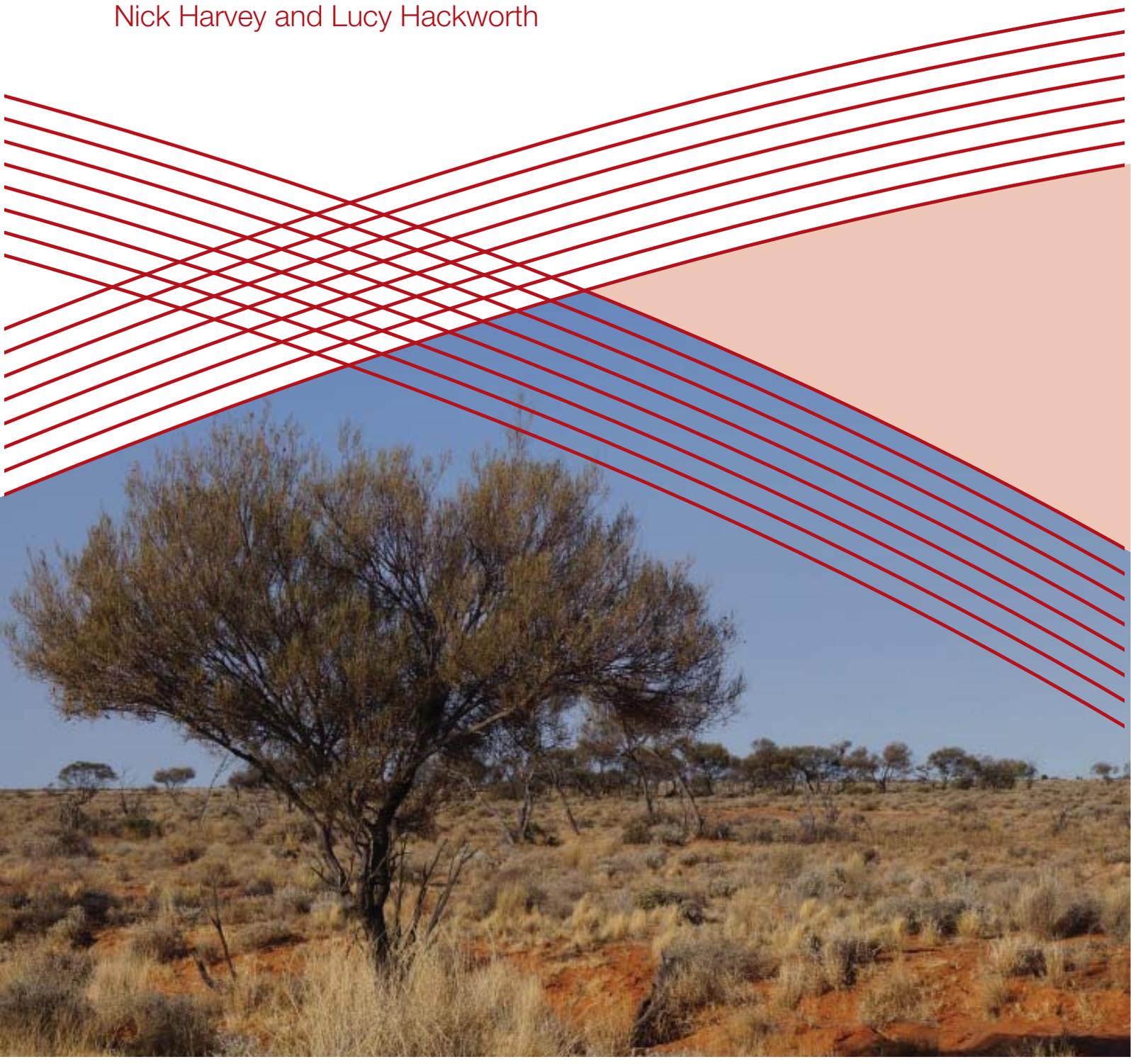




Community based adaptation to climate change: The Arabana, South Australia

Final Report

Melissa Nursey-Bray, Deane Fergie, Veronica Arbon,
Lester-Irabinna Rigney, Rob Palmer, John Tibby,
Nick Harvey and Lucy Hackworth



COMMUNITY BASED ADAPTATION TO CLIMATE CHANGE: THE ARABANA, SOUTH AUSTRALIA

The University of Adelaide

AUTHORS

Melissa Nursey-Bray – The University of Adelaide
Deane Fergie – The University of Adelaide
Veronica Arbon – The University of Adelaide
Lester-Irabinna Rigney – The University of Adelaide
Rob Palmer – AuConsulting Adelaide
John Tibby – The University of Adelaide
Nick Harvey – The University of Adelaide
Lucy Hackworth – The University of Adelaide



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Preface

“There can be no ‘one size fits all’ approach to working with communities in relation to adaptation strategies, every community is unique and has varying strengths and weaknesses...”

(Green et al. 2009)

“It’s very important. There is a lot of things that are affecting our country at the moment, but climate change is the one, the major one that we need to know about besides everything else, this one can change our country, this one can change who we are...”

(Aaron Stuart, 2012)

“Arabana are strong, we’ll be resolute, whatever we need to do we will do...”

(Syd Strangways 2012)

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ABBREVIATIONS

ACIA	The Arctic Climate Impact Assessment
ABS	Australian Bureau of Statistics
ADAPT	Adaptation Database and Planning Tool (ADAPT)
BoM	Bureau of Meteorology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DENR	Department of Environment and Natural Resources
ICT	Information and Communications Technology
IPCCA	The Indigenous Peoples Climate Change Assessment initiative
IPCC	Intergovernmental Panel on Climate change
NCCARF	National Climate Change Adaptation Facility
NRM	Natural Resource Management
SAAL	South Australian Arid Lands
UNFCC	United Nations Framework for Climate Change
UNEP	United Nations Environment Program

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ABSTRACT

The Arabana Climate Change Adaptation project is a collaboration between the Arabana people and the University of Adelaide, South Australia. Arabana people live in the Lake Eyre region, Marree, Oodnadatta, Coober Pedy, Alice Springs, Port Augusta, Adelaide and Darwin. The project was a multi method, cross cultural and interdisciplinary adaptation project which aimed to assess the resilience and vulnerability of the Arabana people and then develop adaptation options.

Project dimensions included production of a peer reviewed science report, an assessment of adaptive capacity via interrogation of wellness, governance and ICT, and conduct of a risk perception values analysis and adaptation workshops. Results suggest that Arabana people have a history of adaptation and are relatively resilient to change, yet Arabana country is highly vulnerable. The Arabana strategy was built around trying to make connections between these two elements. Adaptation options in the strategy include establishment of cultural centres in every place and city where Arabana people live, setting up economic businesses in tourism and pastoralism, moving back to country, establishing cultural camps, revitalisation programs and the establishment of ranger, land management and monitoring and research programs.

EXECUTIVE SUMMARY

Climate change is an international problem and Indigenous people will be affected by it (Macchi 2008) with many case studies being documented in the literature (eg., Huntingdon and Fox 2005, Weladji and Holland 2003). In Australia, studies highlight many Indigenous peoples and communities will be particularly vulnerable to climate change (Green et al. 2009, Beer et al. 2012). This is a report presenting the combined results of two major studies (one examining risk, environmental change and adaptation and another focussing on social sustainability) that looked at climate change, adaptation and the Arabana people. It is the final reporting on a grant funded by the National Climate Change Adaptation Research Facility.

To support the study, we commissioned a peer reviewed science report to identify the key predictions for climate change across all places where Arabana people live including the traditional country for Arabana which is in the Lake Eyre, Marree, Darwin, Alice Springs, Port Augusta and Adelaide. This report finds that the regions will get hotter, in some places wetter, and in others much dryer and that in Arabana Country, water availability overall will decrease. The report shows that flora, fauna, cultural sites and the liveability in the regions will be affected by climate change.

Findings from the risk and adaptation study show that Arabana people consider climate change to be a risk and that they have a number of specific concerns. In particular, Arabana are worried about availability, access, quality and drying up of water, especially in relation to their culturally significant mound springs. They are concerned about the destruction of and eroding away of cultural sites via wind, erosion or flooding. The maintenance of livelihoods is another major issue as is how to build family and cultural networks across the nation. Arabana people across Australia also identified and described a number of changes (mainly environmental) that they had observed over time (a 90 year period). These include observed changes to flora, fauna, settlements, sea level, and the frequency of climatic factors including heat, cold, ice, dust, wind and cyclones.

However, results from the social sustainability study reveal a people highly resilient to change and who have been adapting to change for millennia. This resilience today is manifest in the way in which Arabana people have moved around the country, withstood the pressures of colonisation and remained culturally strong with a resilient sense of identity, no matter where they live. This highlights that the Arabana people are potentially less vulnerable to the impacts of climate change, as they have adaptive capacity to respond to this change. Part of this strength is evidenced by the fact that Arabana people from all across Australia came together in Port Augusta for an adaptation workshop, and collectively agreed on an adaptation program.

In sum, this research found that Arabana country is highly vulnerable to the impacts of climate change, but that the Arabana people are highly resilient. These findings are based on fieldwork, the relative certainty of the science predictions and a literature review. Potentially, this presents a priority for adaptation planning for Country rather than for Arabana people in places where they live.

Results from the adaptation workshop were collated with the research results to produce a community based adaptation strategy, endorsed by the Arabana Board of Directors in December 2012. Suggested adaptation programs included establishing cultural centres in every place and city where Arabana people live, setting up economic businesses in tourism and pastoralism, moving back to country, developing a program of regular cultural camps, revitalisation programs, the building of partnerships and the establishment of ranger, land management and monitoring and research programs.

1. INTRODUCTION

Climate change is an international problem. The report by the International Panel for Climate Change (IPCC) (2007) states that climate change is primarily caused by increases in carbon dioxide into the atmosphere, and that there is very high confidence that this increase has been primarily caused by human activity. Examples of predicted impacts from climate change include sea level rise, warmer global temperatures, ocean acidification, more intense natural disaster events (whether that is fire, flood, storm, snow) and melting of the ice caps.

Indigenous peoples worldwide will be affected by climate change. The United Nations has identified that Indigenous peoples will be amongst the most vulnerable sectors to the impacts of climate change. Macchi et al. (2008) note that the goals of the IUCN report on Indigenous peoples and climate change are as follows:

- to improve understanding of the potential impacts of climate change on vulnerable communities and cultures and their associated ecosystems;
- to identify further research required to reduce the risks of climate change; and
- to develop appropriate adaptation and mitigation measures, particularly in areas with high risk of socio-cultural impacts.

This report highlights that the areas where Indigenous peoples live are also the areas where climate change is predicted to be greatest. Such areas include the Arctic (Krupnik and Jolly 2002), Caribbean, Mediterranean, the south of Latin America and the Amazon, southern Africa, the Arabian Peninsula and large regions of Australia. Some of the issues that may be of particular concern for Indigenous peoples include sea level rise, the impact of more intense and extreme weather events, flooding, drought and environmental dislocation.

The capacity of Indigenous peoples to respond to these changes will depend upon a number of factors including gender, degrees of vulnerability and degrees of social resilience each group may or may not have. For example, women may be more affected by climate change as a result of being more responsible for family structures, having less secure property rights, diminished mobility and less access to resources than men. Other factors that make Indigenous people more vulnerable include increased exposure of extreme events, availability of natural resources, the location and quality of where people live, the status of property rights, poverty, the extent and level of social networks and livelihood diversification.

Another major issue facing Indigenous people as a result of climate change is the associated health issues. For example, in Canada, Aboriginal Canadians already face many health issues and thus specific actions will need to take place to ensure that climate change does not worsen an already difficult situation (Ford et al. 2010).

Indigenous peoples have been active in articulating their global position on climate change for decades, as shown by the historical synthesis in Figure 1.1 below.

2012: National Climate Change Adaptation Research Facility funds Indigenous Adaptation research programs across Australia

2011: Indigenous Peoples Biocultural Climate Change Assessment Initiative established (see <http://ipcca.info/about/>)

2009: The Anchorage Declaration of the Indigenous Peoples' Global Summit on Climate Change

2009: The Manila Declaration of the International Conference on Extractive Industries and Indigenous Peoples, Manila, 23-25 March 2009.

2009: Joint Indigenous Peoples and NGO Statement on the occasion of the presentation of the Report of the Office of the United Nations High Commissioner for Human Rights (OHCHR) on the relationship between climate change and human rights

2008: The Mahinekura Reinfelds Declaration, Snowchange 2008.

2007: Declaration on the Rights of Indigenous Peoples, UN General Assembly, 13 September 2007

2007: 60th Annual UNDP/NGO Conference Declaration, September 6, 2007, "Climate Change Threats – an NGO Framework for Action"

2006: Statement of Indigenous Peoples to UN Commission on Sustainable Development, Nairobi, December 2006 http://www.tebtebba.org/tebtebba_files/susdev/cc_energy/cc.html

2006: Declaration of Indigenous Peoples attending the COP 10, United Nations Framework Convention on Climate Change, Buenos Aires, 6-17 December 2006.

2006: Statement of Indigenous Peoples to UNCS14 High-Level Segment, 11 May 2006

2005: Tiohtiá:ke (Montreal) Declaration, December 2005 International Indigenous Peoples Forum on Climate Change Statement to the State Parties of the COP 11/MOP 1 of the United Nations Framework Convention on Climate Change (UNFCCC).

2005: Arctic Indigenous Statement, December 2005

2005: Arctic Youth Statement, November 2005

<http://www.taiga.net/ayn/declaration.html>

2004: Declaration of Indigenous Peoples Attending the COP 10, UNFCCC, Buenos Aires, Argentina, December 6 - 17, 2004.

2003: Milan Declaration 6th International Indigenous Peoples Forum on Climate Change, Milan 29-30 November 2003.

2003: Indigenous Peoples Kyoto Water Declaration, Third World Water Forum, Kyoto, March 2003

2002: Indigenous Peoples Statement from the Indigenous Peoples Caucus of the Eighth Session of the Conference of the Parties, United Nations Framework Convention on Climate Change held 23 October to 1 November 2002 in New Delhi, India

2002: The Kimberley Declaration from the International Indigenous Peoples Summit on Sustainable Development in Kimberley, South Africa 20-23 August 2002.

2002: Bali Principles of Climate Justice. International Climate Justice Network, Johannesburg Earth Summit, 6 September 2002

2002: Indigenous Peoples Political Declaration from PrepCom IV in Bali, Indonesia, 6 June 2002. http://www.tebtebba.org/tebtebba_files/summit/wssd/poldec.html

2001: The Marrakech Statement on Climate Change from the Indigenous Peoples and Local Communities Caucus of the Seventh Session of the Conference of the Parties, United Nations Framework Convention on Climate Change held 29 October to 9 November 2001 in Marrakech, Morocco.

2001: The Bonn Declaration of the Third International Forum of Indigenous Peoples and Local Communities on Climate Change held 14-15 July 2001 in Bonn, Germany.

2000: Second International Indigenous Forum on Climate Change Declaration of Indigenous Peoples on Climate Change held in The Hague on 11-12 November 2000.

2000: The Declaration of the First International Forum of Indigenous Peoples on Climate Change from 4-6 September 2000 held in Lyon, France.

2000: The Quito Declaration on Climate Change, 4-6 May 2000.

1998: The Albuquerque Declaration of 1 November 1998 from the 'Circles of Wisdom' Native Peoples/Native Homelands Climate Change Workshop-Summit held in Albuquerque, New Mexico.

Figure 1.1: Historical synthesis of Indigenous actions on climate change

This synthesis provides a context for this research, and show that Arabana are not alone in asserting their right to undertake and manage the impacts of climate change.

For example, Indigenous peoples have already begun the process of documenting their climate histories and traditional knowledge about climate change (e.g. Cameron 2012, IPCC, 2007; Laidler, 2006; Leduc, 2007; Nickels et al., 2006; Riedlinger and Berkes, 2001; Thorpe, 2000; Weatherhead et al., 2010). Much work focuses on the experience of Indigenous peoples in the Arctic (Ford and Smit, 2004; Ford et al., 2006a,b, 2008; Laidler et al., 2009; Pearce et al., 2010).

Such work examines the role traditional knowledge plays in advancing climate change adaptation. For example the Inuit use their knowledge about sea ice conditions, weather and wildlife to better understand climate change and how to respond to it (Gearheard et al., 2001; Laidler, 2006; Leduc, 2007; Nichols et al., 2004). Other studies have focussed on how Indigenous peoples can develop adaptation strategies, and how vulnerability of Indigenous peoples to climate change can be assessed.

However, many Indigenous peoples may object to be constructed in the discourse as 'vulnerable' (Haalboom and Natcher 2012, Howitt et al. 2012), and many other studies, highlight Indigenous people's resilience. Newsham and Thomas (2011) for example show how the agro-ecological knowledge held by Ovambo farmers in North Central Namibia has given them resilience to climate variability and change. Turner and Clifton (2009) in a study of the Indigenous Peoples of British Columbia show that they have always had to adapt and respond to environmental change and have recorded these climate changes via oral histories, the memories of their Elders and via Indigenous languages and terminologies. This system of knowledge has recently noted changes including species change and loss, weather inconsistencies and declines in forest and grasslands. These observations are useful in the context of climate change.

In Mongolia, Marin (2010) highlights that when local peoples knowledge and observations about climate is combined with climate science that it is possible to build better plans for adapting to it. Similarly in Malawi, African farmers have been using Indigenous knowledge for centuries to help them predict and understand weather patterns and hence make decisions about farming. They are now working with scientists to help them predict future weather events and build their resilience via integrating knowledge systems to climate change (Kalanda-Joshua et al. 2010).

In Mexico, Indigenous peoples have developed a multiple use strategy for tropical forest management, that combines Western and traditional knowledge effectively, thus again building resilience and capacity to withstand any negative effects as a result of climate change (Toledo et al 2003). Bark et al. (2012) show that when a number of adaptation mechanisms are brought together they can enhance the recognition of Indigenous water claims, thus helping reinforce the point also made by Bisaro et al. (2010) that Indigenous adaptive management, Indigenous property and tenure rights are part of the adaptation process. In the aboriginal community of Wemindji, east coast James Bay, Canada, Cree Hunters have observed many changes in relation to long term landscape changes induced by coastal uplift processes (Sales and Mulrennan 2010).

Adaptations to this have included the construction of mud dykes and the cutting of *tuuhiikaan*, which are corridors in the coastal forest, to retain and enhance desirable conditions for goose hunting. This study highlights the adaptive capacity already being implemented by Indigenous people to respond to environmental change. While it is important to recognise the diversity and therefore individualised nature of Indigenous adaptation responses, the fact that so much is happening in this space highlights its

dynamism. There is potential for Indigenous peoples to find mutual reinforcement and learn from each other's endeavours, even if their situations and cultures are very different,

1.1 Aboriginal and Torres Strait Peoples and climate change, Australia

In Australia, many Indigenous groups will face climate challenges. Together with the already existing socio-economic and other difficulties they face Indigenous peoples will need to build adaptation and mitigation options (Altman and Jordon 2008). For example, in the Northern Territory, where over 90% of the coast is owned outright by Aboriginal peoples, there is a clear imperative to adapt to the major climate change management challenges that they will confront.

Moreover, Aboriginal and Torres Strait peoples still suffer within an ongoing cycle of social and economic disadvantage that will and does exacerbate the vulnerability of remote Indigenous communities' to climate change in Australia. The *Overcoming Indigenous Disadvantage Report* (SCRGSP 2007) highlights the extent of this problem, by showcasing a range of social disadvantage and vulnerability factors. Beer (2012) in a study that constructed a national vulnerability index of remote communities to climate change, finds that Aboriginal communities are amongst the most vulnerable. Other studies highlight the health impacts of climate change on Aboriginal communities (Campbell et al. 2008, Carrington and Young 2011, Dockery 2009).

In a major scoping study of Indigenous peoples, risk and climate change in Northern Australia, Green et al. (2009) overview the key issues faced by Indigenous peoples in Australia. They undertook a study that covered 665 settlements varying from less than 50 to 3500 people and with about 50 per cent of that population living within 20 kilometres of the coast and assessed the impacts of climate change on Indigenous settlements across tropical northern Australia, including the Torres Strait. The study. They demonstrate that those Indigenous peoples most vulnerable to climate change were also those suffering from multiple sources of disadvantage, despite resilience being present in many cases., They also argue that while adaptive capacity reflected the ability of northern Indigenous peoples to respond as climate events occur, that there was nonetheless a need for a deliberative, planned adaptation.

Bardsley and Wiseman (2012, 713, and see Wiseman and Bardsley 2013 also) for example, show that "while the need to understand how climate change will impact on society is valid, the challenge for many vulnerable communities, especially some of the most marginalised, such as remote Indigenous communities of north-west South Australia, need to be couched in the context of both immediate risks to livelihoods and long-term challenges of sustainable development".

In an integrated review of climate change vulnerability for the Alinytjara Wilurara Natural Resources Management region, South Australia, they argue that specific focus on particular climate change impacts and adaptation can mean that the broader needs for both people and environment can be overlooked.

Understanding the risk within existing socio-economic contexts needs to occur so as to ensure that risk can be prioritised and hence adaptation developed. They accent the importance of providing opportunities for strong community engagement with adaptation while combining western and traditional ecological knowledge. Similarly, Petheram et al. (2010) argue that despite a global trend towards adaptation, that Aboriginal people's perspectives have been undervalued and not provided for in adaptation strategies, In a study of the Yolgnu people, they find that participants had

observed changes to the country which was attributed variously to mining, tourism 'development', and climate change. These changes are affecting the welfare of the community. Petheram et al. (2010, 682) go on to note that "poor communication and engagement, top-down institutional processes that allow little Indigenous voice, and lack of recognition of Indigenous culture and practices" constrain adaptation responses at many scales.

