are likely to be ineffective, inappropriate or unsustainable. However, Indigenous knowledge by itself is not sufficient to address all the requirements for adaptation. Communities need support to identify and generate adaptation pathways including being able to:

- access good information and research that enables the necessary skills for communities to understand what climate change means for them and determine the best adaptation options
- establish meaningful input to regional and national policy and decision making processes affecting their lands
- develop opportunities for knowledge sharing between Indigenous communities in Australia and overseas (Griggs *et al*. 2013).

Indigenous people now hold rights and interests over more than half the Australian continental land mass (Hill *et al*. 2013b). As a result, many Indigenous communities are well situated to generate adaptation pathways based on local economies that provide greenhouse gas abatement and carbon sequestration benefits from their lands. In addition, access and connection to traditional country sustains the Indigenous knowledge systems that form the basis of desirable resilience.

However, Indigenous participation in carbon economy schemes are limited by land tenure arrangements and the extent of rights over carbon ; geographic and biophysical factors; low levels of requisite technical, human and financial resources; and lack of appropriate recognition of Indigenous knowledge and cultural responsibilities. Regionally specific capacity-building strategies are needed to enable Indigenous people to participate in emerging carbon offset activities and the generation of associated ecosystem services. For example, 94% of Indigenous organisations in a recent national snapshot reported lack of requisite governance, technical, human and financial resources to engage in adaptation economies (Robinson *et al*. 2014).

Capacity building of indigenous organisations, with a view of these agencies providing a central point for coordination across levels and scales government could potentially position them in a more active role across a

wide range of issues – social, economic, ecological, physical infrastructure, communications. Pooling funding processes to support innovative solutions and experimenting with resilient organisational structures offer possibilities of addressing the concern of lack of funds and fragmented funding (Memmott *et al*. 2013; Wiseman and Bardsley 2013). While the capacities of Aboriginal corporations differ, it is important recognise that some have survived and adapted to changing policy and funding arrangements to potentially be major players in building desirable resilience (Memmott *et al*. 2013). However the lack of authority of these corporations, such as rangers not having the legal capability to act on illegal activities, limits their potential effectiveness (Bird *et al*. 2013). Advocacy by Indigenous groups for community-driven strategies for sustained and effective adaptation outcomes also seek improved governance capacity and responses (Memmott *et al*. 2013; Petheram *et al*. 2010).

If we are to genuinely engage indigenous groups in climate adaptation programs, and act on the increasing impact of climate change, long-term collaboration with indigenous groups on structural transformation is required (Bassett and Fogelman 2013). Transformative change aims to address the long-term adaptation and future conditions rather than short-term adjustment responses within the current context (Park *et al*. 2012). Transformative change calls for active participation of Indigenous groups in defining the role of institutions, governance, and 'development', the pathway for adaptation and what is accepted as transformative change, and the capacities important for managing and responding to risk events (Bassett and Fogelman 2013; Park *et al*. 2012). For Indigenous groups, their strong attachment to place can strengthen their capacity to adapt (Marshall *et al*. 2012), and addressing adaptation of place will also mean addressing the non-climate drivers of indigenous disadvantage (Green *et al*. 2009; Low-Choy *et al*. 2013; Petheram *et al*. 2010).

Monitoring adaptation pathways with Indigenous peoples

Participatory development with Indigenous peoples of monitoring and evaluation based on program logic, indicators and criteria, can support effective use of these approaches and link them to Indigenous knowledge systems, as shown in the Our Country Our Way Guidelines.

Indigenous holistic concepts of monitoring through close observation over time can be supplemented by scientific surveys and technologies like Cyber-tracker.

Integrated monitoring approaches that measure health across social, environmental, economic and cultural domains can support the more holistic Indigenous concepts of adaptation.