In sum, Aboriginal and Torres Straits Islander peoples across Australia and the world are being affected by and are responding to climate change. The Arabana people of the Lake Eyre are no exception. In 2011, the National Climate Change Adaptation Research Facility invited researchers to submit projects that looked at the issue of Indigenous peoples and climate change. The University of Adelaide was successful in obtaining project funds to conduct a study into the vulnerability and adaptation options for the Arabana people. The traditional lands of the Arabana people include the Lake Eyre region in South Australia, but Arabana people also live in Darwin, Alice Springs, Marree, Adelaide, Port Augusta, Oodnadatta and beyond.

Our research objectives were:

- To assess what the varying vulnerability and risks are to the Arabana people from projected climate change impacts not just on Country but in many of the different places that they live.
- To establish what adaptive capacity existed that would assist adaptation to those changes, operationalised via investigation into wellbeing, resilience, governance and ICT (Information and Communications Technology).
- Develop adaptation options/actions for and with the Arabana peoples.

This report presents the findings of the above, specifically the two major studies that looked at climate change, adaptation, adaptive capacity and the Arabana people. The first study, presented in Chapter 3, discusses the adaptive capacity and social sustainability to climate change for the Arabana in three frames: governance; wellness; and infrastructure.

The second study, presented in Chapter 4, presents the results of a field assessment that focussed on environmental impacts and climate change adaptation.

Chapters 5 and 6 outline the adaptation program that the Arabana subsequently developed, and Chapter 8 discusses the challenges ahead and lessons learned from this project that others may draw insight from.

In this report we have drawn upon the academic literature across many fields to highlight contemporary adaptation practices, while presenting the results of the fieldwork. As to be expected in an interdisciplinary report, there is slight stylistic variation in style. We do not presume substantial prior knowledge about the terminology of climate change or indeed the issue, hence have aimed in our presentation to use clear and simple English, in a way that also represents the tone and views of the Arabana we worked with.

2. METHODS

2.1 Introduction: research objective and aims

This report presents the results of a resilience assessment conducted by a team of inter-disciplinary (Indigenous and non-Indigenous) researchers in conjunction with the Arabana people, that led to the launch of an adaptation program. The assessment aimed to understand what the environmental impacts are on Arabana Country and places where Arabana people live (real and perceived), determine the extent of adaptive capacity they had and the implications of these impacts for climate change adaptation.

Our approach was developed within three strands: (i) ensuring that its conceptual frame was consistent with the literature on and definition adopted by the Australian government (for understanding vulnerability/adaptation), (ii) that it was ethical research, and conducted with the Arabana people at its centre and (iii) that it provided the capacity for the inter-disciplinary strength of the team to be maximised by permitting application of discipline relevant methods in the field.

2.2 The Research Team

The research was conducted by a team which included two Aboriginal Professors, an author of the IPCC 4 report, anthropologists, social and climate scientists and a communications expert (see Table 2.1). We also involved the Arabana Board of Directors, specifically Mr Aaron Stuart, who worked with the team, (especially researchers Nursey-Bray and Palmer) throughout the project, and provided cultural advice, liaison and Arabana participation in the project.

Table 2.1: The Research Team

<p>Melissa Nursey-Bray is a historian and geographer who has worked on developing caring for country strategies with Australian Aboriginal and Torres Strait Islanders for 20 years. She also has extensive expertise in climate change adaptation, which includes on ground experience developing climate adaptation programs for local government, fisheries and NRM bodies and delivery of a 100% online course in climate change adaptation. Melissa led the project overall and the team responsible for developing the risk and adaptation components of the project.</p>
<p>Rob Palmer is a communications researcher and Director of communications firm auconsulting. Rob has extensive experience in developing and evaluating cross cultural and sectoral communications in the field of climate change and climate change adaptation. He led the development of communications for the project including coordination and production of all flyers, films, blogs, media and a web site.</p>
<p>John Tibby is a climate researcher focussed on work on the palaeo-climatic regimes of coastal lakes and what lessons can be drawn from them for current and future climate changes. John led the development of the peer reviewed science report which identified what the current and future projections are for Arabana country and places Arabana people live.</p>
<p>Professor Irabinna Rigney is Dean of Aboriginal Education at the University of Adelaide, and an expert in Indigenous methodologies. He oversaw the development and text of the research protocol and brought his experience to bear on solving any method issues during the project.</p>
<p>Professor Nick Harvey, Executive Dean of the Faculty of Humanities and Social Science, was one of the authors in the IPCC 4 reports.. Nick offered his expertise in the area of climate science and convened the peer review of the science report.</p>
<p>Deane Fergie is an anthropologist who has worked with Arabana people for 25 years. Deane co-ordinated the work of the social sustainability team and took responsibility for developing the work on Arabana peoples' heritage of adaptability, social organisation and the challenge of governance.</p>
<p>Veronica Arbon is an Arabana <i>udyurla</i> and was raised in Alice Springs, Urpunga Station and Darwin and is a member of the Strangways line (through Myra Hull) of Arabana people. She has a Phd in Indigenous Education. Professor Arbon took the lead in researching and reporting on the contemporary wellbeing and resilience dimensions of this research.</p>
<p>Lucy Hackworth is a social scientist with training in development studies and gender studies. She is a research officer and designer in the LocuSAR team at the University of Adelaide. Lucy took responsibility for our enquiry into ICT and infrastructure.</p>

2.3 The Arabana

The Arabana people are from the Lake Eyre region in South Australia. Due to colonisation, relocation, and missionisation, Arabana people are extremely dispersed with major populations living in Alice Springs, Oodnadatta, Marree, Adelaide, Coober Pedy and Port Augusta (see Figure 2.1 below for Arabana country)

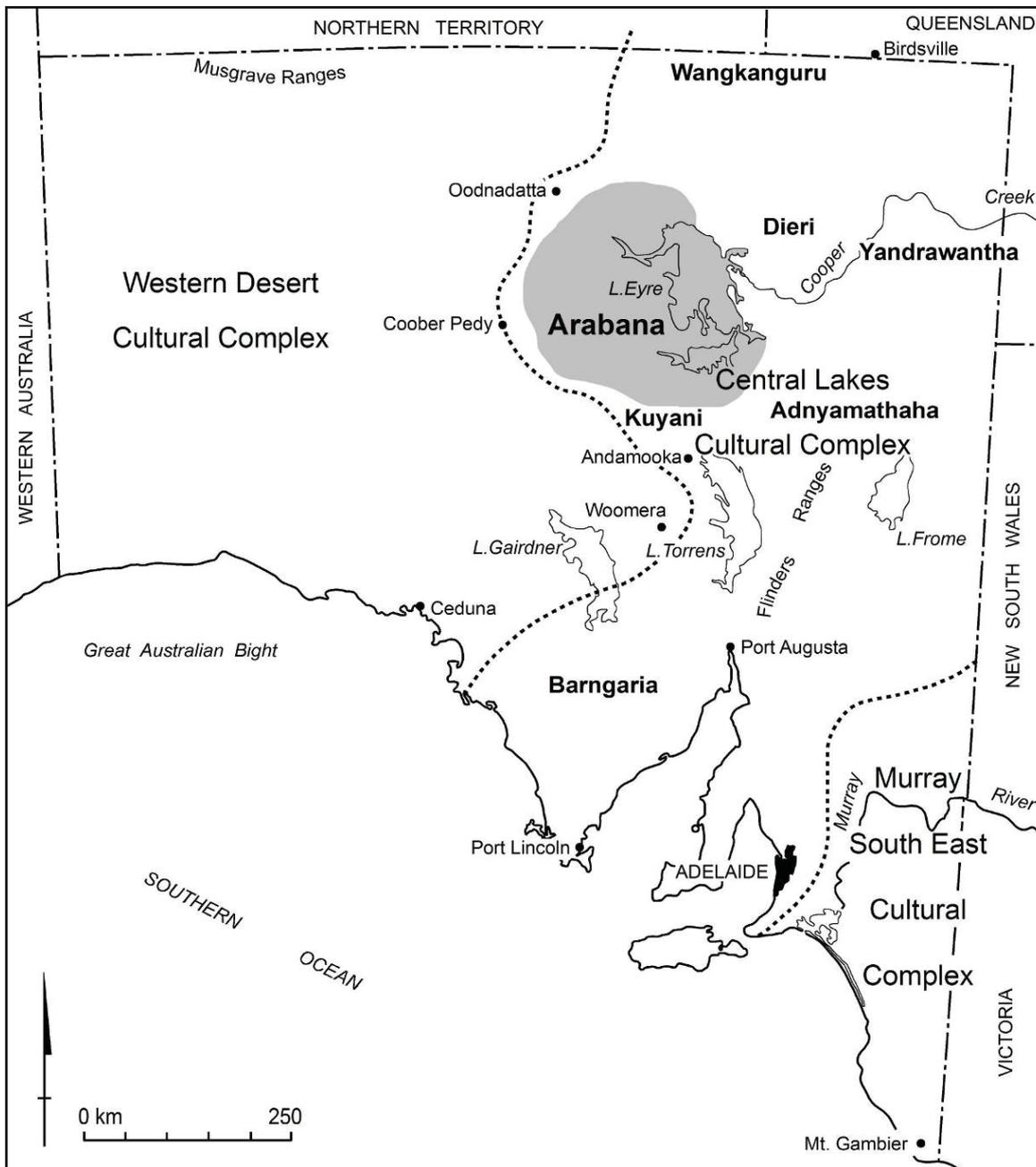


Figure 2.1: Indicative distribution of Arabana country (Map drawn by Chris Crothers)

As a region, Lake Eyre is unique. It is Australia's largest salt lake, located 647 km north east of Adelaide in the state of South Australia and its catchment spans Queensland, the Northern Territory, South Australia, and New South Wales. It is popularly described as comprising between one fifth to one sixth of the Australian continent. The Lake Eyre is a drainage basin of over 1.2 million square kilometres and at 15.2 metres below sea level in its eastern perimeter, is Australia's lowest point. The Basin consists of two lakes: Lake Eyre North and Lake Eyre South both of which are connected by the Goyder Channel (Arid Lands NRM 2010). The region experiences little rain, and floods on average only four times a century; although between 2006 and 2011 there have been many more rain events than usual. Named after the English explorer Edward John Eyre, the region is also the traditional land for the Arabana, the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands, and other Indigenous peoples who have inhabited the area for thousands of years. Today, there are about 57,000 people living in the basin working in pastoralism, tourism, mining and petroleum; as well as township based work such as retail, education, medical and other services. A further analysis of the statistics that indicate change over time in demography, economy and environment in traditional Arabana Country would be useful, and we suggest it as a future piece of research. Preliminary work done to date in this regard highlights the difficulties of 'seeing' particular peoples like the Arabana outside of their 'Indigeneity'. This potentially cloaks the Arabana with an invisibility in official data that has the potential to make the adaptive capacity of Arabana culture virtually inaccessible to conventional policy frameworks that tend to target 'Indigenous-in-general'.

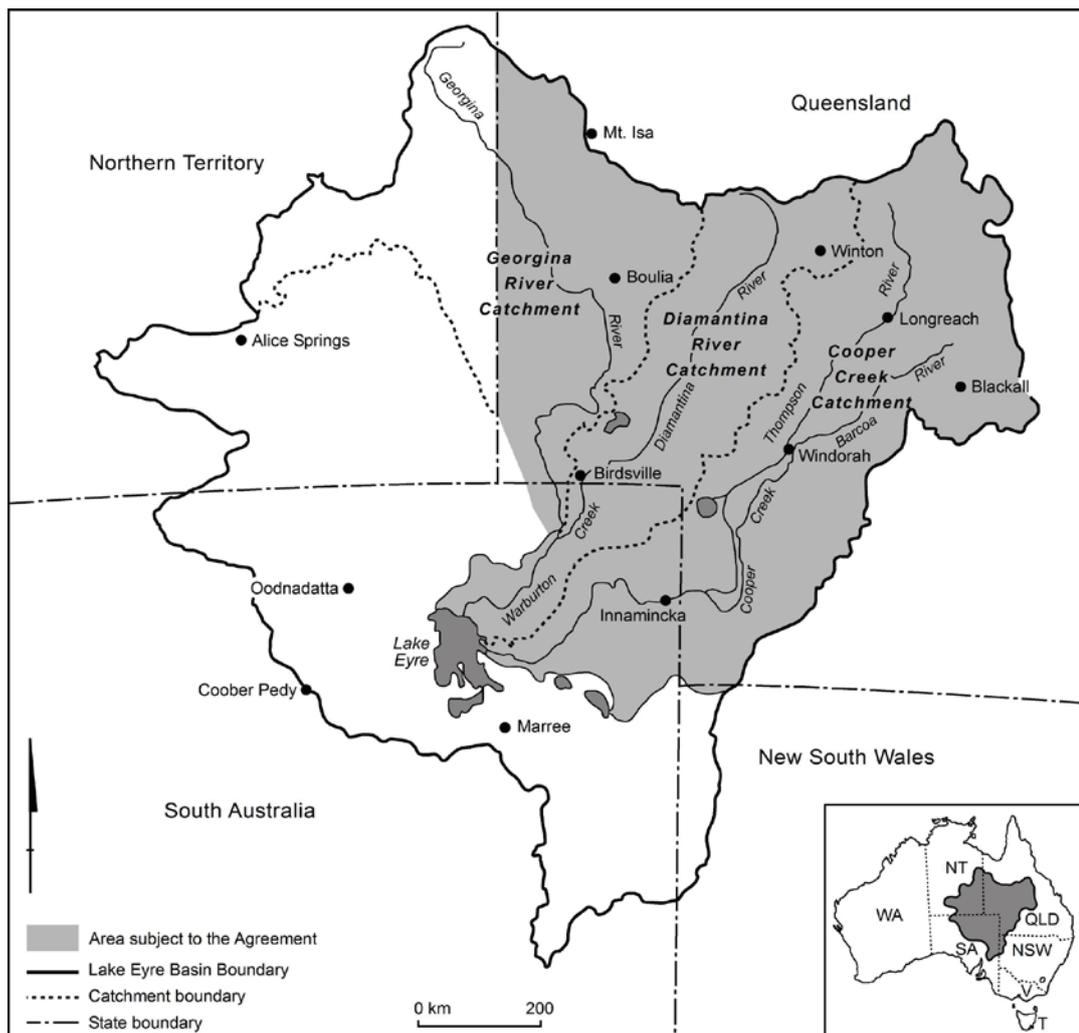


Figure 2.2: The Lake Eyre Basin (Map drawn by Chris Crothers)

2.4 The conceptual frame: assessing vulnerability and resilience for adaptation – why do it?

Vulnerability and resilience are two concepts that go hand in hand, the one indicating how likely we are to suffer or be impacted by change (vulnerability) and the other indicating what strength we have to bounce back from or respond to that change (resilience). It is necessary to understand both in order to develop appropriate adaptation options.

2.4.1 Vulnerability

The notion of vulnerability has multiple definitions and has been used to assist groups and peoples to understand the extent to which they may be vulnerable or subject to the impacts of climate change. It is important to understand levels of vulnerability in communities such as the Arabana because this will have implications for governance, particularly if decision outcomes rely on stakeholder involvement. Moreover, as Ostrom (2001) reiterates, acknowledging the plurality of knowledge sources and the diversity of cultural response to risk and hazard management must be understood by policy makers when implementing adaptation processes responding to climate change.

Understanding vulnerability must also include an understanding of how institutions, class, gender and other social variables create differential effects in responding to climate change in particular locales. In other words, social and class vulnerability to climate change matters (Handmer et al. 1999, Sen 1984). Adger (2006) demonstrates that people from low socioeconomic areas that lack other entitlements are more vulnerable to the effects of climate change. Using an example of flooding in low lying coastal areas associated with monsoon or hurricane impacts, he highlights that those most vulnerable are people that are also economically disadvantaged and feel proportionally insecure. This has implications for decision and policy makers trying to ascertain where the brunt of climate change impacts will be most felt.

Case studies have demonstrated the value of vulnerability assessments and the importance of incorporating the social and cultural dimensions. For example, Naess et al. (2006) in a Norwegian study found that the information generated through the assessments themselves, and the institutional linkages to local level decision-making processes were crucial factors. Accordingly, they suggest that policy makers, when approaching climate change issues, need to do so within a dynamic process of information exchange rather than integration of different data sets. This is especially relevant in Indigenous contexts where knowledge is in fact situated within different cultural domains and paradigms. This approach emphasises the role of the process rather than product generation and highlights the need to anchor vulnerability assessments within local decision-making processes.

Other authors consider the relationship of vulnerability to adaptive capacity. In mapping vulnerability for example, different socio-economic profiles may result in different vulnerabilities and therefore impact upon a community's capacity to adapt to change. Alberini et al. (2006) confirm this in a project that asked conjoint choice questions of public health and climate change experts to ascertain which countries are most likely to have adaptive capacity. They found that per capita income, inequality in the distribution of income, universal health care coverage, and high access rates to information were important determinants of adaptive capacity, again highlighting the link between types of vulnerability and socio-economic factors.

2.4.2 Resilience

One of the determinants of societal vulnerability is its resilience. The extent of resilience or robustness of a sector can affect how vulnerability is constituted (Gallopín 2006). Moreover, how resilience is manifest will in turn guide which adaptation strategies are the most appropriate. Therefore, factoring in resilience as part of planning enables policy makers to incorporate the robustness of natural, social and economic systems to change and can help to provide a platform for suggested solutions.

Folke (2006) notes, when reviewing resilience work by Berkes et al. (2003) and Smit and Wandel (2006) the advantage of shifting policies from those that aspire to control change in systems assumed to be stable, to those managing the capacity of social-ecological systems to cope with, adapt to, and shape change. Building on Walker et al. (2003) and Adger et al. (2005a, 2005b), Folke (2006) argues that managing for resilience enhances the likelihood of achieving a sustainable response to climate change. This includes ensuring that the likelihood of change and unpredictability are built into societal development. In other words making sure a community will be resilient to the unpredictable nature of climate change. Resilience then can provide the basis for adaptive management, where a system takes advantage of any opportunities provided by change, while dealing with the negative impacts. In this sense, resilience provides adaptive capacity (Smit & Wandel, 2006) as it permits continuous development.

Case studies from the Arctic highlight the importance of resilience (Berkes and Jolly 2001). Focusing on community vulnerabilities associated with resource harvesting, studies have found that the Inuit in Arctic Bay have already demonstrated significant adaptability in the face of a changing climate. This flexibility is due to the application of traditional Inuit knowledge, and the existence of other factors such as strong social networks, and economic flexibility within seasonal hunting cycles (Ford et al. 2006). Similarly, studies on the impact of climate change on subsistence lifestyles of the people in the Andes highlight inbuilt community resilience (Young and Lipton 2006).

The concept of resilience has implications for policy because it requires a shift in thinking towards an acknowledgement that humans are a part of the environment. This encourages the development of policy that provides the conditions that will enable effective adaptive governance structures to evolve and be implemented. In turn these will encourage the social-ecological resilience needed to address climate issues.

We have taken the definition by Folke (2006) as our baseline as he constructs resilience as being within a social-ecological system:

“(i) the amount of disturbance a system can absorb and still remain within the same state or domain of attraction; (ii) the degree to which the system is capable of self organisation (versus lack of organisation, or organisation forced by external factors); and (iii) the degree to which the system can build and increase the capacity for learning and adaptation”.

2.4.3 How do we assess vulnerability/resilience?

There are many case studies using different methods for assessing community or sector vulnerability to climate change (Handmer et al. 1999, Liverman 1990, Luers 2005, O'Brien et al. 2004, Ford and Pearce 2012)¹. Adger and Kelly (1999) also

¹ For a detailed description/analysis of a range of different methods see Nursey-Bray and SGS Consulting (2008).

present a conceptual model of vulnerability at the level of individuals and communities. Instead of using impact scenarios of a future climate, they study adaptive processes in communities to today's climate and socio-economic context, and consider how these processes serve to increase or decrease vulnerability to climate change.

However, the value of vulnerability assessments is often dependent on the criteria used. Schroter et al. (2005) suggest five criteria for vulnerability assessments, and argue that each assessment must at least incorporate one of the following dimensions:

1. That there is a knowledge base from various disciplines and stakeholder participation.
2. That vulnerability assessments are place based.
3. That vulnerability assessments must consider multiple interacting stresses.
4. That vulnerability assessments examine differential adaptive capacity.
5. That they are prospective as well as historical.

These are the principles which we have used to try and assess the vulnerability and resilience of the Arabana people to environmental change. The assessment was place based, and included not just Arabana Country but places where Arabana people live. The assessment considered many interacting stresses, including environmental, social, cultural, economic and social sustainability dimensions. We asked respondents to discuss their past experience as well as future issues.

In line with this we developed a conceptual framework for undertaking the project overall that is consistent with the Australian Government's definition and figure for assessing vulnerability (see Figure 2.3 below). As such, vulnerability is constructed as a function of exposure-sensitivity and a description of the adaptive capacity that exists to respond to those risks (Ford et al. 2010, Turner et al. 2003, Fussel 2007). Our focus on adaptive capacity operationalised via the social sustainability work and the risk perception study, ensures that other non-climatic factors, often as important in defining adaptation, are considered. This framework provided the conceptual base that informed the risk/adaptation and social sustainability research components. The shaded area highlights where fieldwork was undertaken and is the space within many other methods, consistent with the disciplinary orientation each researcher employed. This included a risk perception study, a values analysis, ethnographic history, resilience assessment and face to face interviews, focus groups and workshops. The figure charts the development of the project from its inception, to its end, which resulted in production of a climate change adaptation strategy. Specifically we also tried to determine adaptive capacity as this would enable better understanding of overall resilience.

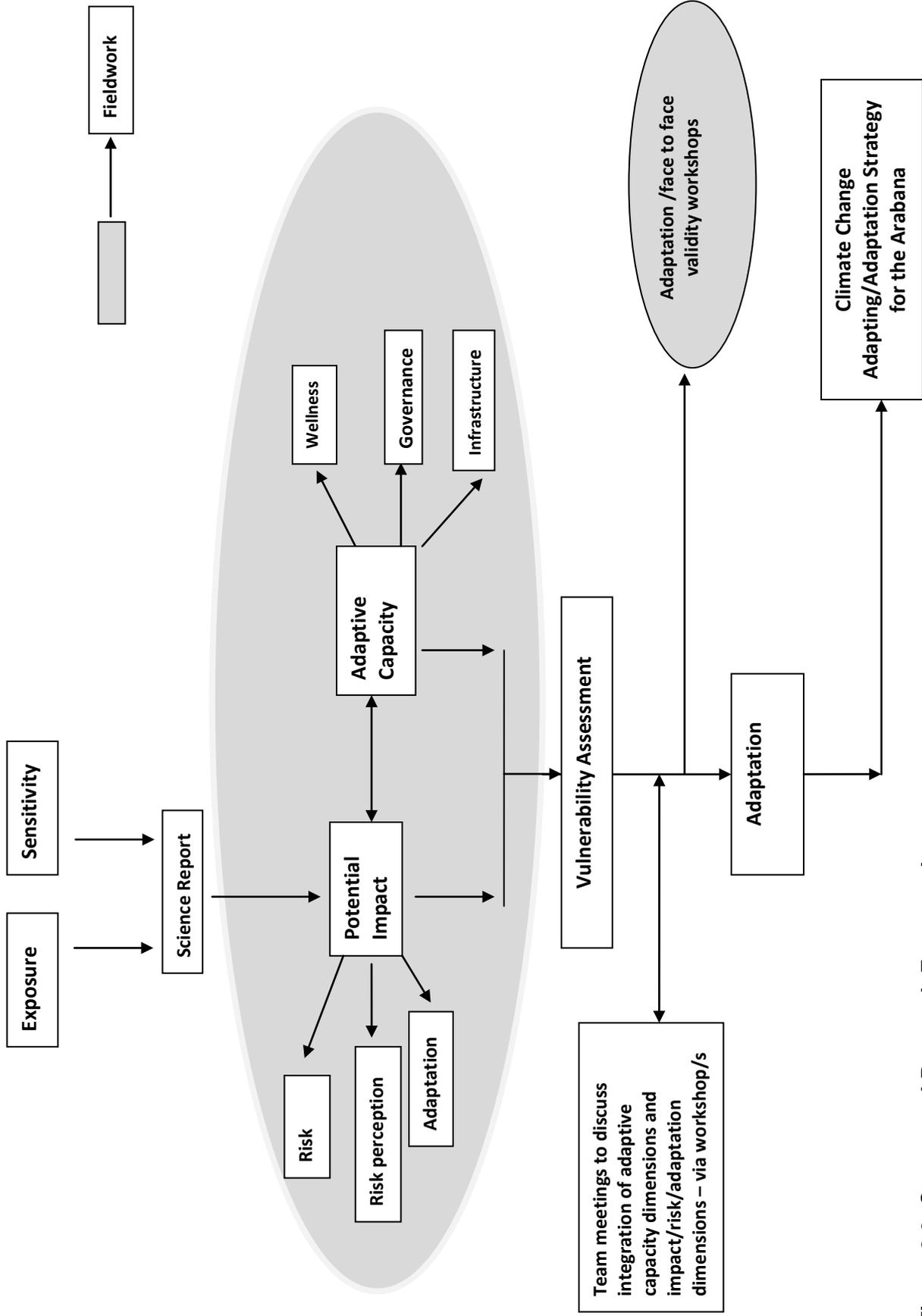


Figure 2.3: Conceptual Research Framework

2.5 Ensuring Ethical Research

Essential to building not only an ethical research process, we also wanted to build a project that had Arabana people at the centre of it (Denzin, Lincoln and Smith 2008, Denzin and Lincoln 1998, Smith 1999). This would help facilitate the community ownership and genuine collaboration that we committed to. As a first step in this process we obtained formal ethics approval via the University of Adelaide's Human Ethics Committee. However, we felt it was important to take this one step further and also develop our own cultural protocol with the community. This has implications for future research because it amplifies the need to build trust with local communities, and the need to ensure that protocols are tailored specific to the issue, people and location not simply to what is an institutionally derived understanding of ethics. Thus for us, an immediate priority and obvious part of ensuring integrity in this research was to develop a research protocol with the Arabana (please see full text of protocol at Appendix 3). While the protocol itself is important, it was the process of building it that started to build the trust needed for the project to proceed. At all times, we involved members of the Arabana; in the formulation of research questions, in involving Arabana as members of the research team, and in training Arabana to do the research with us². Table 2.2 shows the series of steps we took in detail.

² Please note that in this report we have used the convention of citing identified quotes from Arabana interviewed during the research where they have given express permission to identify them in text of this report. This is a convention we have used throughout. Elsewhere, Arabana have been cited anonymously.

Table 2.2: Chronology of research steps/methodology

- Brought together an inter-disciplinary team which included two Aboriginal Professors, one of whom (Arbon) is Arabana.
- Undertook literature review of vulnerability/resilience/adaptation to determine best conceptual approach overall and to enrich text of final report
- Established a team e-space/blog to enable sharing of resources and uploaded many articles about Indigenous adaptation to it.
- Developed a short introductory video of CIs Nursesey-Bray and Arbon, to showcase project and which was sent to all Arabana on Native Title list
- Worked with other team members and the Arabana Association to develop (a) ethics application and (b) research protocol (see Appendix 1). This set baselines for our conduct while out in community.
- Had a number of meetings with the Arabana and team members to develop a plan and exchange intent about and/or research interviews.
- Coordinated the production and publication of the science report and the peer review.
- Coordinated the production of a short film explaining the science and project.
- Coordinated the production of a plain English brochure about the project and a plain English brochure about the scientific findings.
- Met with the Arabana committee and explained the fieldwork and project.
- Conducted a media launch of science report but which also generated broader awareness of the project.
- Each team then undertook fieldwork interviews in Darwin, Marree, Alice Springs, Adelaide and Port Augusta. Team members also attended the Native Title Determination held May 22nd Marree and worked with the Native Title lawyer Steve Kenny who gave advice and helped coordinate attendance at Arabana management meetings when required.
- Developed communications flyers which summarised findings from each team
- Held climate change adaptation workshop in November 2012, in Port Augusta using a facilitator, in which we presented results from both teams, and workshopped ideas for adaptation
- Developed draft adaptation strategy for Arabana
- Presented this draft to the Arabana Board of Directors, December 2012, who via formal motion endorsed it as their strategy for future action, and which they will launch via media March 2013.
- Developed web site which will act as communications tool kit about the project, and enable all Arabana to download all products including the series of photos and footage we took throughout the project
- Project closes, but we now implement the outreach strategy which will include: (i) attending showcase of adaptation, South Australia, (ii) attendance at conferences (including NCCARF one June 2013), (iii) delivery of results to various Lake Eyre Basin committees, (iv) ongoing work with Arabana seeking monies for other projects that can help implement climate change adaptation strategy, and (v) in conjunction with Arabana (as authors) develop suite of academic publications in the areas of inter-disciplinary adaptation, communication and methodology.

2.6 Capturing inter-disciplinarity

In order to capture the energy and disciplinary diversity of the team, the two groups of researchers, also adopted their own methods which are explained in detail in the individual chapters that report on their work. Adger (2006) specifically notes that “climate change represents a classic multi scale global change problem in that it is characterised by infinitely diverse actors, multiple stressors and multiple time scales”. As such, climate change is particularly suited to inter-disciplinarity input.

The value of inter-disciplinarity in research initiatives and policy outcomes has also been recognised in multi-discipline teams. Projects such as the Vulnerability Assessment of the Tasmanian Rock Lobster (Pecl et al. 2009) have highlighted the value of economic and social research (Nursey-Bray et al. 2012). Integrating seemingly incompatible methodologies and qualitative and quantitative approaches was initially challenging, but this is a process that must occur in order to build interdisciplinary adaptation frameworks. For example, Pecl et al. (2009) combined qualitative approaches such as the conduct of interviews and focus groups, with quantitative modelling. Subsequent projects saw integration between social, economic, governance, and biophysical sciences as essential in addressing the adaptation research challenges.

After Klein and Newell (1996, 395) we take inter-disciplinarity to mean the drawing of different disciplinary perspectives to integrate multiple insights into the construction of a more comprehensive perspective. While we conducted the research in two parts, at the end we collated and integrated our results to provide a synthesis of the patterns of adaptation, resilience and vulnerability across the project. We also sought to build an interdisciplinary environment, which despite its inherent tensions, would build the connections between the different knowledge sets and disciplinary orientation of each team member. Our project also had the added complexity brought by working within a cross cultural environment. We facilitated this via the communications we developed and which all agreed was effective representation of the diverse range of perspectives within the project.

2.7 Communications

A key feature of our project was the employment of a communications researcher with on ground experience to develop innovative mechanisms of internal and external communication throughout the project. These communications ensured that culturally appropriate ways of communicating the project and climate science were devised, they acted as a forum by which Arabana people communicated with each other about business and the project and enabled team members to talk to each other (scans of these products are located in Appendix 1). We strongly advocate for the inclusion of funds for communications expertise in all climate change projects. While our incorporation of communications was a great strength, we are aware, that to build them routinely into research and adaptation projects it must be in the context of attaining sustainable communications and having the resources to invest in them over the long term. Projects such as these, to have longevity and resonance, would benefit from institutional strengthening of this facet of operations. The types of tools that were developed included the following: -

1. Media coverage at a local, national and international level, including a SBS Living Black story;
2. Face-to-face meetings with Arabana people in Adelaide, Darwin, Alice Springs, Maree, Oodnadatta, William Creek and Port Augusta;

3. A community based adaptation workshop, held in Port Augusta;
4. The production of two Videos. One introduced the project and was published on YouTube the second explained the science report and was shown in smaller groups during interviews and meetings;
5. Two brochures and some summary results flyers were produced;
6. A pamphlet summarising the science report in plain English was produced;
7. Three presentations were made to the Arabana Board of Directors;
8. Discussions with industry operating within the Arabana traditional lands including major mining companies, pastoral holdings and smaller local businesses including tourism operators;
9. Establishment of a secure internal web portal;
10. Establishment of an Arabana Climate Change Blog.
11. Production of a document that documented the climate change adaptation strategy
12. Production of a Climate Change Adaptation Toolkit website.
13. All communication outputs sent to or disseminated to Arabana people involved across Australia, and a web site was constructed from which all Arabana could download research outputs.

2.8 Terms of Reference

Finally, it is important to clarify up front how we presented the terms of engagement regarding climate change terminology. Below is a summary of the definitions we used, and how we presented them to Arabana people in the flyers/communications used.

Table 2.3: Definitions used

What do we mean by being vulnerable?

Being vulnerable is a combination of being sensitive to and exposed to various factors that will have a negative impact on you, your family, or your society/group. It is being unable to operate properly as you normally would due to these factors stopping you from doing so.

The IPCC report (IPCC 2001) defines vulnerability as: “the extent to which a natural or social system is susceptible to sustaining damage from climate change, and is a function of the magnitude of climate.”

What do we mean by climate change?

Climate change is occurring when there is a change in the long term (over years) weather patterns, such as in rainfall, or storm/cyclone events, and which can cause impacts such as flooding, drought or sea level rise.

This is different from the weather which is the day to day climate – the temperature, wind, rain or sun we get on a day to day basis.

What do we mean by adaptation?

Adaptation is the process we use to respond to changes in our lives once the effect has occurred.

The IPCC defines adaptability as ‘the degree to which adjustments are possible in practices, processes, or structures of systems to projected or actual changes of climate’, and note that ‘adaptation can be spontaneous or planned, and can be carried out in response to or in anticipation of a change in conditions’ (Watson et al. 1996).

What do we mean by mitigation?

Mitigation is when we do something to stop the problem in the first place.

The IPCC defines mitigation as: “Technological change and substitution that reduce resource inputs and emissions per unit of output.”

2.9 Summary Reflection

Building community ownership of anything in any context is always a challenge; a challenge made more difficult when it is the researcher approaching the community to build a product rather than the other way round. Our approach to this project has been to try and actively promote community involvement, and in so doing, provide information about climate change and adaptation and encourage responses to that information. Ultimately though, it is essential for the researcher to let go; a community plan or process has to be a community based and driven product, and that will be the next stage leading on from this project.

In sum, our methodological approach applied qualitative participatory and community based research methods, while adhering to a scientific conceptual framework for assessing vulnerability/resilience and determining adaptation as established in the literature and employed by the Australian Government. Given the short period of time for the project and the wide scope of the project we feel we have achieved much with the resources at our disposal.

The detailed methods and results employed by each team in developing the respective components of the project are detailed in the following chapters. The social sustainability dimension is presented first as it also provides much important context setting and temporal information that will give insights into the Arabana people and country over time and assist interpreting later chapters.

3. STAYING CONNECTED: ARABANA CAPACITY FOR ADAPTATION

Authors: Deane Fergie, Veronica Arbon and Lucy Hackworth

“People will adapt their own strategies to survive. Arabana have always adapted” (David Hull 2012 ACC1:56).

3.1 Introduction

This section reports on the work of the adaptive capacity/social sustainability team. Our aim was to understand the range of resources which Arabana people, as First People’s in the nation-state of Australia, bring to the challenge of living viably into the future with the growing challenge of climate change. We did this by using social sustainability as our frame by which we investigated the adaptive capacity of the Arabana, past and present. This is a critical facet of the project as a whole since, as Dillard, Dujon and King have noted:

The necessity of community involvement in environmental efforts reflects the dawning realization that social sustainability is the only bedrock on which meaningful environmental sustainability can be grounded. (Dillard, Dujon and King, 2008,1)

Our findings on the whole are positive and optimistic. We find that Arabana people have a significant *heritage of adaptation* indicated by their social viability in:

- A region that already has many of the characteristics that are predicted to be the broader challenges of this coming phase of climate (that is inhospitable extremes and dramatic unpredictability).
- Social viability through long *duré*³ processes of change (including 45,000 years of climate change) and,
- Demonstrated adaptation to more recent on-going and intense challenges, such as the invasion of their country and colonisation of their lives.

Prout’s work (2008) on this dimension, offers excellent insight into these issues and their implications for service providers and policy makers, and our social sustainability field report refines on these issues.

3.2 Method

3.2.1 Social sustainability and adaptive capacity

Adaptive capacity is often understood in the literature as the capacity to respond to adversity or hazard (Solberg et al. 2010).

Social systems are inherently dynamic and there are a variety of impetuses for change and adaptation. In our work, we investigated Arabana response to the history of long term processes of change as much as the sharp discontinuities and hazards predicted

³ “Duré” is a French term meaning literally ‘strong and hard suffering’ (Oxford dictionary 2012)

for future times. In looking at the concept of 'social sustainability' we sought also to emphasise the long *duré* dynamics which bring *heritages of social change and adaptation* into the present from the past and frame *trajectories of adaptive capacity* into the future.

Our focus was to examine the three key areas of social organisation and governance, well-being and resilience, and Information and communications technology (ICT). In so doing, our research was characterised by what O'Reilly (2005, 2-3) argues is the minimum criteria of ethnography and:

- evolved in design over the course of the study (that was iterative-inductive),
- drew on a family of social research methods (including interviews, participant-observation, discussions, surveys, mapping the social organisation of space, visual recording, perusal of documentary and archival records)
- involved direct and sustained contact with people in the context of their daily lives

We also undertook fieldwork, generally as a team, with Arabana people. In total we did 70 'person days' of fieldwork in twelve separate fieldtrips. Most fieldwork involved two or three members of our team working together. Fieldtrips ranged in duration from one to ten days and took us to Darwin, Alice Springs, Marree (twice), Port Augusta (seven times), Broken Hill and Adelaide. Our fieldwork included eliciting genealogies, interviews, surveys, participant-observation and social mapping. Our interviews enabled us to enquire conversationally and bring Arabana voices and views into our work. We worked over a number of hours, on a number of occasions with several key informants in each location. We surveyed a cross-disciplinary range of learned literature to better inform the scale of our analysis including a range of primary ethno-historical sources dating from the late nineteenth century, and summary data sets for example ABS demographic and other on key locales.

3.2.2 Adding a dynamic and elemental approach to social practice

Broadening our attention to the literature was important as an impetus for change in our work in the project. Specifically we drew on two pieces of work; (i) *The Dynamics of Social Practice* by Shove, Pantzar and Watson (2012) and (ii) Cameron's work with the Inuit.

Firstly, our fieldwork was informed by Shove et al's emphasis that research should make a difference to policy making, be broader in focus than the individual and that practices rather 'individuals who carry them' are the core unit of analysis (2012, 139). Such theories of practice have untapped potential for understanding change and depends on developing a means of systematically exploring processes of transformation and stability within and between social practices (Shove et al, 2012, 1). To achieve this they develop an 'elemental' approach to the analysis of practice and change which identifies 'material', 'competency' and 'meaning' as the basic elements of practice. They note that practices are only realised when each of these elements is connected (through practice). Change can be tracked as links between elements are lost (and the practice becomes an erstwhile practice) or their content changes over time. In Shove et al's analysis materials are placed front and centre and include objects, infrastructures, tools, hardware and 'the body itself' (2012, 23) Their second element, competence, includes 'know-how, background knowledge and understanding' (2012, 23) and lumps together 'multiple forms of understanding and practical knowledge' (ibid). They give the element of 'meaning' a similarly broad definition in which they collapse what others have described as 'mental activities, emotion, and motivational knowledge' (ibid).

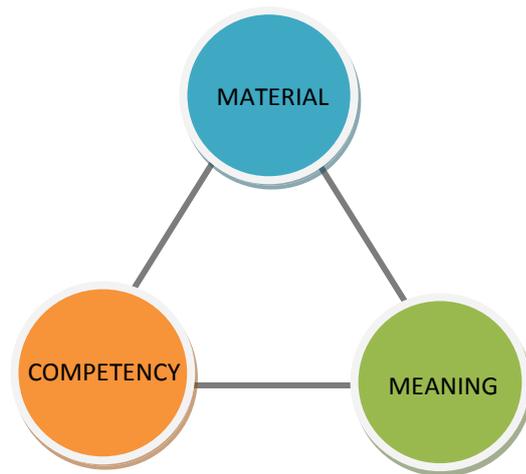


Figure 3.1: Shove, Pantzar and Watson’s view of elements, which when linked, constitute a practice

The Dynamics of Social Practice caused us to rethink how we approached our enquiry with informants. For example, instead of simply recording that relationships with elders entailed ‘respect’ we began to ask our informants what they did to be respectful; how they did it and with what; how did people learn to do this and if and how have such practices changed. Our work with the Arabana people makes clear that practice cannot adequately be understood without consideration of social relations and structuring structures of power as constitutive elements of everyday life practices as are the elements of meaning, competency and material.

3.2.3 Adding attention to spatial and temporal scale

Cameron’s work with Inuit people also critically affected the course of our research. Cameron made a strong case for researchers to attend to ‘scale’ in their enquiries. She urged analysts not to conflate Indigeneity with ‘tradition’ or ‘traditionalism’, nor to see Indigenous people as ‘isomorphic with particular territories’ (Cameron, 2012, 105) She urged analysts to recognise how extractive industries so often sighted in the traditional lands of First Peoples linked them in to global scales of climate change. Setting the context for this position Cameron wrote that the Inuit insist that their distinctive ontologies and epistemologies emerge from intimate relations with place and land, these ways of knowing are not *limited* to the local. Not only can distinctively “Indigenous” and traditional forms of knowledge be brought to bear on translocal, complex, contemporary dilemmas (and they are), but also a number of Indigenous leaders and scholars explicitly reject the delimitation of Indigeneity to an externally defined understanding of the local, traditional, or Indigenous... They reject, in other words, the move from recognizing the importance of the traditional and intimately local to limiting Indigeneity itself to these spheres (Cameron, 2012, 105).

Cameron went further to show that seeing Indigenous people and their territories in ‘global’ scales brings global extraction industries, which are so often located in Indigenous homelands, into purview. She urged a ‘colonial governmentality perspective’ (2012, 108) to draw attention to the global (extraction) industries which have significant impact on global warming and climate change occurring in and around Indigenous locales but often omitted in community-based and Indigenous research projects. Consideration of the work of Cameron has led to us broadening the scope of our work to include a historical review of some of the literature which highlights the continuity of Arabana people to the land, and the fact they have adapted to and

survived change previously. In so doing, we seek to develop depth of field in our results. Thus we seek to understand whether Arabana social structure has been dynamic in responding to change, how Arabana social practices have changed in new circumstances, how change affected Arabana wellbeing and how it demonstrated resilience. Figure 3.2 outlines the focal layers of our analysis and how we sought to integrate analysis of these layers overall.