Result Based Management, the Logical Framework Approach and the accompanying logframe are the most common monitoring and evaluation approaches used for adaptation (Lamhauge *et al*. 2013). The Australian MERIT system which operates in the NRM domain is based on these methods. The inherent scientific and reductionist approach MERIT is somewhat at odds with the more holistic approaches to NRM management and monitoring by Indigenous peoples based on their culturally-derived knowledge systems. However, case-management approaches by the Australian government teams that support Indigenous Protected Area and Working on Rangers in capacity-building have resulted in effective adoption of these methods by Indigenous organisations (Hill *et al*. 2013b).

Guidance on how to implement MERIT in NRM contexts with Indigenous peoples is provided in Our Country Our Way: Guidelines for Australian Indigenous Protected Area Management Plans (Hill *et al*. 2011). Participatory workshops can help groups think through the Program Logic, a one-page "roadmap" or diagram to illustrate the rationale behind the adaptation pathway. It sets out the link from actions to short, medium and long term

changes, and how these will lead to the achievement of the long term goal or vision for adaptation.

These Guidelines also discuss how traditional monitoring of country through close observation can be supported by fauna/flora surveys conducted with science partners to establish a more comprehensive baseline data. Cybertracker systems can be used to collect data when out on country. Other monitoring programs use a traffic-light based assessment of the health of the main targets and uses indicators to measure change over time. Some Indigenous people have updated paintings to show how their country is changing. In New Zealand, a cultural health index for streams is based on Maori concepts of country (Maclean 2010). In the wet tropics, Indigenous peoples have identified "linked cultural and biophysical indicators" across six categories, with associated sub-categories, indicators and criteria attached to cultural significance (Cullen-Unsworth *et al*. 2012). More recently, participatory monitoring of co-management of coutnry that use health indicators across results, structures and processes is proving useful to underpinning a more holistic measure across social-economic-cultural-environmental domains (Hill *et al*. 2013a).

Case examples

ARCTIC

Hunting in the Arctic

The indigenous people at Sachs Harbour are coping with changed seasonal patterns by: modifying the timing and location of their seasonal hunting and fishing activities; diversifying their harvests; and closely monitoring sea ice conditions (Berkes 2008).

In the Arctic, narwhal co-management arrangements across multiple levels of governance are supporting knowledge sharing and the use and integration of indigenous knowledge and science (Armitage *et al*. 2011). This arrangement is reinvigorating traditional knowledge, practice and governance and is building adaptive capacity of the groups involved (Armitage *et al*. 2011; Ford *et al*. 2010). Wage income is also an important part factor of household adaptive capacity in Inuit communities (Ford *et al*. 2010).

Arctic: The arctic reindeer herders use of the polar view initiative (McLean 2010)

The polar view initiative in the Arctic provides reindeer herders with satellite-based snow maps. Snow is of paramount importance for reindeer herding because its quality determines whether reindeer are able to access the pastures that lie beneath it for much of the year. The project explores ways that satellite observations can help herders by gathering information on snow and snow change and providing this to herders to assist them to make decisions about winter pasture quality and potential migration routes.

ASIA

Housing and weather extremes (McLean 2010)

Traditional housing techniques are changing in Bangladesh and the Philippines in response to typhoon flooding. Communities are re-designing and adjusting their homes to be flood resistant. These changes include use of low cost materials, local labour, skills and knowledge. Changes include the construction of an attic for storage, joining of bamboo and timber to form joists for homes that increase the flexibility of homes during typhoon winds, and houses built on raised platforms (McLean 2010).

Use of Local knowledge in disaster management (McLean 2010)

In Bangladesh flooding submerges 60 percent of the land. This also damages agricultural land, property and results in loss of life. Coping mechanisms of villages include raising homes, planting of catkin reeds to reduce erosion, shelter in elevated grounds, reducing food intake, fuel and food storage as well as re-location.

MALDIVES

Sea level rise and safer islands strategy (McLean 2010)

The Maldives is one of the most vulnerable nations to predicted impacts of sea level rise from climate change.