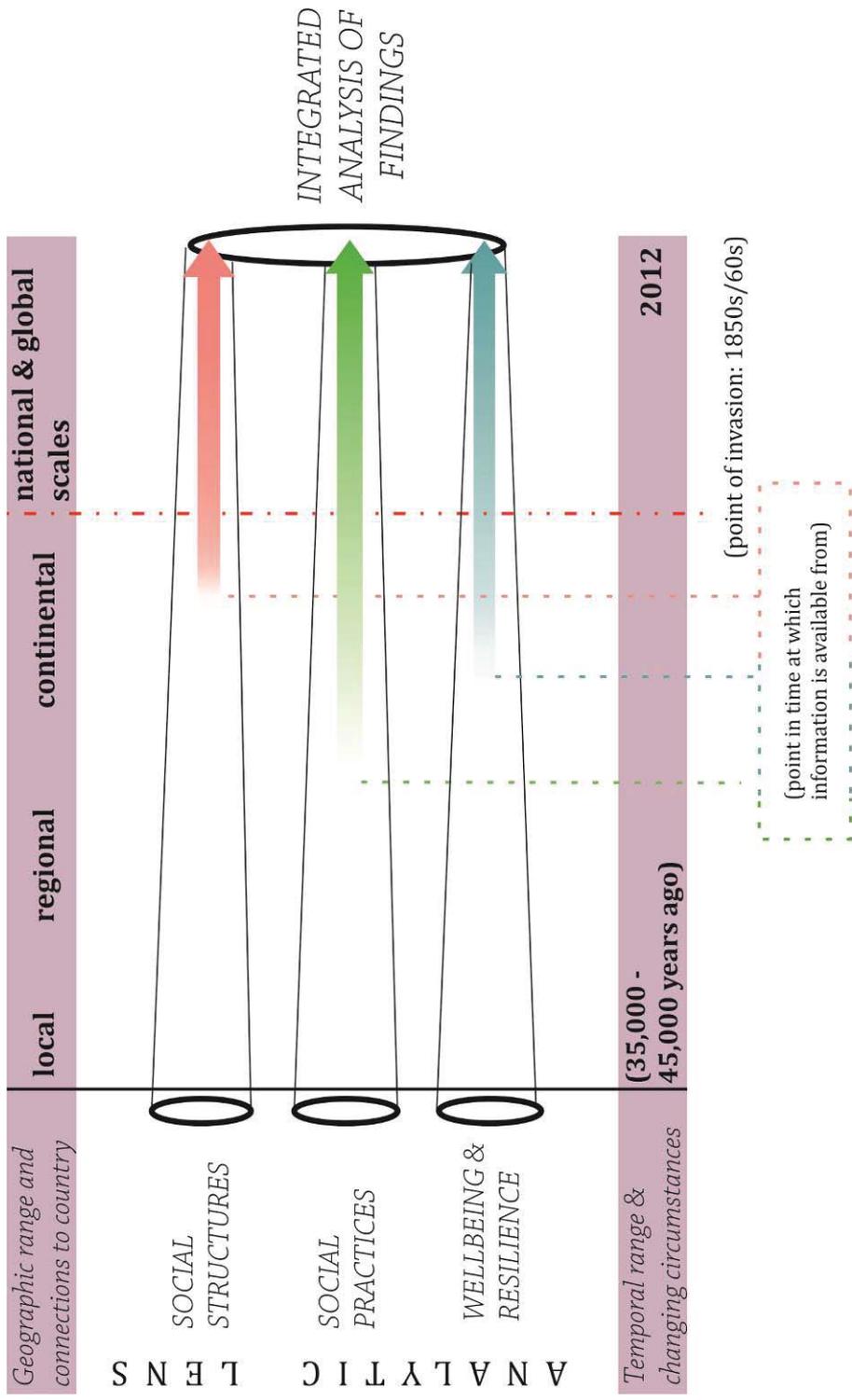


Figure 3.2: Research layers & analytic lens

3.3 Results: analysis of long duré change and response

3.3.1 Deep prehistory – climate change and human range

Science has documented climate change in the quaternary and Holocene periods in some detail. In this context, based on the use of historical and archaeological sources, we present in snapshot, some of the challenges and adaptive responses that Arabana people would have faced and made during those times (Robins 2005).

For example, Gregory, then Professor of Geology at the University of Glasgow, found evidence of climate change in the Lake Eyre region, including the fossilised remains of more fecund times and then subsequently evidence of the drying of the region, what he called the present 'age of desiccation' (1906/1997, 145—154) and articulated by Smith (2005) as the 'saw teeth' of climatic change with alternating periods of hot and cold periods. Aboriginal peoples of the time had incorporated these changes into their knowledge systems:

According to the traditions of some Australian [A]borigines, the deserts of Central Australia were once fertile, well-watered plains. Instead of the present brazen sky, the heavens were covered by a vault of clouds, so dense that it appeared solid; where to-day the only vegetation is a thin scrub, there were once giant gum-trees, which formed pillars to support the sky; the air, now laden with blinding, salt-coated dust, was washed by soft, cooling rains, and the present deserts around Lake Eyre were one continuous garden.... (Gregory, 1906/1997, 3-4).

During the last ten thousand years, known as the Holocene, there is evidence of the region forming a base for human settlement. From 10,000 BP to 4,000 BP the environment continued to dry. Lake Eyre which 90 -130 years BP had been a high lake had become a much smaller shallow lake. More broadly this was a phase of local dune building. By about 3,000 years BP Lake Eyre was an ephemeral basin (See Smith 2005a, 104-5 and Thomas, 2005, 18). Aboriginal people were mobile and moving thousands of kilometres in response to change (Smith and Hesse 2005, Spencer and Gillen 1904).

3.3.2 Geographic range and connection to country

Today, the country of the Arabana is in the most arid part of Australia. It is dramatically hotter than most parts of Australia rainfall is seasonal and varies enormously across years. Rain is typically uneven and is delivered in scattered showers and thunderstorms. Evaporation is high (Florek, 1993:32-33). Geographer Colin Harris (Harris 2002) observes that Aboriginal peoples of the region maintained an adaptive response via mobility

Harris has summarised the findings from field surveys of mounds springs along the South Australian edge of the Great Artesian Basin (GAB) that took place throughout the 1980s:

The surveys confirmed that many of the springs had been major habitation sites, with artefact densities up to 600/m². The tools present were typically of late Holocene age with tulas, pirris, microliths and seed grinders prominent. Both stratigraphy and artefact typology indicated an age within the past 5000 years, although at two springs west of Marree there was some evidence of older artefacts (Harris 1992, 162).

These mound springs are culturally very significant to the Arabana people with archaeological evidence demonstrating human occupation of them in the years before invasion (Florek, 1993). The springs also represent a focal point for land use adaptation, and as Florek (1993, 21) argues local level material and its analysis demonstrate that Arabana people planned and strategized their lives:

The mound spring sites provide a unique opportunity to study variation within one subsistence system. This variation can be seen as a reflection of a fine-tuned life strategy, much more subtle than the relatively crude alterations prompted by seasonal changes. The homogeneous landscape of the mound springs country must have been perceived by prehistoric inhabitants as a patchwork and this subtle diversity was accounted for by the survival strategy in an extremely difficult environment. Moreover, this strategy of land use was followed faithfully for several hundred years, providing a rare glimpse of the past social system which must be brought in as the factor responsible for consistent transformation of traditional knowledge between groups and down through generations.

Florek's analysis demonstrates that in and around the mound springs were a series of well established 'camps' which small groups might base themselves in for many days, weeks or even sometimes months, especially in dry, hungry times. They stayed on the move within the complex because the food and other resources they needed to survive diminished over use. From one site in the complex people might move to camp at another long standing camp site in the spring complex. When conditions allowed people would move out into transient overnight campsites as they moved about hunting and gathering in the 'back country'.

3.3.3 Social organisation as adaptation

At a regional scale the Arabana were part of a broader cultural region known as the 'Central Lakes cultural complex' but more simply the 'Lakes cultural region' (Fergie 2005, Hordacre 2011). Commonality and connection was in the early ethno-historical record (Shaw 1995). Howitt and Siebert noted these are 'a group of tribes who are more or less akin to each other' (1904, 101). Fergie and Lucas (2011) confirm that groups in this region shared cultural principles of relatedness and rights in land and resources and part of a broad system of circulating marriage that gave partners and their children rights to live in and use the estate and resources of their parents, spouse and spouse's parents. Indeed, early ethno-historical evidence supports the view that the Arabana 'preferential marriage system' had significant spatial scope across the range of Lakes cultural groups (which reached up into Queensland, over into NSW and down into the Eyre Peninsula, as well as into abutting cultural groups (e.g. the Kokotha in the west and Arrente in the north). Moreover, the available evidence suggests that marriages leading up to and just after invasion were with a spouse whose primary (ularaka/pintara) country was at some distance from their own. Marriage arrangements gave people secondary rights in (often) distant country - and this provided an important livelihood safety net. The practice of this preferential marriage system, together with ceremonial and other relationships gave Arabana people significant geographical range, which also highlights the significant (regional) spatial range of this analysis.

In the Lakes cultural region social networks were intricately ordered by kinship. That order structured practice and connected human society and the environment in which it was sustained. As a whole the ethno-historical material supports the view that on the eve of 'European' invasion Arabana society had two sides referenced by gender and gendered connections. Every Arabana person had two complimentary sides of their being which positioned them as members of a number of different groups. One aspect of a person was their bodily substance, which came from their mother (and her mother

and matrilineal kin). Another aspect of a person was the spiritual essence which animated and gave form to their flesh. This aspect came in enduring form from their father and his father before him as patrilineal kin. At the same time each person also carried something of the spiritual essence of their mother and their mother's brother.

Madu came from one's mother and was shared with one's matrilineal kin and gave them membership in a larger group of beings who were understood to share the flavour and smell as the same kind of flesh or bodily substance. A *madu* group included people and another kind of agent in the world. *Madu* were named after the non-human agent they were related to: an insect, animal, fish, bird or an environmental force such as wind or rain which were regarded as having the same kind of flesh and after whom the group as a whole was named.

As *madu* were the basis of moiety, moiety membership too came from one's mother. While they got their flesh, *madu* (and moiety side) from their mother, a person got their key spiritual form and connections from their father. This patrilineal connection was called *ularaka* by the Arabana and *pintara* in some other Lakes languages. *Ularaka* came through to them from their father and his father back through their patriline to a founding Ancestral Figure, the *mura mura* who gave shape, story and actions to their country (estate). A living person regarded themselves as a rightful descendent of the *mura mura*. *Ularaka* connected patrilineal kin in the 'here and now' to each other and to an estate over which they had primary rights and responsibilities because they were the living descendants of the *Mura Mura* who had formed that country. Patrilineal *ularaka/pintara* were the main channel along which people got rights and responsibilities in country and through which they were positioned in ceremony about human reproduction and the endurance and vitality of their *mura mura*.

But Lakes people like the Arabana recognised that as well as giving flesh and flavour (*madu*) to their children, also gave them something of their own *ularaka* essence. This connection to the ularaka estate of their mother and mother's-brother was called *abalga* in Arabana and *marduka* in some other Lakes languages⁴. A person's *abalga / marduka* was a secondary pathway to rights in and responsibilities for country, action and ceremony. The ethnohistorical material makes clear that *ularaka/ pintara* and *abalga/ marduka* were the pivot of a critical range of complementary and grounded correlations.

These two sides of a person – their bodily substance (from their mother) and their enduring spiritual substance (from their father and in a more limited way from their mother's side) – was at the heart of this social system. The most basic rule of the Lakes society was that two sides are needed for human and cultural reproduction, and these social systems sustained Arabana and other Lakes peoples in the event of the changes they experienced. Such social networks sustained the ancestors of the Arabana.

Arabana people living around the ephemeral Lake Eyre in the late Holocene had a heritage of adaptation and survival that reached back, through episodes of significant climate change and across a broad, changing landscape to the late Pleistocene. Arabana life then was sustained by social structures, practices and life strategies which integrated them into a regional system that could frame social life well adapted to but always vulnerable in this unpredictable and harsh desert environment. The base of their adaptation and sustainability was a social system which related people across

⁴ Elkin (1938) renders it Abältga in his Fieldnote book 1/2/2 p 270 (transcribed by Rod Lucas), held Fisher Library, University of Sydney.

deep time and space to each other, to their human antecedents and to the powerful ancestral actors who formed their country and their culture in ancient times. Their system of kinship and marriage ensured that people moved with authority in their own local *ularaka* estate.

3.4 'Short change' processes

3.4.1 Tectonic change and dynamic response from the late 1850s to 2012

While we purport that Arabana people had likely for hundreds of generations been part of a complex, multi-faceted regional system of adaptation, by 1856, the colonial frontier had reached the country of Lakes people and explorers were making forays into their universe (Gale 1964). The depositing of archaeological material on Arabana mound springs terminated abruptly and precisely at 1860 (Florek, 1993,78). The fault line of invasion undermined the grounds of their adaptive social system. Arabana people have had to adapt to the tectonic changes wrought by colonisation.

By the late 1850s explorers, in search of new pastoral prospects, were coming to their lands in ways that would fundamentally disrupt and threaten their connections to each other and to their country. John McDouall Stuart's expedition in Arabana country from 2 April to 2 July 1859 provides an exemplar of how these colonial agents would dislodge the taken-for-granted grounds of Arabana being and the trajectory of their lives.

Sunday, 5th June, Mount Younghusband [which he had named after 'the Honourable Wm. Younghusband' the day before]. – I must remain where I am today; the horse is so bad that he cannot proceed.... I have sent Müller to the west side of the mount to see the extent of the springs; they are on the banks of a creek which has brackish water in it, large and deep, and a quantity of rushes. The water comes from the limestone banks which are covered with soda. He rode round the mount: it is all the same, and the feed is splendid right to the top of the mount. It is wonderful country, scarcely to be believed, I have had one of the springs opened to-day, and the water to-night tastes excellent; it could not be better. Native tracks about; I am surprised we see none of them; we are passing old fires constantly. Latitude, 28°1' 32".

Stuart's expedition had encircled the region of the mound springs which, as we have seen, had sustained Arabana people's lives in this uncertain environment for many hundreds of generations. This expedition of Stuart's, financed by pastoralists, drew their enterprises to these sacred waters so fundamental to Aboriginal survival in this whole region. Between 1860 and 1862 Stuart used the line of mound springs as a 'spring board' to the rest of the continent he sought to cross from south to north. By the time he did so in 1862, the line of springs had become a conduit of colonial invasion and Arabana control and care of their country and their people had been usurped.

New lines of connection further rattled the foundations of the Arabana universe. Between 1870 and 1872 the route of the overland Telegraph' was laid down in the footfalls of Stuart's 1860s expeditions to the northern edge of the continent. The great northern railway reached Marree (then called Hergott Springs) in 1884. In 1889 new sections of the railway were built along the mound spring alignment and on to Oodnadatta (Litchfield, 1983,14 – 19) Both were major logistical events and brought more stock and Europeans¹ into the zone of springs which had hitherto sustained *ularaka* and their living representatives (see Figure 3.3).

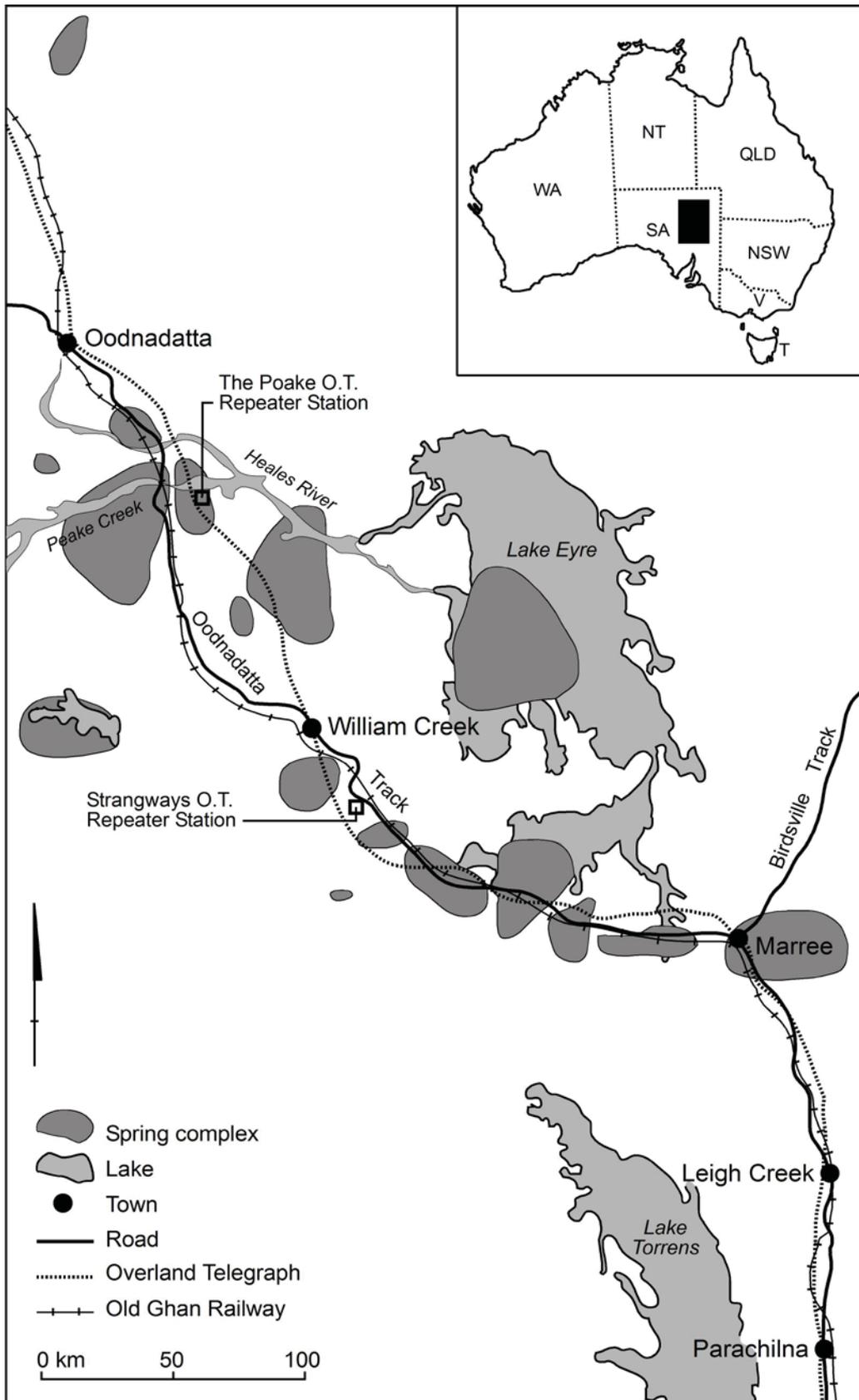


Figure 3.3: New lines of connection: telegraph, railway and roads over mound spring complexes (Map drawn by Chris Crothers)

Over time Arabana and other Lakes people moved to ration stations on pastoral runs, in towns and to the Lutheran Mission in Dieri country on the east side of Lake Eyre. Many Arabana worked on pastoral stations where rations underwrote their labour costs (Paterson 2005). Government supplied rations which became one pillar of Arabana social viability over the most part of a century. When the Lutheran mission at Killalpaninna closed down just after the end of the First World War a number who had been living there went west to join their relations on stations to the West of Lake Eyre. Following the influenza epidemic in 1919 Dr Herbert Basedow undertook what was termed the 'Third Medical Relief Expedition among the Aborigines of South Australia' (GRG 23/1/330/1921). He documented radical depopulation writing:

Although the [non-Arabana] western ... groups ... are still represented by goodly numbers, the population along the more civilized central tracts [the Lakes region] has suffered alarming losses. The recent influenza epidemic was disastrous, having in many centres, like Hergott Springs [Marree] and Oodnadatta, almost completely annihilated the resident groups. We were surprised also to note the appalling decrease in the numbers at Anna Creek, once a veritable stronghold of the local tribe when the station was in the hands of Messrs Hogarth and Warren. The principal camps at which we found the remnants of local groups congregated were at Finniss Springs, Stuart's Creek, Anna Creek, Oodnadatta [and thence out of Arabana country]. (GRG23/1/330/1921, [4-5])

Finniss Springs station was to become a significant locale for Arabana living on country. This pastoral station, the only one despite its name which was not homesteaded on a mound spring, attracted Arabana people when Francis Dunbar Warren (who had formed a relationship with an Arabana woman Nora Biralda), moved there with his growing family of Arabana children. It is said, fearing that his own children might be taken from him, Warren invited the United Aborigines Mission to set up a school and establish a church on Finniss Springs in the 1930s. A substantial settlement developed. As Florek has noted:

This settlement, of up to about 70 – 100 Aboriginal inhabitants, has water supplied from the dam and several large ground tanks. However, a long drought in [the] late 1950's forced occupants to abandon the settlement and the mission was closed in 1961...This is an instructive case showing how the Aboriginal population was marginalised and forced out of the springs which provided the vital resource in the area. It shows that prolonged settlement away from the springs was not possible even with the aid of technology not available to pre-contact inhabitants of the mound spring country (Florek, 1993:58)

Warren's own sons and grandsons had to find jobs off the station. Some worked on other pastoral stations in the region. Some moved to towns or sought work with the railways. The railway too offered some employment opportunities to the Arabana and their Lakes cousins. Working on the railway, and the rerouting of the railway in the late 1980s took Arabana people across the breadth of the continent to establish focal locales with intergenerational roots in centres like Port Augusta which was a major terminus for the line, Oodnadatta, Alice Springs and Darwin (where the Hodgson sisters went following their father a train driver) Figure 3.4 shows focal locales of current Arabana society (Fuller 2012).

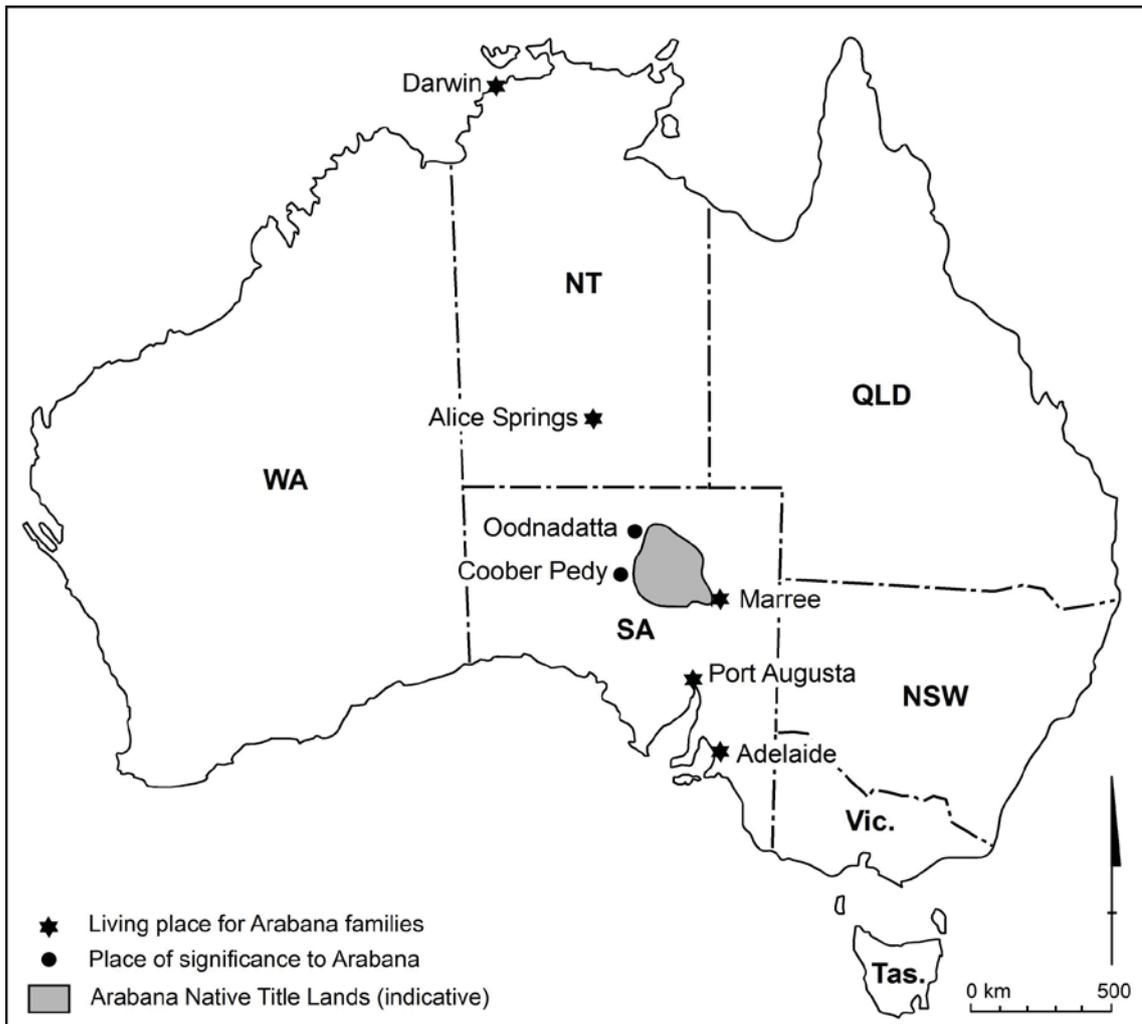


Figure 3.4: Focal locations of Arabana settlement in Australia. (Map drawn by Chris Crothers)

Since the 1980s extraction industries have encircled Arabana country: at Roxby Downs (Olympic Dam), Prominent Hill, Moomba and more. Minerals, oil and gas are extracted and sent around Australia and the globe. The substantial uranium, copper and gold mine at Olympic Dam extracts water from bore fields on Arabana country.

3.5 The present and into the future: wellness, governance and infrastructure

3.5.1 Governance

With depopulation, the ongoing death of people and changes in reproductive rates sounded a death knell for classical Lakes social organisation. By the 1950s Arabana social organisation was transforming from its 'classical' form (before and in the immediate wake of invasion). In this system, *ularaka* and *albalga* gave rightful access to land and *madu* and moiety with the preferential marriage system regulated marriage in ways that structured a range of links across a broad region and in which livelihood bands (headed by an *ularaka* elder) were the basic unit of everyday life.

The changes in these traditional governance systems to new social forms underlie both the adaptive capacity of Arabana to respond to change, but also a vulnerability caused by the now dispersed nature of Arabana people living across Australia. The impact of this dispersal is seen in current expressions of Arabana identity. For example, Daphne May introduces herself by name and went on: "I'm Arabana - born Marree, live Darwin. I'm a Hull - daughter of Myra Hull who was the daughter of Clara Strangways. So I'm one of the Strangways mob or family. I can trace back to Nanna Lilly" (DF ACC1:9).

This introduction located Daphne in contemporary Arabana geography – from the focal locale of Marree, on Arabana country to Darwin where now she lives as part of an intergenerational Arabana community with her brother and sisters, in turn all now grandmothers and great grandmothers. This highlights another level of contemporary Arabana social organisation, that is families of polity which are '... a distinctive post-colonial Aboriginal social system' (Sutton, 2003, 210) through which traditional interests in country are transmitted and maintained:

These cognatic groups are not 'extended families' of living people with a role confined to kinship and mutuality, nor are they households. They are kin groups of enduring and central importance to the conduct of Aboriginal business. They are families of polity in the sense that they form major structural elements of public life in Aboriginal society and do not belong merely to a domestic or private domain. They persist over long periods, and thus have many recognised deceased members who are not merely remembered but who continue to form powerful reference points in determining how their living descendants establish rights and interests in traditional forms of cultural property, including identification with country. (Sutton, 2003, 210)

Amongst the Arabana family names such as 'Allan', 'Conway', 'Duck', 'Forrest', 'Heles', 'Stuart' 'Strangways', 'Warren', and 'Warren(er)', are Arabana families of polity which emerged in the first phase of the colonisation of their country and to a large extent remain as families of polity today.⁵

This re-constitution of social and familial networks is colloquially known as 'grannies groups' (pers comm. Dean Stuart 2013) or, as it is described in Arabana as *wathali mara* or 'my [family] mob', a notion Arbon has rendered 'relations together' (DF

⁵Intriguingly, Jean Wood told Deane Fergie that the pastoralist Francis Dunbar Warren, father of a number of Arabana children, got Arabana people to change their surnames. By Mrs Wood's account 'Drovers' became 'Dodds' for example and Warreners became Warrens, on the face of their surname apparently (but not necessarily) related to Warren's own children.

ACC3:45-46) In our view this is the 'atom' of contemporary Arabana social organisation and of authority in Arabana culture.

Fundamental practices of socialisation and 'growing up' or rearing up are founded in this group of kin. At the heart of such a family is its elder, a nanna (kadnini or thanti) or great-nanna (*Kadnini bunta* or *thanti bunta*). People in this key position are described as the 'centre' or lynchpin of their family (DF ACC1:18). Grannies look after and look out for their descendants. They grow them up. Though they may not live in the same house members of a grannies group (siblings, parents and grandparents) share food and other key resources. This kin group is sometimes referred to as 'the bank' indicating how money held by one member of this kin group might be accessed by others in a series of reciprocal 'withdrawals' and 'repayments' and phone credits (DF ACC1:28). Cross-cutting the apparent equality of reciprocity is also the basic hierarchy of Arabana society: age-ordered authority or the authority of elders. Daphne May told us that:

Grannies are the power. Under them come the families.... Nanna is still the stronghold. Everyone under them has still got to listen to their opinion. (DF ACC1:32).

Members of grannies groups expect open access to food held by any of them. A range of informants described how sharing and caring is at the heart of a grannies group:

- Dean Stuart explained how it is his immediate family who can go to his fridge and take food without asking (DF ACC3:17). The principle is that 'families will look after families (DF ACC3:19)
- Veronica Milera expressed it this way: You give to family members if you've got some money and can afford it. Some expect it back. Some don't. But you give 'em anyway (DF ACC3:106).
- 'Caring and sharing' David Hull said were 'instilled in us by our mothers and grandmothers. The caring and sharing side of things is something natural which happens to us as Aborigines' (David Hull DF ACC3:104).

In May 2012, at the sitting of the Federal Court of Australia to determine, in Australian law, that Arabana society and their native title rights have survived colonisation, these adapted organisational structures could be seen in the pattern of social networking and camp sites. Here, members of grannies groups camped together around a single fire clustered broadly in larger Arabana descent groups known by their founding ancestor's surname. Where grannies groups camped also revealed descent groups which appear to be in a process of fission.

The structure of grannies groups is constantly developing as elders die and children are born and adults step up to replace those who have died as elders and as they do so head a new *wathali mara*. This phase in the developmental cycle of families highlights the dynamism and adaptability of the broader level of Arabana social organisation, the *wathali kuri* or the 'big [family] mob'.

Arabana families of polity, those surnamed descent groups (in which descent can be traced either along the patrilineally or matrilineally), are the contemporary successors of *ularaka*, *madu* and *moiety*. In this dynamic social system grannies groups are the new livelihood band in which authority is sustained. Families of polity (at every nested level) emerge from generational succession from grannies groups (Fergie, 2009)

While 'grannies groups' form a key part of informal and cultural governance arrangements Arabana people must also develop formal governance arrangements in line with Australian policy and law. For example, the determination of native title over Arabana lands in 2012 also meant that Arabana people, under the *Native Title Act*

were obliged to establish a 'Prescribed Body Corporate' (PBC), a corporation to 'hold' Arabana native title for its members. The Arabana Aboriginal Corporation (AAC) is the PBC which came into being in May 2012 for this purpose.

This Corporation oversees all formal business on behalf of the Arabana and is the legal entity and key focal node for government and researchers to engage with Arabana people and issues. For example, it is responsible for coordinating key aspects of Arabana response to climate change. The rules of the Arabana Aboriginal Corporation, in accord with its administering Act, specify that there will be no more than 12 Directors of the Corporation⁶.

Given the historical changes in governance to date, and in light of the correlative existence of grannies groups we ask the following questions: (i) are there structures of governance that might maintain these dynamic links amongst the constituent elements of Arabana authority and decision-making practices, (ii) is it possible to devise an 'Arabana' structure of governance that would be more effective than a Board of twelve Directors elected at an AGM by vote of all eligible members over the age of 18)?

In this context, we suggest some possible governance arrangements that could facilitate transition arrangements from the old Arabana management committee to the Arabana Aboriginal Corporation, as the Prescribed Body Corporate and bring a fusion of informal (grannies groups) and the formal (prescribed body corporate) modes of governance. Option 1 (see Figure 3.5) suggests that the members of each 'grannies group' would have one collective vote (with twelve preferences) in the election of the Board of Directors on the PBC.

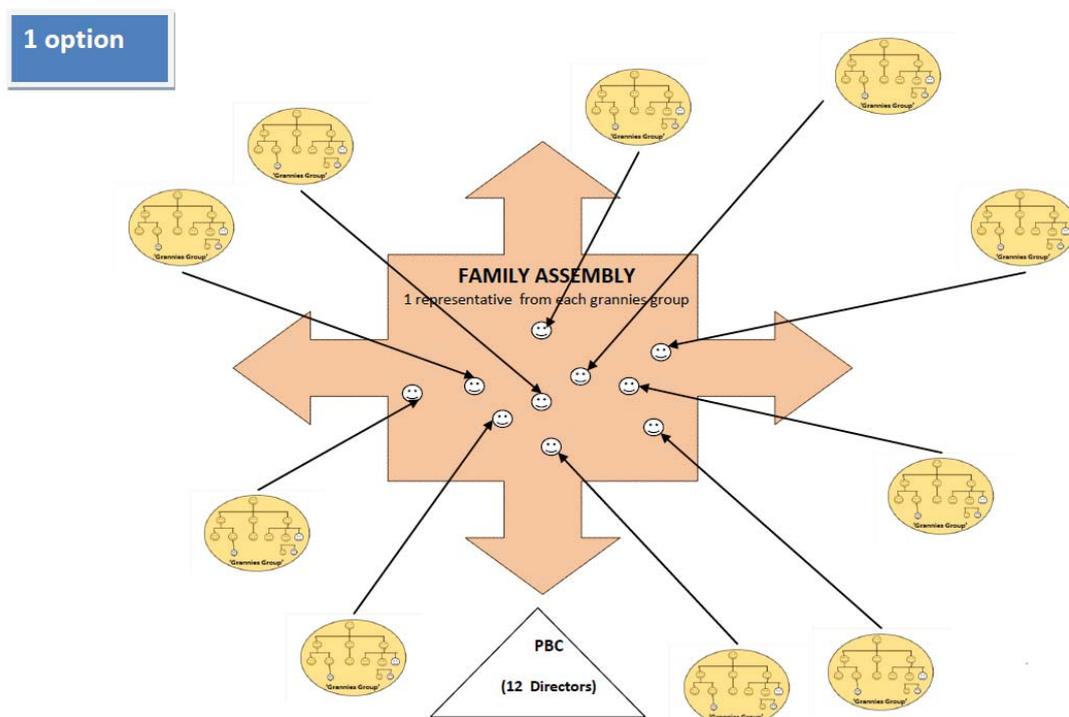


Figure 3.5: Governance option 1

⁶ PBC's are established under the oversight of the Office of the Registrar of Indigenous Corporations (ORIC).

A second option (Figure 3.6) suggested a more complex structure in which a 'Family Assembly' would be formed with a single representative for each grannies group. That Assembly would then appoint members of a range of committees:

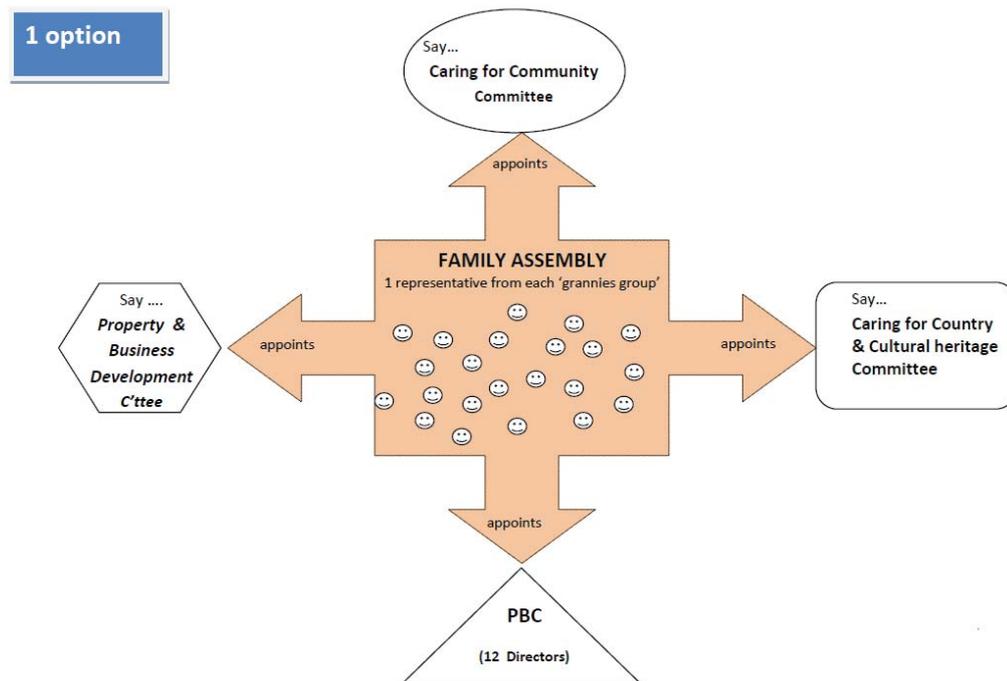


Figure 3.6: Governance option 2

Arabana social organisation has shown remarkable dynamism and resilience as it has moved from classical forms of social organisation to contemporary 'family-based' forms, while also engaging with Western governance structures via native title and the prescribed body corporate. The conjuncture of traditional and contemporary, and informal and formal modes of governance gives the Arabana strong capacity to withstand a diversity of pressures. In being part of wider discussions about climate change initiatives, as well as being able to make direct decisions about their own country, Arabana people are situated well to remain part of and build partnerships within any of the processes that build climate change adaptation in the region.

3.5.2 Wellness and resilience

Country

Resilience and wellness within the Arabana was evident in a number of ways. Firstly, a source of wellbeing was connection to country (Ganesharajah 2009). Arabana people identified that country remained important even though they may not have resided within country for more than ten, twenty or thirty years. One participant recalled, "We moved to Marree. Loved it, it was like coming home. We went to school there" (Bowditch, B VA ACC1:46). Shirley Arbon recalled how they would take the train up to Coward Springs stating "it was a natural spring. Beautiful natural spring in which we would swim" (VA ACC1:3). Another told how he had "travelled back to an old camp where he had lived as a young child on the edge of the Margaret" recalling how his sister had a "miraculous escape from a flooded river" (Strangways, S VA ACC1:14).

Another participant stated it was important "for people to reconnect, for us who may not live there to be able to visit" (Hull, D VA ACC1:54). This yearning to be in country

included many who had not been born on country. Those who did live in the small town of Marree spoke of their 'pride' in continuing to live in the north of South Australia. Many individuals and families who now reside in Darwin, Adelaide, Alice Springs, Port Augusta and in other places identified they travelled in country, camped at important sites and spent time in the small towns recalling "we travelled through in a convoy" (Arbon, S VA ACC1:7). Others said they "felt more alive in country" (Hull, D VA ACC1:60). A participant also spoke of his role in relation to younger family members stating it was important "to take them bush, live off the land, teach them how to track and how to walk through the bush" and "the kids love it out bush" (Stuart, D VA ACC1:68). As witnessed when the Arabana Native Title Consent Determination occurred, emotions ran deep as family celebrated being in country and that they had always belonged to country. People were everywhere and the spirit of the occasion was a powerful almost palpable presence.

The need to know country is tied within these relationship and responsibilities requiring one to visit sites, monitor country and the mound springs and walk properly on country while walking carefully so as not to disturb too much all other features within the environment. As David Hull said "Lake Eyre is significant and we need to know what is happening" (VA ACC1:58). A job he had in country "was not work for us it was like a big holiday and we got to see a lot of country – our country- we loved it. We didn't want to come home. Going back after was even better - really special". He went on to say "we were present", "interacting to look after" and "we were putting things right" (VA ACC1:60). Therefore, taking care of country through a presence in country, in visiting or working on country fulfilled individual and family responsibilities and made people feel well.

Arabana people also identified family relationships of respect and support as another source of wellbeing (as well as challenge) and a measure of adaptive capacity (Biddle 2011). Today they facilitate these relationships in many ways and hence enhance their wellbeing. For example, Arabana people identified they maintained relationships with family through travel and technology. Others spoke of the difficulty of leaving family out bush and having to come into school at Finniss Springs, in the early days. Syd Strangways outlined his struggle of separation from key family to go to the Mission school in the following way, "I knew people were there. However, it was hard as I had to leave Nana Lily behind. She was at Gudnanumpa" and "I would try to run away to my humpy grabbing the pews hard as they dragged me into school. Old tent" (VA ACC1:14). The Hodgson family in the past have also spoken about their sadness at leaving country and relatives when they moved to Alice Springs in the late 1940s (Arabana Elders and Arbon 2010).

The dispersed nature of Arabana society today, means travelling to visit each other in the Territory or in South Australia, and is a way of maintaining relationships and knowledge about family. One individual stated "when we went south we always dropped in to visit family in Berri, Adelaide and Port Augusta" (Arbon, S VA ACC1:7) or "I just returned from visiting family in Broken Hill" (Stuart, D VA ACC1:68) or "we nearly always travelled north to Darwin for our leave" (Arbon, R VA ACC1:11). So maintaining contact with family is incredibly important for Arabana people. Such relationships are clearly fostered in local collaborations which can include visits, train or car trips, flights across Australia and increasingly the telephone, facebook and even skype to share information and talk.

In many parts of Australia celebrations of older family members bring descendants of different Arabana families together to celebrate. The Native Title gathering in 2012 drew people from as far away as Alice Springs, Adelaide and New York. These are important family gatherings. In Darwin, a regular meeting of the Hodgson sisters takes

place every Saturday afternoon bringing extended family together on a weekly basis. Meetings of big families were also reported in Port August. Veronica Millera stated “We have family meetings to discuss issues or to get together” (VA ACC1:14). This point was supported by her brother who added it was “important to surround the younger people with people who know”, “of trying to instil a sense of pride” (Hull, D VA ACC1:56). Others spoke of always having a “family meeting to organise” adding “Young people can be included in family meetings” (Stuart, D VA ACC1:68). Funerals although very sad also play a role in affirming relationships. Such occasions assist in acknowledge the significance of family, informing relationships and playing a major role in resolving tensions, if any, within families.

Families financially support younger people when they may need it. It is grandparents along with parents who have the responsibility to ensure the younger generation have knowledge with understandings of that knowledge and the respect it demands of each individual. As one of the participants said, sharing and caring was important and in relation to funds you “feed off each other” (Hull, D VA ACC1:56). This comment related to limited loans and money that moved in organised relationship patterns through the community.