More than 85% of the nation lies less than 1.5m above average sea level. More than half the populated islands have been affected by recent swells and storms. The Maldives government development the 'Safer Island Strategy' that includes re-settlement from smaller vulnerable islands to larger island and improved coastal defences. The larger islands will provide safe shelter as well as basic and emergency services before or after a disaster, with a long-term view of supporting re-located inhabitants of the small vulnerable islands.

CARRIBEAN (Adger 2003)

A strong positive relationship between government and local stakeholders in the Buccoo Reef Marine Park facilitated a new institutional design, conflict resolution strategies and the joint development of a new management plan for the marine park. The strong stakeholder networks are a critical resource to cope with extreme weather conditions, where individuals involved in disaster planning are also working closely with the marine park to promote management of the protected area.

NEW ZEALAND

Cultural health index for streams and waterways (McLean 2010)

The Maori monitoring of New Zealand wetlands project uses indigenous indicators to assess how Maori see their environment changing. A method was developed with Maori organisations for their people to use to assess the change in their environment and prepare a report for their state of environment report that is delivered to their local and central governments. Maori concepts underlie the monitoring indicators.

Consultation with Maori on Climate change (McLean 2010)

In 2007 consultation was held with Maori people across the country to discuss climate change issues and options. It was acknowledged that climate change is an urgent issue that requires action, both for future generations and to restore the environment Participants also made clear their desire for more and better information. The principle of partnership was highly regarding in developing policies that will affect Maori.

AUSTRALIA

Ranger programs in Northern Australia

(www.indigenousclimatechange.com.au/casestudy7.aspx, accessed 5 April 2014).

The ranger programs in northern Australia, in Broome, Maningrida and Ngukurr (Northern Territory), and Wujal Wujal (Queensland) are supporting indigenous adaptation in those communities. Rangers are managing climate and environmental threats of bushfires, coastal erosion, feral animals and weeds, loss of biodiversity through strategies that use both traditional and western knowledge.

Re-introduction of traditional fire management in Northern Australia

(www.indigenousclimatechange.com.au/casestudy11.aspx, accessed 5 April 2014).

Also in northern Australia, a partnership between NAILSMA and the University Nations University, and the Australian Government on a savannah fire management and sustainable livelihoods project is seeing the re-introduction of traditional-style patch burning. The practice has reduced the intensity of late dry season fires and emissions. Other benefits delivered through the project were increased use of cultural and social tradition and increased capacity to adapt to climate change.

TUMRA between Great Barrier Reef Management Authority and Girringun Aboriginal Corporation (Zurba 2009)

The Traditional use of Marine Resources Agreement (TUMRA) between the Great Barrier Reef Marine Authority (GBRMPA) and the Girringun Aboriginal Corporation (GAC) in Northern Queensland demonstrated increased consideration and inclusion of indigenous knowledge into a co-management approach. Increasing dialogue and the incorporation of indigenous knowledge and perspective has

strengthened the co-governance of arrangement for a more adaptive resource-use community.

Summary and conclusions

Generating adaptation pathways and opportunities with Indigenous peoples in the Wet Tropics cluster region requires recognition that culture, history and geography underpin both high resilience and high vulnerability to the impacts of climate change. Indigenous knowledge systems are highly adaptive and provide the foundation for developing adaptation pathways and opportunities. However, many Indigenous organisations and communities report lack of technical skills and knowledge to take account of the contemporary context of climate change policy that shapes their opportunities, and seek better understanding of the science of climate change. Regionally-specific capacity building and knowledge co-production projects can help to address this gap. At the same time a number of approaches, methods and tools are necessary to ensure that Indigenous knowledge and culture are integrated into mainstream adaptation polices, programs and practices. These include support for Indigenous governance and co-governance, cultural brokers, the use of Indigenous-driven and cultural planning approaches, and visual and spatial tools including cultural mapping and seasonal calendars. Cultural keystone species have been found to play a catalytic role in knowledge integration (Bohensky *et al*. 2013; Hill *et al*. 2013b; Maru *et al*. 2014; Robinson *et al*. 2014). Many Indigenous communities already face liveability challenges across infrastructure issues including transport, energy, water, sewerage, industry, housing. Integration of Indigenous knowledge and cultural considerations into the adaptation strategies for these sectors is vitally important.