Shirley Arbon recalled, that in difficult times of family crisis and their mother’s illness, “We managed. Marg was older and we all helped” (VA ACC1:4). Another said the common ethos was that “Arabana stick together when you have bad luck. Work together” (Stuart, A VA ACC1:41). This was also stated by Veronica Millera (VA ACC1:42) and others including Millie Warren. Syd Strangways powerfully summed this up by stating “In the old days as you fell down. Really before you fell down, metaphorically speaking, someone would pick you up” adding “Family and depending on each other made Arabana strong” (VA ACC1:14). Dean Stuart pointed out that his job was “looking after the younger ones – going to talk to and encourage young ones” (VA ACC1:68). Grannies (*Kadnini/Thanti*) help young people through hard times, encouraged them or ‘growled’ them when they were doing the wrong thing. Dean Stuart also stated “All that community at Finniss used to look after each other. Eyes were everywhere” adding “there is a need to spend time with the young people. Respect” while noting “some not properly looked after today” (VA ACC1:68, 69). The significance of this ethos is enabled through the social organisation of families.

The importance of respecting each other and being respectful of older people was critically important to many who told their stories or responded to questions within this project. This was repeated often as being a central plank within Arabana society. Millie Warren, an older Granny, for example, said “Arabana respect their old people” or in relation to her partner another stated “I just followed him” (Arbon, S VACC1:5) or indicating the important relationship of a brother and sister another stated, “I can tell my sister off” and “she can tell me off” while stating the need to “Look after the needs of family” (Hull, D VA ACC1:60, 64) Other comments highlighted the expectation that younger people should ‘not speak back’ to parents and those who were older. Arabana people noted the importance of teaching the young people about respect within the context of family and extended family and country. This again affirms the centrality of relationships within the lives of Arabana people.

David Hull spoke about the “importance of having photos of old people around” (VA ACC1:56, 60) so family were known. David Hull also recalled “Seeing Mum and Auntie Mille speaking Arabana made me so proud. Uncle Glen would also come and they would all speak Arabana (VA ACC1:68). Additionally an “Arabana keeping place” was raised. It was pointed out that “Knowledge is a powerful thing because it holds secrets” (Hull, VA ACC1:56, 60). Such a place could also keep the all important photos and other important information. These discussions included telling the young ones stories

and, for some, listening to Arabana language speakers. For others having access to recordings of those who speak the Arabana language was important and brought immense pride.

Arabana people described strategies to support family when problems did emerge as “driving hundreds of kilometres to see a young person” or “calling a family meeting” or “going to another Elder to discuss ways to prevent youth from spiralling into fights” (Stuart, D VA ACC1:). Such actions are central to family relationships and individuals operating with knowledge, strength and respect. As Dean Stuart said “What goes wrong in families is that they get weaker” (VA ACC1:68).

Health is a key dimension of wellness and resilience (MacKean 2009, Marmot and Wilkinson 2006), one “has to take care of oneself to be responsible” (Syd Strangways pers comm. 2009). Another participant in this study recalled that “Nana Clara was a great help to a lot of families as a mid-wife” or that key “women were around when they were young to help them” and of “camping in the sand hills out of Port Augusta when she went with her Nana to visit her sick mum” (Arbon, S VA ACC1:0). Being healthy was about working together to get the money to live. As Shirley Arbon indicated, “we camped in a tent on a fencing line where Ray was employed when my first child was less than a year old” (VA ACC1:5). In all of these statements Arabana are considered strong and took care of their own health.

To be healthy was considered “a personal matter” although “family and structural support”, were sometimes necessary to maintaining good health. Wellbeing in this context was about “your health and living how you should as Arabana” (Hull, VA ACC1:64). Another individual spoke of the need to “find strength within” to get through difficult times and the need for “good friends” to whom one could speak with confidence (Marree informant, VA ACC1:22). Often people spoke of a mentorship or of being helped by other Arabana people. As one person stated “Arabana were strong and resilient because of family and depending on other people to be there when needed”. In the old days if an individual did not “fulfil responsibilities to family they would be punched or punished” (Strangways, S VA ACC1:12),. This occurred in the past but still today older people can tell a younger family member off for not fulfilling obligations or responsibilities tied within relationships for not respecting themselves or others in times of illness.

Little mention of education and employment was made in this study. However, one participant stated “When I was young Granny Fred took me in the buggy to the next station – for work” (Stuart D VA ACC1:69) and another pointed to his family – “his sister was qualified as a nurse, Veronica with a Diploma of Business”, as examples (Hull, D VA ACC1:56). Some have been able to study or gain work. However, far too many Arabana are also unable to be gainfully employed or complete their schooling.

This is evidenced in the worries about the young people “missing school and coming down the street” while many pointed out that education was a “big must” and that there was a need to “encourage them to stay at school and work hard” (Hull, V VA ACC1:42,43). There was also the statement that “whole groups were not involved in the future” and the addition that “alcohol undermines authority” (Marree informant, VA ACC1:22). There was also discussion around how family politics were taken into the school or into employment to the disadvantage of Arabana people (Marree informant, VA ACC1: 23). The impact of such actions on the learning or work of other Arabana (usually younger) and their capacity to understand the meaning and significance of what was occurring was the greatest concern. These are pointers to areas of vulnerability in the face of climate change (Green and Morrison 2009). The low socio-

economic statistics also point to health education and employment factors that will place Arabana people at a disadvantage (Hordacre et al. 2011).

In summary, we found that the resilience of the Arabana people is entwined in relationships born from country and made manifest with all including between family members. Visiting and communication is considered to be centrally important to providing experiences of country and families and from this, learning at all levels, including around the important area of respect, is passed through the generations. Older people have the responsibility of teaching younger people about country and relationships and also on mentoring and encouraging young people to hold knowledge. The capacity to feel that one has autonomy over ones' life is clearly very important along with the ability to fulfil responsibilities to family and country. Mobility within country and out of country has always been important to dealing with environmental challenges and family dispersal and contractions across the land has and continues to be a critical factor within the lives of Arabana people today.

3.5.3 Information and communications technology and the Arabana

Information and Communications Technology (ICT) was a key focus of our research in understanding social sustainability and adaptive capacity. In this respect we had three aims:

- To better understand the role of ICTs in and for Arabana social life
- To better understand contemporary Arabana ICT practice as an indicator of Arabana adaptive capacity
- To make a preliminary evaluation of the potential of an elemental approach to the dynamics of social practice in climate change adaptation assessment and policy making.

Information and Communications Technology (ICT) has the potential to strengthen adaptive capacity in the face of climate change (Ospina & Heeks, 2010, 1). Research on ICTs and climate change has focussed on sustainable development, mitigation and, most recently, adaptation. This most recent focus arose out of recognition that climate change will affect those in 'developing contexts' which will have the effect of "magnifying existing vulnerabilities, poverty and resource deprivation" (Ospina & Heeks, 2010, 5).

ICT and climate change information specific to Aboriginal and Torres Strait Islander people has been much less researched, although research has begun to be undertaken by the National Climate Change Adaptation Facility (NCCARF). Given the similarities between First Nations of Australia and developing countries in terms of wider problems relating to health, economic and social disadvantage, there is knowledge to be gained from research undertaken in the context of developing countries. Despite seemingly appearing vulnerable, many Aboriginal and Torres Strait Islander people are still well positioned to respond and adapt to climate change, due to their high capacity to adapt to landscape change (Sheraga and Grambsch, in IPCC, 896).

For Arabana people specifically, the need to communicate over considerable spatial distances, coupled with their existing relatively high ICT use and literacy, gives them a strong capacity and high need to adopt and utilise ICTS in climate change adaptation strategies. In Marree particularly, and amongst the wider Arabana community too, many expressed concern about succession, particularly getting young people involved in the community. This presents a very real problem in Marree, as there are some

integral roles that will need to be filled as key older members of the community begin to retire. Whilst many consider this lack of youth involvement to be a problem of young Arabana people themselves, there may also be a place for the development of initiatives to encourage the contribution and recognise the worth of young people, which may foster and facilitate their participation in the wider community. Given that the IT literacy rates of young people are often higher than those of older community members, there is the potential for initiatives promoting integrated training, knowledge transferral, and youth-oriented programs encouraging involvement.

As noted, senior and elder Arabana people have a strong, unwavering commitment to their (Arabana) community: as a result they are generally open to innovative ideas for the future, and many have ideas themselves as to how Arabana can best manage their country and stay connected as a community. Connectivity to each other, particularly within family groups, is a particularly strong aspect of Arabana life and people. Many older Arabana have started to use Facebook with the sole intention of keeping connected with family. Most limit their usage to viewing the 'Arabana Mob' "page", and a few interact on the page, or engage with Facebook on a broader scale

Arabana's commitment to the health, wellbeing and connectivity of their community would ensure the consideration and adoption of strategies that include ICTs, providing there was an understood benefit to Arabana in the broad sense. This commitment to their community would override, and has already overridden, hesitations to ICT adoption.

The Australian Bureau of Statistics (ABS) has reported that in 2008 across Australia:

- 53% of Aboriginal and Torres Strait Islander households in non-remote and 20% of Aboriginal and Torres Strait Islander households in remote areas had a computer that had access to the internet.
- 51% of households without internet connection were such because of the high cost.
- In very remote areas, 3% of Aboriginal and Torres Strait Islander people had used a computer at home (compared to 38% of non- Aboriginal and Torres Strait Islander people).
- Across Australia, the majority of people living in Aboriginal and Torres Strait Islander households had telephone access (98%) (ABS, 2010).

We found that on average, Arabana people had medium to high levels of access to ICTs and demonstrated a relatively high capacity to use them. Most people we spoke to had access to quite a wide range and selection of ICTs, (including mobile phones, desktop computers, laptops, gaming consoles, TVs, radios and music devices), however material and infrastructure barriers such as unreliable or no connectivity, high costs relative to income limit and influence ICT practice. We found many had a 'layered' usage of technology particularly with older people. For example people will ring to let someone know they were sending them an email, or had sent something in the post.

Our research suggests that Arabana people have a high capacity for adapting to new technologies. Our research indicates a relatively high uptake and usage of communications technology such as mobile phones. But some, particularly older Arabana people, use limited functions of technologies in everyday practice even as they have demonstrated an ability and commitment to learn new functions, or adopt new technologies, particularly in order to stay connected to family and the wider Arabana community.

Interestingly, many participants we worked with had a relatively limited knowledge of the practical capacities of the technology they owned and expressed hesitancy in learning more of the available functions than they thought essential. This reflects broad findings by Bell (2004) that users often underestimate their technological capacity and literacy, believing themselves to be a 'novice' (Bell, 2004, 14).

In our observation many participants had a higher ICT competency level in practice than they said they had. This underestimation of one's own know how extended in to practice. For example some of our older participants considered their understanding of technology inadequate for using certain features or devices without help, assuming they wouldn't be able to or that by trying they may get something "wrong".

Some Arabana people didn't maintain their ICT capacity. One respondent from Marree told us that she used to know how to use a printer when she was in school a decade and more ago, but hasn't used one since and thought she wouldn't know how anymore. In Darwin, Daphne May noted she used to use her mobile phone to access Centrelink online when she worked at Prominent Hill, but hasn't done so again since she stopped working and now does not use the online function of her mobile phone. Her sister Betty (in Darwin) said she used to use email at work "15 years ago" but doesn't anymore, and added that she wouldn't know how to now.

Some Arabana people lacked interest in seeking out new uses for their existing technology. They said they 'couldn't be bothered' with some functions – especially if there was no perceived benefit. An Arabana man from Melbourne who has recently retired from a high level job at national level was visiting relatives in Alice Springs when we interviewed him. He said he is confident using most technologies, but limits the functions he utilises. He has a smart phone and knows how to use the extra functions, yet doesn't, because it involves 'too much mucking around'. Instead, he uses his iPad for banking, facebook, emailing, surfing and transferring photos. Arabana people used others' devices for specific functions regardless of the capacity of their own devices. Daphne in Darwin for example, has her own laptop but uses Skype and Facebook at her sister Zena's house. She does her internet banking on her granddaughter's computer. This is partly an issue of not having internet credit, but also an issue of not knowing how to set up such functions on her computer, and having minimal desire to do so.

We found that 'keeping connected to each other' was the primary reason Arabana people used ICTs. When asked "What is the main way of keeping in touch with family", many responded "I go and visit, or I ring them". In their practice ICTs supported, but did not change, the fundamental way that information was transferred between family groups (grannies groups). In Darwin amongst the 'Hodgson sisters' for example, important information is relayed through the grannies group by its head (granny). This was a context in which, consistent with Shove et al. (2012) the elements of material (phone), meaning (staying connected), capacity (know how) and social structure (the grannies group) were connected at the heart of practice. Indeed a key feature of Shove et al's analysis is that they use their elemental approach to practice to track change over time. Their view is that:

'Practices emerge, persist, shift and disappear when connections between elements of these three types are made, sustained or broken.' (Shove et al, 2012, 15).

As such we represent via Shove's analytical framework a truncated view of Arabana communication practices over time, as shown in the figure below. Showing just three 'moments' in a dynamic chain of changing practice, the figure shows how the element

of material has changed from 'face to face bodily contact' before invasion to landline telephones by the late twentieth century and computer and internet based communication by 2012. The Figure also makes clear that as the material dimension of practice changed so too was there change in the element of 'competency'. Arabana needed to learn new skills, acquire new know how to keep communicating with the new technology. The diagram is also an exemplar of the fact that Arabana people always and continue to exhibit adaptive capacity. Despite substantial change in more than one element of practice over time some fundamental features of Arabana life remain. Communication is a dynamic and enduringly sustaining Arabana social practice. In short Arabana communication practice has clearly been dynamic over the past 150 years but the links have not been broken as the content of some elements have themselves transformed.

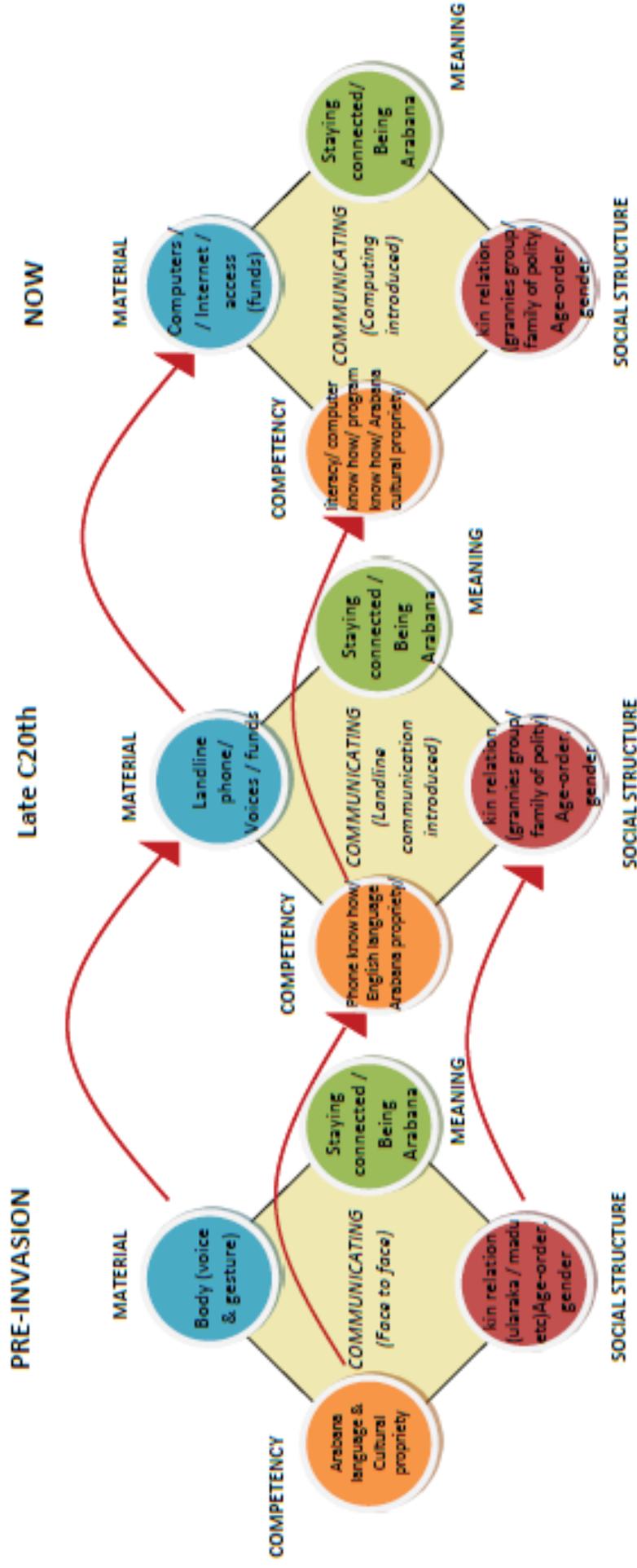


Figure 3.7: Tracking the dynamics of social practice and ICT

ICTs also have the potential to assist in adaptation to climate change in areas such as health, monitoring and mobility. Table 3.1 highlights how this may be facilitated.

Table 3.1: Dimensions of climate change and ICT

Dimension	Pathway
Well being and health	Early diagnosis Facilitate remote treatment and advice
Broader community	Early warning systems Keeping family connected in climate related emergencies
Climate change monitoring	Monitor and plan land use (Pittock and Wratt 2001)
Collaborative research and education	Sharing knowledge Developing land management techniques and sharing them via long distances
Mobility	ICTs encourage connection and ability to live in many different areas yet stay connected to country and what happens on it
Mitigation	By reducing dependence on printing etc

In order for ICTS to have an impact in climate change adaptation, the following issues need to be considered. Arabana, like the wider Indigenous population, are impacted by disadvantage and poverty, which, along with ‘demand sharing’ (after Peterson 1993) means that Arabana people often have limited to no disposable income. Arabana social order asks them to give away money to relatives when asked, and to provide for their children (both blood and kinship lines etc). As a result most are living “week to week”. This is, and will continue to be, the biggest hurdle to the uptake and use of ICTs. The cost of implementing and servicing ICTS is a potential barrier.

ICTS have the potential to deliver new ‘assets’ to communities, however the risk of this is that such assets may not be useable, locally relevant, or in an appropriate language (even if users speak the language of delivery, the “lingo” could still be a barrier). As previously mentioned, reluctance to adopt or learn technologies is a factor to consider in the design of climate change adaptation strategies, as there can be a perception from individuals that their technological literacy is lower than it actually is, or believed to be not adequate enough for expanding their usage. Other challenges to ICT approaches to climate change that Arabana might face, and aka Ospina & Heeks (2010, 12-14) are shown in Table 3.2 below.

Table 3.2: Challenges to applying ICT.

Difficulties accessing, analysing and forecasting meteorological data in areas that most need it, as infrastructure and economic and human resources are inadequate	This is especially relevant in Marree – technological infrastructure and capacity is limited and economic and human resources are currently not situated to commit to analysing and collecting data
There is a need to evaluate the impact that ICTs themselves will have on climate change, particularly considering the potential for their own CO2 emissions, and increase in e-waste. The economic impact of introducing new ICT initiatives also needs considering, as there is a risk of low uptake with Arabana, due to lower incomes and the reality of cultural systems that mean few have disposable incomes of ICTs, and capacity of users	In order for ICT initiatives to be considered and introduced, there needs to be an understanding of the potential of ICTs in climate change adaptation amongst decision makers, as well as an increase in the ICT capacity of users and stakeholders. For Arabana, this means clear and culturally specific planning for new initiatives, as well as training in any new initiatives
Address issues of access and funding	Uneven access to ICTs among Arabana needs to be considered in adaptation initiatives, and utilisation of existing technologies should be prioritised over the introduction of new ones

Arabana’s high level of adaptive capacity overall, coupled with the knowledge that ICTs “can play a key role in strengthening adaptive capacity” (Ospina and Heeks, 2011,1) makes the community well-positioned to be able to adopt ICTs to use innovatively in the face of climate change. ICT initiatives could help overcome barriers that leave Indigenous people disadvantaged in areas such as income, education, health and employment. Arabana people have exhibited strong commitment to the adoption of new technologies and processes when there is a reason to, and when the technology is viable and appropriate.

3.6 Summary Assessment of Arabana Adaptive Capacity

1. Arabana people have a significant *heritage of adaptation*.
2. The Arabana social system is dynamic and has remained viable in the face of cataclysmic episodes, substantial short term processes of change as well as change over the long duré.
3. Arabana social practices are dynamic and can be demonstrated to have adapted when there was continuity over time in some elements (such as meanings associated with being Arabana).
4. Points of strength for many Arabana people are also points of vulnerability for other Arabana people (for example in grannies groups truncated by the premature death of their erstwhile or potential leaders).
5. Livelihood security, welfare dependency and the disadvantages of race in contemporary Australia remains a point of vulnerability for a significant number of Arabana.

4. “SEEING CHANGE”: RESULTS OF THE RISK PERCEPTION, VALUES ANALYSIS AND ADAPTATION STUDY

Authors: Melissa Nursey-Bray, Rob Palmer, John Tibby and Nick Harvey

4.1 Introduction

This chapter reports on the research undertaken to understand the risk and adaptation dimensions of the project. Our role was to document the impacts of climate change according to the best currently available science, to document Arabana perceptions about those changes, identify what environmental change they had observed, and workshop adaptation strategies (that they suggested based on all of the above).