Integrated approaches that support sustainable development to address current socio-economic barriers are central to climate adaptation for Indigenous peoples. Comprehensive community planning processes underway with First Nations in Canada provide a good example of how to do this, and are worthy of consideration. Indigenous peoples in Australia emphasis the need for community-driven adaptation that empowers their roles and responsibilities. However, many structural factors are encountered as barriers by Indigenous peoples in generating these pathways, including limitations to tenure and rights over carbon. Long-term partnerships that address these deep structural sources of disadvantage are needed to build Indigenous adaptive capacity. Indigenous peoples' emphasis on integrated approaches that link adaptation across social, economic, environmental and cultural domains challenges our usual more reductionist approaches to monitoring and evaluation. Nevertheless, participatory knowledge/action projects are demonstrating how program logic-based approaches can be linked with Indigenous knowledge to generate effective holistic measures

Specific adaptation actions have not been identified in this Chapter, as these will be negotiated through the participatory processes facilitated by NRM groups and other stakeholders. Effective adaptation pathways and opportunities will be different for different Indigenous people, communities and groups across the Wet Tropics cluster. Application of the approaches, tools and methods synthesised in this chapter provide an opportunity to support beneficial approaches across this diversity by tailoring to the context. Indigenous roles in managing country provide a key avenue for adaptation pathways that contribute positively to health and well-being of people and natural resources across the cluster. Table 6.2 provides an example from the Upper Georgina River Basin (UGRB) of the key strategies, actions and outcomes identified as part of an adaptation planning process involving Aboriginal people from five communities in the UGRB and the Aboriginal Environments Research Centre (AERC, University of Queensland) (Memmott *et al*. 2013). While the Upper Georgina strategies have been developed in very different geographical, climatic and community contexts to those present in the WTC region, many issues are common to Indigenous peoples across regions, as reflected in the planning themes (i.e., land management, housing and settlements, enterprise development; Table 6.2). We commend this and the other examples and adaptation approaches provided in this chapter as useful entry points for Indigenous peoples and communities in developing practical adaptation pathways.

Table 6.2 Key climate adaptation strategies, strategic actions and outcomes identified by Aboriginal communities in the Upper Georgina River Basin (UGRB) (Source Aboriginal Environments Research Centre). *Reproduced with permission from Memmott et al. (2013).*

ADAPTATION STRATEGIES	STRATEGIC ACTIONS	KEY OUTCOMES	BARRIERS
1. Anticipatory Adaptations/ Preparedness for Climate Change			
1.1 UHRB Aboriginal communities to work together in building climate change adaptation (CCA) strategies.	Establish a UGRB CCA Group.	Co-ordinate preparedness and anticipatory adaptation activities at a regional level.	Potential issues regarding who funds the formation of this group.
1.2 Appropriate regional climate change planning processes required.	Consult with Aboriginal community members and Government/NGO agencies.	Develop further the Regional Climate Change Management Plan. Develop a Disaster Management Plan for each community.	Lack of funding and cross-jurisdictional issues.
1.3 Better regional climate change preparedness communication processes needed.	Establish a regional CCA social media program.	Co-ordinate local communities and State, Federal and non-Government agencies re. practical climate change adaptation ideas, both for chronic change and acute weather response.	Lack of funding and cross-jurisdictional issues disrupting good communication outcomes.
1.4 Management of response and recovery processes during and after an extreme weather event.	Link with the Australian Red Cross (ARC).	Become the conduit between local communities, State, Federal and non-Government agencies re. disaster management co-ordination.	Potential issues with communications protocols, roles and responsibilities during such events.
1.5 On-going CCA research in the UGRB region required.	Continue communicating with Aboriginal climate change protagonists in the UGRB region.	Seek further funding to continue current research.	Lack of funding options prevents this from happening.
1.6 Appropriate regional and local CCA programs need to be implemented.	Consult with Aboriginal community members and Government/NGO agencies.	Develop a primary and secondary schools education program.	Lack of funding.
1.7 Appropriate regional and local CCA training programs need to be implemented.	Consult with Aboriginal community members and Government/NGO agencies.	Develop a regional Emergency Management Queensland/TAFE training program.	Lack of funding.
2. Land and Riverine Management			
2.1 Managing culturally and environmentally significant places.	Documentation and mapping of culturally and environmentally significant places.	Establish a set of cultural places and plant and animal habitats for monitoring and protection and	Access to knowledgeable Aboriginal people and availability of suitably skilled people to record knowledge