4.2 Methodological Approach: a Fusion

Overall, we took an action based, community based participatory research approach, that drew on a range of literature discussing the dimensions of undertaking research with Indigenous peoples including (but not restricted to): Arbon (2009), Rigney (1999), Humphery (2000, 2001), Ivantiz (1999), Hughes (2000) Henderson et al. (2002), Hurley (2003), Jackson et al. (2012) and Smith (1999), as well as current AIATSIS research guidelines. The benefits of this approach are well described. Berkes et al. (2001) in a study of the Canadian Arctic and the Oceans Act, highlight the importance of participatory environmental research as does Kwiatkowski (2011) in a study relating to health impact assessment. Part of the aim was also to build community capacity in research, by training Arabana to undertake research interviews for us. Fourteen Arabana people were employed to work with us throughout the project. Using science as a base and then building and developing community based responses to climate change adaptation issues, our aim was to build community ownership of the project and its products.

Shaw et al. (2009) note the difficulty of promoting understanding of climate change at local scales, due to it being local in cause, but global in its impacts. Keeping this in mind, we thus also applied a form of scenario analysis when conducting the interviews and going out on country to observe and document environmental changes. In doing so, we presented a synopsis of the science report as a series of scenarios, such as “the science predicts it will get hotter by 1.5 degrees, what does this mean for you, how do you think Arabana can cope and respond to this change?” By breaking up the implications of the science report into bite size pieces it made it easier for Arabana people to discuss them. As Dinero (2013) stresses in reflecting on the Arctic: “One way to better understand and analyze the extent to which climate change is affecting subsistence activity ...is by turning to members of the communities most affected by this change, and by asking them if they are experiencing change, if so how they see it being manifested, and to what degree they see impacts upon their ability to hunt and fish as a result of these changes” .We got better at relaying this as the fieldwork progressed, so later interviews were sometimes richer for this.

As Green et al. (2007) corroborate, “the use of scenarios could have many benefits including promotion of relationship building and trust between the Indigenous community and researchers/practitioners, allows the impact of uncertainty to be explored, and enables the incorporation other broader social and economic issues facing Indigenous communities”.

An important dimension of the work however was also documenting observed changes. Consistent with Smit's work (2008 and Smit and Wandel 2006) we made sure that we did not discuss what the science said until *after* we had had a discussion about observed change. This is essential so as to ensure respondents are not led into changing their observations or framing their discussion in a climate change context unnecessarily. It is also important to help set the context of the research (Huntingdon et al. 2006).

4.2.1 Process

By the conclusion of 2 periods of substantive fieldwork, and many smaller meetings and interviews, we had interviewed 35 people in total and talked to a further 25 or so at the community based adaptation workshop. We interviewed Arabana people across all the places Arabana people live, and we interviewed Arabana people about their country and their place of residence. We covered a time period going back 90 years. A thematic values analysis was used to synthesise the results, based on a close reading of the transcripts and in field observation.

Information saturation was achieved quite early on, but important detail gained from the ongoing research. Face to face validity and Lincoln and Guba's criteria were used to evaluate the project validity. These criteria are: (i) credibility, confidence in the 'truth' of the findings, (ii) transferability - showing that the findings have applicability in other contexts, (iii) dependability - showing that the findings are consistent and could be repeated, and (iv) confirmability, establishing degree of neutrality or the extent to which the findings of a study are shaped by the respondents and not researcher bias, motivation, or interest (Guba and Lincoln 1985). The steps we took to actually complete this component of the project, and do the assessments are presented in Table 4.1 overleaf.

Results highlight that despite Arabana people living in so many places, there *is* consistency in their perspectives and suggestions.

Table 4.1: Steps in risk/adaptation dimension

- Undertook literature review of similar work in this area to ensure work is methodologically sound.
- Worked with other team members and the Arabana Association to develop (a) ethics application and (b) research protocol (see Appendix 3). This set baselines for our conduct while out in community.
- Had a number of meetings with the Arabana and team members to develop a plan and exchange intent about and/or research interviews.
- Coordinated the production and publication of the science report and the peer review.
- Coordinated the production of a short film explaining the science and project.
- Coordinated the production of a plain English brochure about the project and a plain English brochure about the scientific findings.
- Met with the Arabana committee and explained the fieldwork and project.
- Conducted a media launch to generate broader awareness of the project.
- Met with selected individuals to explain their role and action in research when in field.
- Undertook fieldwork interviews in Darwin, Marree, Alice Springs, Adelaide and Port Augusta.
- We asked everyone to sign a permissions form and left them with the project brochure, a flyer that translated the science report, the ethics approval and the research protocol.
- We interviewed people about: (i) their history; (ii) understanding of climate change; (iii) risks they perceived to Arabana Country and where they lived; (iv) documented stories and observations about what changes they have seen in their lifetime; and (v) asked people to suggest what types of adaptation options they think would be good and appropriate. We also showed the science video about climate change as part of the interview process.
- We ensured face to face validity of our data via (i) return of transcripts to respondents for verification, (ii) meeting face to face to present the results of our work and (iii) sending of our (risk and adaptation) reports to everyone we interviewed for comment and additions.
- We collated all this information and presented them formally as identified adaptation options to the Arabana committee. This was formally endorsed as the content to be within the climate adaptation strategy.

4.3 The science: climate change for Arabana country and places Arabana people live

4.3.1 Introduction

One of the first steps we took was to seek an understanding of the science and current information about the Arabana country and the places where Arabana people live. As such, this section presents the results of this review and the flyer that was produced and given to Arabana people during fieldwork.

The review⁷ predominantly focuses on the area bounded by the South Australian Arid Lands Natural Resource Management Board region (Figure 4.1) and the settlements of Adelaide, Alice Springs and Darwin. It draws principally on Suppiah et al. (2006), CSIRO and BoM (2007) and DENR (2010). Climate projections cited in this report are based on a set of models that have the greatest skill at simulating South Australian (Suppiah *et al.* 2006) and Australian (CSIRO and BoM 2007) climate.

This area and, particularly that in central Australia, includes some of the hottest and most arid parts of the Australian continent where annual average rainfall is less than 200 mm. In this region there is substantial rainfall variability from year to year and from decade to decade (Van Etten 2009).

In terms of projected climate change in the region, Suppiah et al. (2006, p.XI) note:

“A significant degree of climate change across South Australia now seems inevitable, and is likely to become increasingly apparent during the second half the 21st century as carbon dioxide concentrations in the atmosphere exceed twice the pre-industrial level. Changes are to be expected in both the average values and in the magnitude and frequency of extremes. This means that long-term planning should not be predicated on the assumption that future climate statistics and resources will be as they were over the last century. Significant adaptation to a changing climate will be necessary.”

In terms of understanding the effects of climate change in the region, it is important to note that natural variability will be superimposed on shifts in the mean state of climate so that “[t]he conditions of any individual year will continue to be strongly affected by natural climatic variability which cannot be easily predicted.” (Suppiah et al. 2006, p.24). More importantly, future climate change at a regional scale may occur in a “step like” manner rather than as a gradual transition over the coming decades (Jones 2012).

⁷ This summary is based on the full science report conducted by Dr. John Tibby, as part of the project.

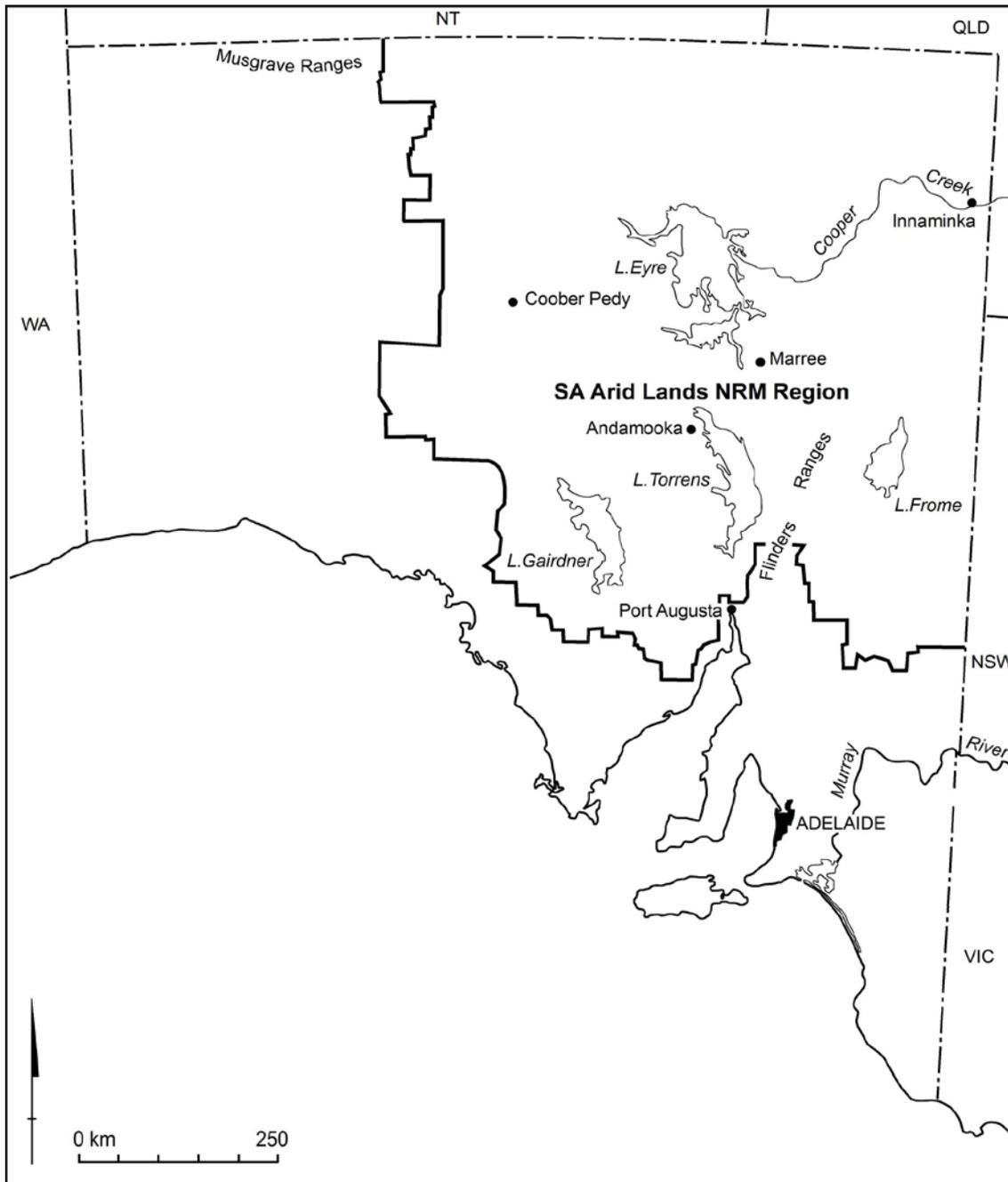


Figure 4.1: The South Australian Arid Lands Natural Resource Management (NRM) region (Map drawn by Chris Crothers)

Many of the climate projections in this report are for this region. Climate change projections for Alice Springs, Darwin and Adelaide which support relatively large numbers of Arabana people are also included.

4.3.2 Uncertainty: a key theme

A broad theme in climate prediction is the notion of uncertainty. The level of uncertainty in climate projections varies with a number of factors. These include:

1. the effect of future changes in human behaviour
2. the accuracy of models used to infer climate, which is influenced by:
 - a. the properties of the models

- b. the variable being forecast
 - c. the geographical location
3. the time in the future that is being forecast.

In terms of the uncertainty associated with the effect of future changes in human behaviour, climate changes over the coming several decades are largely inevitable, based on the amount of greenhouse gases already in the atmosphere, along with inertia in the climate system. In the climate change literature this is known as *commitment* (IPCC 2007). Beyond this time period, because future human behaviour and technological innovation are unknown, the degree of uncertainty increases. It is important to stress that, for some variables (notably rainfall), uncertainty increases with an increase in greenhouse gas emissions. Hence, the greatest divergence between model rainfall predictions occurs under high emissions scenarios in 2070. Under high emissions scenarios both considerably higher and considerably lower rainfall in the region is possible.

4.3.3 Climate projections: central region

Overall patterns of projected change

DENR (2010) notes, models do not usually predict a combination of the greatest temperature increase and most substantial rainfall decline. Hence, it is unlikely that the future climate of the region will be the “worst” of all possible outcomes.

Projected temperature increases

There is a consistent pattern of projected temperature rise in the study region in the 21st Century, with increases projected throughout the century. Notably, even if there are significant reductions in the rate of greenhouse gas pollution, the region is still projected to experience warming through the 21st Century (Suppiah et al. 2006). In general terms, temperature increases will be greater inland due to the buffering effect of the oceans on warming.

By 2030, annual average temperatures are projected to increase in the South Australian Arid Lands NRM region (SAAL region) by between 0.6 and 1.5°C (Suppiah et al. 2006). Importantly, projections during this time period are not strongly influenced by the amount of emissions and therefore this provides some certainty. In the northern part of the state, including population centres such as Marree and Coober Pedy, the climate is projected to warm by between 1.0–1.5°C. This amount of warming is equivalent to the current temperature difference between Port Augusta and Roxby Downs. Projected median warming for Port Augusta is more moderate and likely to be between 0.5 °C and 1.0°C. It is likely that warming in the period 1990 to 2030 will be greater than that experienced in the 20th Century (Suppiah et al. 2006). This highlights that it is not only the degree, but the rate and manner of warming that will present adaptation challenges.

The projected range of temperature increases is much greater for the year 2070. Differing amounts of greenhouse gas pollution exert a strong influence on the projected outcomes. By the year 2070, temperatures are projected to increase in the Arid Lands region by between 1.2 and 4.7°C (Suppiah et al. 2006). Warming will be greatest in Summer and Spring with warming of 1.3°C to 5.1°C and 1.3°C to 5.3°C, respectively. However, even the slightly smaller amounts of predicted warming in winter (by 1.1°C to 4.7°C) and autumn (1.2°C to 4.6°C) (Suppiah et al. 2006) are substantial. If large reductions in emissions occur, then the range of annual average warming in the SAAL region reduces to 1.2°C to 2.4°C. However, such reductions require an almost immediate halting of emissions growth and substantial future reductions (IPCC 2007).

Both historical temperature changes and simulations for SE Australia (Jones 2012) suggest that warming will not be gradual but consist of steps and trends.

Changes in moisture balance

Rainfall variability is already very high for the region (van Etten 2009) and it is argued that it may not be until 2050 that regional changes in rainfall can be conclusively attributable to human induced climate change (Suppiah et al. 2006). However, because rainfall variability will be superimposed on the effect of a warming climate, the effects of human induced climate change on available moisture will be felt much earlier.

An interesting feature of DENR's (2010) analysis of climate predictions for the SAALNRM region is that, although there is a universal agreement between models that the region will warm, for a number of "timeslices" the predicted rainfall change is divided roughly equally between models that suggest increased and decreased rainfall. For example, in the decade beginning in 2040, there is an equal number of models that predict an increase and decrease in rainfall (DENR 2010). The range of model predictions is substantial, with reductions in rainfall of more than 20% predicted for most decades analysed to 2100, but with possible increases in rainfall of over 30% also predicted (DENR 2010). Increases become more likely to the north of the region.

Despite the above observation, when the (divergent) predictions are averaged, the degree of predicted rainfall increase is moderate (e.g. +4% by 2070 for the SAAL NRM region; Suppiah et al. 2006), while decreases may be severe (25% by 2070 Suppiah et al. 2006). There is greater coherence in the timing of rainfall change (with a majority of models predicting declines in winter and spring rainfall). Hence, the combination of certainty in predicted increases in temperature with the (variable) rainfall predictions means that overall water availability in the region will be decreased. This notion is summarised in predictions of potential evapo-transpiration in which even the most favourable scenarios predict increased evapo-transpiration availability across the region (CSIRO and BOM 2007). There is also considerable potential for increases in the number of extreme rainfall events where large amounts of rain fall in short time periods (Nicholls 2009).

Changes in extremes

In general, particularly in the context of the difficulty in predicting hydrological changes in the region, it is difficult to predict the changes in frequency of "extreme events" including for example the frequency and duration of storms, floods and droughts (Nicholls 2009). Although this observation is generally true, in the case of extreme temperature (e.g. defined by a threshold such as exceeding 35°C), prediction is somewhat more straightforward. This is because, in large part, an increasing number of hot days arise from an increase in mean temperature which then results in a shift in extremes.

Hennessey et al. (2011) have recently modelled the frequency of days exceeding 40°C for a number of South Australian localities including Woomera, Marree and Oodnadatta. They predict that by 2030, the average number of days exceeding 40°C in Woomera, Marree and Oodnadatta will respectively increase from 13 to 19, from 28 to 37 and from 37 to 47. However, a word of warning: these projections were based on the linear interpolation of mean change. For Marree, the long term average of days >40°C 1910–2011 is 29 days but for 2000–2011 is 41 days. Similar recent increases in extremes in SE Australia suggest these estimates for 2030 are already being reached (e.g. in Laverton, Victoria has moved from an average of 8 days above 35°C pre-1997 to 12 days above 35°C post 1997). Predictions for 2070 based on high rates of

greenhouse gas emissions result in a more than doubling of the number of days >40°C in all locations.

As a result of increased warming of the atmosphere, there will be a “speeding” of the hydrological cycle. This speeding results from both an increase in average evaporation and an increased ability for the atmosphere to hold water vapour. As a result, many projections indicate that there will be a tendency for individual rainfall events to be less frequent but that these events will be more extreme (i.e., there will be fewer total rainfall days but an increased number of high rainfall days) (Nicholls, 2008).

4.3.4 Climate projections: population centres (Adelaide, Darwin and Alice Springs)

In the more northerly part of the study region (i.e. in Alice Springs and Darwin) the task of predicting rainfall becomes even less certain. Suppiah et al. (2006) have shown that despite a selection process that identified the best performing thirteen climate models out of a total of twenty five, that for almost all of the Northern Territory there are inconsistent results between models (i.e. less than 10 out of the 13 models exhibit the same trend). As a result of the dispersed nature of the settlements considered in this section, climate changes are considered by settlement, rather than by climate parameter.

Adelaide

Projected changes for Adelaide are similar to, but more moderate than, those projected for the central region. By 2030, annual average temperatures are projected to increase by between 0.6 and 1.3°C (CSIRO and BoM 2007). By 2070, median model projections under high emissions scenarios indicate that Adelaide will warm on average by 2.8°C. Associated with this increase is an approximate doubling of hot days from the current 17 to 36 days over 35°C (CSIRO and BoM 2007). Even under more moderate emissions scenarios (i.e., the B1 emissions scenario) the number of days exceeding 40°C is also likely to double (from 2.3 to 4.8) (Hennessey et al., 2011). Note that days above 40°C for Adelaide 2000–2011 totalled 5.3 per year.

Median model predictions for 2030 suggest that rainfall will decline in Adelaide by 4%, with a possibility of much greater declines (10th percentile prediction: 9% decline) or modest increases (90th percentile prediction: 2%)(CSIRO and BoM 2007). Predictions for 2070 based on median model outcomes indicate a greater decline in rainfall (7% under low emissions and 13% under high emissions). Under the most extreme scenarios, rainfall is predicted to decrease by almost 1/3rd.

Alice Springs

Reflecting the overall trend for continental regions to experience greater warming, annual average temperatures in Alice Springs are projected to increase by between 0.8 and 1.6°C by the year 2030 (CSIRO and BoM 2007). By the year 2070 there is a substantial range in annual average temperature projections based on variation in both model outputs and assumptions about emissions. Median model predictions of temperature increase vary from 1.9 to 3.7°C, depending on the underlying emissions scenario. However, some models indicate that a warming of 5.2°C is possible under high emissions scenarios (CSIRO and BoM 2007).

Median projected changes in rainfall in Alice Springs for 2030 suggest a decrease of 6%. However, there is a possibility of greater declines (10th percentile prediction: 17% decline) or moderate increases (5%) (CSIRO and BoM 2007). In Alice Springs, as in other locations, projected ranges expand with time and with increasing concentrations of greenhouse gases. As a result, under high emissions the range of predicted rainfall

change is from a decline of 44% to an increase of 16%, with the median model projection being a 17% decline in rainfall (CSIRO and BoM 2007).

Darwin

It is likely that by 2030 annual average temperatures in Darwin will have increased by 1.0°C, with a possible increase of up to 1.4°C (CSIRO and BoM 2007). These average values to some extent mask the dramatic changes associated with this increase. Median climate model predictions for Darwin indicate the number of days where the maximum temperature exceeds 35°C will quadruple from 11 per year to 44 (CSIRO and BoM 2007). The current rate 1998–2011 is 18 days per year. Median predicted temperature changes in Darwin by 2070 range from 1.7–3.2°C depending on whether low or high emissions are assumed. While these increases are not as great as in the central part of the study region, they do result in a very high proportion of very hot days, with 89 and 227 days over 35°C associated with 1.7 °C and 3.2°C increases in annual average temperature respectively (CSIRO and BoM 2007). Median climate model predictions suggest that there will be no change in rainfall in Darwin by 2030, but that it is possible that there will be marked decreases (-7% per year) or increases (6% per year) (CSIRO and BoM 2007).

Darwin is vulnerable to tropical cyclones. Such cyclones generally only form in regions where sea surface temperatures exceed 26.5°C, leading to a concern that continued ocean warming would result in an increase in the frequency of tropical cyclones (Nicholls, 2008). Early modelling exercises (focused on the east coast) suggested that while the frequency of tropical cyclones will decrease in the future, there will be a greater frequency of intense cyclones (i.e. category 3 and above) (Walsh et al., 2004). Similar assessments have been made for other locations in the Southern Hemisphere (Lavendar and Walsh, 2011). More recent predictions using a downscaling of three climate models derive similar conclusions, with all models indicating either no change or a decrease in the frequency of cyclones making landfall in Darwin (Lavendar and Walsh, 2011). However, this modelling exercise also suggests that there may be an increase in the intensity of cyclones that make landfall over Darwin (Lavendar and Walsh 2011), with two of the three models indicating increases in wind speeds by the year 2090.