ADAPTATION STRATEGIES	STRATEGIC ACTIONS	KEY OUTCOMES	BARRIERS
	Protection of culturally significant places and plant and animal habitats. Negotiation over land and river use with regional stakeholders including pastoralists and mining companies.	implementation of program. Build the capacity of Aboriginal representatives and their involvement in environmental management.	as well as funding for Aboriginal Knowledge recording, archiving and retrieval. Accessing funding. Availability and willingness of knowledgeable Aboriginal people and regional stakeholders to meet, discuss and lobby effectively.
2.2 Education about Aboriginal land and river management and climate change in the region.	Lobby local government for visitor interpretation and history of land management.	Develop a range of educational resources in collaboration with the Aboriginal community on land and river management, Aboriginal Knowledge and climate change in the UGRB for use in local and regional schools and in the wider community.	Availability and application of appropriate teacher training and educational resources for schools as well as for the wider community.
2.3 Training and employment of local Aboriginal rangers.	Create further opportunities and programs for Aboriginal ranger training in the UGRB region.	Support local Aboriginal groups to gain access to ranger training programs in the UGRB region.	Funding for all aspects of locally-based ranger training programs and availability of suitable trainers and mentors.
3. Housing and Settlement Program			
3.1 Improve adaptive capacity of individuals.	Increase employment in local service delivery.	Aboriginal provision of infrastructure, services and housing construction.	Aboriginal participation and initial costs.
3.2 Integrated settlement design.	Aboriginal participatory planning.	Utilise local knowledge in settlements planning.	Upfront cost.
3.3 Bioclimatic housing.	Low-energy housing case study.	Aboriginal participation in design, planning and construction, with teams of qualified building consultants, experienced in cross-cultural design.	Costs and complexity.
4. Enterprise Development Opportunities			
4.1 Ecosystem restoration works in relation to carbon farming initiatives relevant to the region.	Investigate Aboriginal environmental management processes.	Develop a regional carbon farming enterprise and mining land rehabilitation enterprise.	Complex land use agreement process between local pastoralists and UGRB Aboriginal communities. Lack of will by mining companies to support such

ADAPTATION STRATEGIES	STRATEGIC ACTIONS	KEY OUTCOMES	BARRIERS
			an agreement.
4.2 Environmental disaster management and clean up.	Investigate environmental disaster management processes.	Develop an environmental land rehabilitation enterprise.	Lack of will by mining companies to support such an enterprise.
4.3 Emergency road repair.	Investigate infrastructure and disaster management processes.	Develop an infrastructure and disaster response enterprise.	Lack of funding opportunities to support such an activity.
4.4 Weed eradication programs.	Investigate Aboriginal environmental management processes.	Develop an environmental land rehabilitation enterprise.	Complex land use agreement process between local pastoralists and UGRB Aboriginal communities.
4.5 Feral animal hunting.	Investigate Aboriginal environmental management processes.	Develop an environmental land rehabilitation enterprise.	Complex land use agreement process between local pastoralists and UGRB Aboriginal communities.
4.6 Patchwork burning programs.	Investigate Aboriginal environmental management processes.	Develop an environmental land rehabilitation enterprise.	Complex land use agreement process between local pastoralists and UGRB Aboriginal communities.

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