4.3.5 Conclusion

Climate change in regions where Arabana peoples are located is projected to be marked. In the arid zone annual temperature increases of more than 4°C are possible by 2070. Increased temperatures may be accompanied by very substantial reductions in rainfall and by changes in the nature of extremes. While some uncertainty exists about the magnitude and, at times, the direction of projected change, this information provides a basis on which adaptation strategies can be developed.

The following summary was produced as a plain English report that summarised the scientific report written by Dr. Tibby and which we used to explain the science to community.

Climate change projections for where Arabunna people live



THE UNIVERSITY
of ADELAIDE

Introduction

A scientific report has been written that examines climate change projections for where Arabunna people live.

The report was written as part of a project that has been funded by the National Climate Change Adaptation Research Facility to see how Arabunna people can adapt to a changing climate.

This flyer presents a very brief summary of some of the reports key findings.

About the scientific report

Climate scientist, Dr. John Tibby from The University of Adelaide based his report on the different studies that have been written about projected climate change impacts on where Arabunna people live. He looked at lots of studies. His report was then examined by other scientists, including Professor Nick Harvey who won a Nobel prize for science, to make sure it is correct.

In his report John talks about uncertainty. This is due to the varying scientific projections about likely changes, especially when predicting far into the future. Therefore, John says, scientific models about changes that are likely to occur by 2030 are much more certain than those that are projected beyond 2070.

The key reasons why scientists are not 100% certain about likely climate change is because we don't know for sure how much more carbon pollution people will keep pumping into the atmosphere.

The more we put in, the more the climate is projected to change.

His report therefore presents projections based on

low, high and average levels of carbon pollution and the impacts this might have on the climate where you live.

Projected changes to Arabunna County

The report has found that a significant degree of climate change across Arabunna Country now seems inevitable, and is likely to become increasingly apparent during the second half of the 21st century.

The report says this is a big challenge for Arabunna people because the changes to climate might not be gradual but could happen in a series of steps, starting in the next twenty years.

For Arabunna people living in Country, this is more challenging as they already live in a place with a very unreliable climate. This means Arabunna people will have to adapt to the double challenge of dealing with natural variability plus climate change.

In population centres such as Marree and Coober Pedy, the climate is projected to warm by between 1.0 and 1.5°C.

This amount of warming is equivalent to the current temperature difference between Port Augusta and Roxby Downs. For Port Augusta, change is more moderate and likely to be between 0.5 °C and 1.0°C.

It is probable that the degree of warming that will be experienced in the period 1990 to 2030 will be greater than that experienced in the 20th Century.

This highlights that it is not only the degree, but the rate and manner, of warming that will present adaptation challenges for Arabunna people in Country.

By the year 2070, the next step in change is projected with temperature increases in Arabunna Country by between 1.2 and 4.7°C.

Warming will be greatest in Summer and Spring with warming of 1.3°C to 5.1°C and 1.3°C to 5.3°C depending on how much carbon people keep polluting the atmosphere with.

In Marree the number of really hot days above 40°C will rise from 28 to 37. In Oodnadatta, the number of really hot days above 40°C will increase from 37 to 47 by 2030. By 2070, projections indicate a doubling of the number of days above 40°C.

Predicting rainfall changes is more difficult. Some scientists suggest more, others less. However, when combined with predicted increases in temperature, substantial declines in the availability of surface water, run off and soil moisture can be expected as a result of substantial increases in evaporation.

Projected changes to Adelaide

In many ways the projected changes predicted for Adelaide are similar but more moderate than those that are projected for Arabunna Country.

Under moderate scientific models the number of days predicted to exceed 40°C is likely to double (from 2.3 to 4.8).

Rainfall is projected to decrease 4% by 2030. By 2070, based on average model outcomes, a decrease in rainfall of between 4% and 7% is projected.

Projected changes to Alice Springs

Annual average temperatures in Alice Springs are projected to increase by between 0.8 and 1.6°C by the year 2030.

The median of climate model predictions suggests that the number of days above 35°C will increase from 90 per year to 109 per year.

Scientists are less certain about the rate of temperature change in Alice Springs by 2070. Some suggest increases from 1.9 to 3.7°C, whilst others indicate a warming of 5.2°C.

Rainfall in Alice Springs by 2030 could decrease by 6%.

Projected changes to Darwin

By 2030, annual average temperatures in Darwin are projected to rise by 1.0°C, with an increase of up to 1.4°C possible.

Median climate model predictions for Darwin indicate the number of days where the maximum temperature exceeds 35°C could rise from the current rate of 18 to 44.

By 2070, Darwin could see temperature increases in the range of 1.7 to 3.2°C.

Although this increase in temperature is less than other areas where Arabunna people live, because Darwin is already a very hot place, the number of extreme days over 35°C could increase between 89 and 227 days depending on the level of carbon emissions humans continue to pollute the atmosphere with.

Median climate model predictions suggest that there will be no change in rainfall in Darwin by 2030. By 2070, the level of rainfall could decrease by 7% or increase by 6%.



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4.4 Identified risks relevant to climate change

This section presents the results of the risk perception and adaptation options we developed as part of the adaptation fieldwork. What is striking about our results is that notwithstanding the wide range of places that Arabana people live, there is huge consistency between their values and suggested adaptation responses. We asked people about their history and relationship with Arabana country and as Arabana people, their views and perceptions about climate change and what environmental changes they have observed. We then showed people the climate science video and asked them about what types and kinds of adaptation or response they could envisage.

We present the results of this work by way of a thematic values analysis of the issues of most importance. While we commissioned a peer review science report that summed up the main climate projections for the regions of interest to Arabana, we were also aware of the shortcomings of the vulnerability approach where it fails to incorporate other contexts and indeed the more intangible, yet still keenly felt impacts of climate change. After Wolf et al. (2012) we thus instituted a risk perception exercise which would help provide 'empirically grounded context of people's values' (Wolf et al. 2012, 15). We present these values as clusters identified by the major themes, with exemplary quotes. These quotes have been reviewed by Arabana and adjusted/corrected accordingly. In this way we deliberately present Arabana views via their own voices. We let them speak.

At the end of this section there is a visual presentation of photos of sites and areas that we were shown in the field that represented some of the changes that people talked to us about. The following chapter presents the adaptation options that Arabana then suggested as part of these discussions.

4.4.1 Summary of perceived climate impacts

Weather

Changes to the weather over a long period was discussed and raised by the Arabana – and in multiple contexts. The following section provides an overview of the key dimensions that were discussed. They provide, in the words of the Arabana, a wide spectrum of observation, especially from those people who have lived in many places over the time period. Reflections include observations not just for Arabana country but all the other places that Arabana people live. The changes to wind and its effects was raised not just in terms of levels of comfort but also in relation to the fact that some sites were perceived to have been 'blown away'. Arabana people often raised the differences in dust storms over time. Even people from Darwin remembered and discussed these storms. Most respondents in Darwin discussed the difference in their experience of cyclones. Most often reiterated was their view that cyclones are not as common, nor as drenching as they used to be, but most importantly that many cyclones seem to bypass Darwin now. Arabana people in Darwin talked about their observation of tides rising and associated flooding as a result of sea level rise. The lack of, variability and the need for rain were raised often. Whether or not this was a result of climate change was debated as many respondents took the view that the climate in Arabana country is always one of extremes anyway, but certainly, Arabana people were worried about what would happen in the future in terms of rainfall and how it would be affected by climate change. An interesting point made by many respondents, whether from Alice or Marree, was their memory of seeing ice and therefore the fact, from their perspective that this showed it was warmer now. Similarly, heat and cold and how people experienced were discussed. In some cases though people reflected that their ability to 'cope' with these extremes may be a function of their age or of modern technology, given many have air conditioners now.

Table 4.2: Weather

Issue	Dimension	Exemplary Quotes
Weather	Wind	<p>“Used to be cold like it is now, and used to get a lot of wind and stuff, now the wind doesn’t seem to be as strong, ground is all eroded, even camp at Curdimurka, plenty of sand, level, now more or less on a sand hill, high! Country sand hills all gone, sunk down earth or soil there before all blown away! Wind has had effect and it’s hotter now too in summer time, and winter time bloody cold. Hotter now, hotter for longer maybe, always hot but more days now that are hot” (Alice Springs respondent 1, 2012).</p>
	Dust	<p>“With the Arabana country, when we went there as kids, it seemed always to be dry and hot and not a lot rain but a lot of dust storms – oh those dust storms, once it rained - storm and rain at the same time, house was coated with this red mud” (Darwin respondent 2012).</p> <p>“We used to get dust storms in Alice Springs - sweep floor 6 times a day – don’t get dust storms like that in Alice so much” (Alice Springs respondent 2, 2012).</p> <p>“Big dust storms and droughts those days -such big red dust you couldn’t see anything wind just blew everything” (Marree respondent 3, 2012).</p>
	Erosion	<p>“When I went back for the determination, well! I couldn’t believe my eyes, been maybe 30 years since I been there, but in those days there were red sand hills, as high as the eye could see – no more now! Just little bumps, wind made it all gone, made me feel sad to see that” (Port Augusta Respondent 2, 2012).</p>
	Cyclones	<p>“A lot of them cyclones pass over now. Monica – you could hear the wind but we didn’t get that much from it – and not much rain from them either last one last year was hardly anything and yet usually with cyclones get at least 10 days rain” (Darwin respondent 7 2012).</p>
	Tide changes	<p>“Tides and everything changes, coming up higher all the time – washing the grass areas and have to put matting stuff up where we sit, it is changing, ocean levels are rising., in Indonesia places are sinking” (Darwin respondent 3 2012).</p>
	Ice	<p>“Weather- yes when we kids growing up we would go to school and winter time it was cold the grass would be frozen you know and under the shade of trees. Black frost then but not so much now” (Alice Springs respondent 4 2012).</p> <p>“Been getting colder and hotter here. First came in April we used to get frosts here, in the 60s and early 70s. Don’t get frosts at all now until maybe May if at all. It is warmer, used to get 6- 7 days of winter a year but now you get 4 – 5 months of it, that’s different” (Alice Springs respondent 1, 2012).</p> <p>“Oh yes climate changed for sure when I first got here as young fella, come back and there used to get ice on the trough – you don’t see that these days. Not just little bit used to be thick. Always been hot” (William Creek respondent 1, 2012).</p>

Issue	Dimension	Exemplary Quotes
Rain	History	“Dry season? We didn’t have very good wet this season, Years ago it rained for weeks and weeks - everything would go mouldy, For weeks- you don’t get it like that anymore” (Darwin respondent 4 2012).
	Quantity	“When our kids were small, would rain for weeks and would have to hang your clothes inside as it rained and rained and rained didn’t have fans in those days either” (Darwin respondent 7 2012).
	Timing	“Haven’t seen much winter rain, see it very seldom now, get summer rains now” (William Creek respondent 1, 2012).
Heat and Cold	Changing conditions	“But even up here, the weather, it’s like got hotter, we didn’t use to have air cons before, and some of those housing commission didn’t even have fans, just opened your louvers” (Darwin respondent 4 2012). “Heat – has gone hotter, I don’t think I could sit out without air conditioning now! Years before that when we had nothing how did we do it? Old tin shack we live in! Nothing. Didn’t matter to us then” (Marree respondent 2, 2012).
	Extremes	“It’s a country of extremes – really dry periods, really wet periods, seems like now when they happen, they are hotter and dryer and when rain comes much wetter” (Adelaide respondent 2, 2012). “It’s getting hotter I reckon. In winter time used to get ice on the wash dish, now you can have wash any time no ice or anything thats a lot of change” (Macumba respondent 2, 2012).
	Confusion and predictability	“Weather unpredictable, it’s getting hotter whereas one time you knew the seasons, not any more it’s all mixed up getting times when you should get rain and it doesn’t then get too much rain, then sun not shining, I am sure animals are confused!” (Oodnadatta respondent 1, 2012).

Climate change

Unsurprisingly, there was confusion about climate change in and of itself. This was a challenge for the research but also will be an issue in adaptation planning. The danger is that people simply agree to initiatives because they trust those leading it but don't understand it. Despite many people not exactly understanding the nature of climate change or adaptation, most people interviewed felt or perceived it was a risk they needed to address, whether as individuals or as Arabana.

Table 4.3: Climate change

Issue	Dimension	Expression
Understanding climate change	Confusion	"I don't really understand this climate change, understanding the science is really hard. People like Aaron seem to have good grip on it, and helps telling us but needs to be more" (Alice Springs Respondent 1, 2012).
	Communicating climate change	"Before I didn't know what climate change is all about - but just listening to Aaron and John I am starting to understand what it is - we have seen the changes but we didn't know what it was" (William Creek respondent 2, 2012).
	Significance	"What is this climate change about anyway? I am trying to get my head around what it means" (Marree respondent 1, 2012).
Risk of climate change	Lack of knowledge	"I do think climate change is a risk, I guess with me I don't know much about that kind of stuff " (Alice Springs respondent 3 2012).
	Cycles	"I think climate change has a fair bit to do with it and I think it is causing these extremes, I know it's always up and down but the last drought was really - made everything so dead, and then the water in the lake after it had filled the first time, then filled again following year and now still got water in it although drying out now. Quite unique – lot of volume of water as well. Rising higher than before" (Adelaide respondent 2, 2012). "With climate change - the whole cycle of bush food as in kangaroos, you know, ...we can't get enough of that bush food and I know roos going into national park getting sanctuary – our country was good place years ago, lots of roos, turkeys, emus, and lots of goannas, lots of printi. Where now it's like hard to find - you know there is supposed to be fruit ready for this time of year but they not ripe at right time or even there to fruit. Climate change is affecting growing of things and also affecting trees" (Oodnadatta respondent 2, 2012).

Summary of values

History

Arabana people discussed their personal history and the relationship they had with other Arabana and within Arabana country. It was clear that working on the railways, and on the cattle stations such as Anna Creek, Peake and Macumba were cherished times for the Arabana. Many people also talked about how much they loved growing up in and around Finnis Springs.

Table 4.4: History

Values	Expression	Exemplary Quotes
History	Connection to past	"I think that railway line made a big difference to the Arabana people, in the old days, out at Finnis Springs Arabana people could just take the train to Curdimurka there, Alice Springs, had lots of friends over" (Darwin respondent 3 2012).
	The Ghan Railway	"Got job on railways followed jobs big drought Finnis moved here. This town thriving town then old Ghan one way, new line in - Playford that one, came with big mob then and opened the railway when they built that platform there" (Adelaide respondent 2, 2012).
	Mobility	"We moved to Alice Spring with Dads job as a fettler working on the railway lines, then moved to Marree. We loved it, all the kids loved that place, it was like coming home. We went to school there and Dad was pretty strict with us girls, you know that stolen generation thing that was going on, lot of children" (Darwin respondent 2012).
	Happiness	"We grew up here no power - had hurricane lamps go - but we were happy, never starved, went to school, was taught everything, grandmother used to take us hunting on weekends and that - I miss all that" (Marree respondent 1, 2012).
	Work	"Work came before education those days, like from where I was, to where I am now – struggled- between the station and railways here, then went on the camps like Alberrie Creek, Curdimurka, then gangers certificate and went to William creek then...they still can't take the bushman out of me!" (Marree respondent 3, 2012).

Identity and Historical impacts

Identity as an Arabana person was manifest when people related their ability to connect with climate questions and with their capacity to offer suggestions, to their identity. Some people expressed a conflicted sense of loyalty between their family and their cultural identity as Arabana, and some expressed a sense of sadness that knowledge was being lost and they wished they could learn more or have more time to be part of Arabana business.

Table 4.5: Identity and Historical impacts

Values	Expression	Exemplary Quotes
Identity	Family	“Once we all came to Darwin – hard, to find family but we still always knew we were Arabana. We travelled a lot and came in contact with other Arabana” (Darwin respondent 5 2012).
	Heritage	“I am proud of my Arabana heritage and my culture I feel disappointed with myself that I don’t visit country but it certainly doesn’t mean that I don’t see myself removed from claiming my own Arabana cultural heritage. I will get there one day. As we grow older opportunities to do that limited but we will work out a way in the next couple of years to do that” (Darwin respondent 7, 2012).
	Colour	“I guess I am quite light after my dad after my dad so a lot of people don’t even know, a lot of people I definitely don’t hide from it but I don’t go round advertising my heritage, I definitely am proud of it, I guess I see both sides as a lot just don’t realise that I am” (Alice Springs Respondent 3 2012).
	Change	“Family, and knowing that we are from there, mum always talks about stories, hearing those stories is since having that big family, but I think that is also going to be lost families getting smaller these days, all separated, we got our own little families not like it was when I grew up – all families- having dinner- always HUGE table full cos cousins would rock up, now we separated, concentrating on our own lives and individual families. Know it’s there it’s not that close to us” (Alice Springs Respondent 3 2012). “Otherwise - another big change, Had to leave the traditional thing and go other way and all men started working for railways. Started school here. Used to talk Arabana eh? The teacher flogged us and told us not to talk Arabana! That how we were brought up here. They stopped us from talking our language sort of stuffed a lot of things up on our knowledge and culture. He had to give us the cane to force it - is not us! We didn’t know! We didn’t know! That was a big change. We never know that and they didn’t understand us so we had to live the white fellas way. We started school we lost all that ” (Port Augusta respondent 1, 2012).
	Elders	“My grandfather taught me and I stayed with him. Learnt a lot from him showing us the country, naming, all Arabana country – also Uncle Norm Woods, well known and I learnt a lot from those two old people. Even now I always come back, first chance I get to come back here. Country goes right up to Oodnadatta, down to Marree across Lake Eyre side and nearly over to Roxby” (William Creek respondent 2, 2012).

Place

One of the key things we sought information on was what changes Arabana people have observed over time. This section presents a selection of overall comments that show the wide scope of issues that were covered in discussions. This includes discussion around flora, fauna, cultural sites, recreational activities and the weather. The primary message is that yes, change has happened and that the capacity for Arabana to subsist as in earlier times is now perceived to be considerably reduced.

Table 4.6: Place

Value	Expression	Exemplary Quotes
Place	Connection to the past	<p>“When I was a kid, we used to walk for miles and miles with the old women camping out – never used any European stuff, whatever we gathered and killed- used to get rations but that used to be like a bonus or something, people used to like the tea and stuff, love tea, other than that they wouldn’t worry about stuff- even with flour used to get seeds and grind them and make flour in the ashes and yes there used to be trees and bushes in abundance when we get this stuff. If we went out now we’d die. We didn’t use any European stuff – didn’t need to. Food was there all the time. Can’t do that now”(Alice Springs respondent 1, 2012).</p>
	Change	<p>“The weather is changing whole Australia over, like in Adelaide, been there in May and June hardly any rain – and it’s freezing with the rain, it’s everywhere, Sydney having wetter weather, Sydney having cyclone weather, up here our cyclones are going past us, we don’t mind but they bypassing us!” (Darwin respondent 3 2012).</p> <p>“All the time I visit country - there’s been a big change. Everything has changed, Completely changed. In my days when I was there, when I was a child, well, there seemed to be lots of plants and animals around – now they are dying out and there hardly any animals left and there are other animals there now like cats and stuff. They moved in. That’s a big change - when I lived in Curdimurka, it was a big sandy creek with gum trees, but there no trees or sand anymore. Even Curdimurka itself we used to gather lots of yams and stuff nothing there now salt and sand killed it all” (Alice Springs respondent 1, 2102).</p>
	Change subsistence	<p>“Change is happening alright. We don’t know about that much but when you look over time we will know a bit more. That was our food source before - now we don’t look for it, but if we had to look for it, would take a lot” (Adelaide respondent 1, 2012).</p> <p>“Rats mice lizards – gotten more of them than what there used to be emus really thicker than kangaroos in this area, rabbit’s died down but now come back. Wind - where country already flogged erosion is hard...one thing I noticed – when it rains, it’s heavy rain, not just steady stuff- does cause erosion, but dust storms used to be much bigger in the old days. Haven’t seen dust storm like that for 30 years so that way I reckon it’s got better...still get dust storm but not as regular and not as thick” (Macumba respondent 1, 2012).</p>

Value	Expression	Exemplary Quotes
	Loss	<p>“Well I went lately back to Finniss for determination. Went back there and it’s like there’s nothing there, feed, trees all dying , seems to be in one area, pretty sad really, something to do with getting water out of the Lake Eyre, draining that side of the country” (Macumba respondent 2, 2012).</p> <p>“The old people say that if the land is sad, the people are sad. If you look at it now it’s not like I it was when they were growing up, so they are sad” (Oodnadatta respondent 1, 2012).</p> <p>“Changes are mainly around where we went hunting and camping around Lake Eyre – now it’s all dead, even the trees and bushes even around Finniss, all dead, and here at four mile sand hills, much less, Another one the Bubbler – water today hardly any water there. Used to be birdlife, ducks and swans, it sad to see that. Belly button plants don’t see them so much on sand hills – parachelia too – another plant cattle used to thrive on, live on it, so could live on sand hills for weeks on end - couldn’t find it now, maybe cos of climate change, maybe cos of lack of rain” (William Creek respondent 2, 2012).</p>

Water

The importance of water was unanimously reiterated time and again. Water emerged as the most consistent issue as a concern for all Arabana when considering how to manage environmental change and in terms of thinking about how to go back to country and how to adapt to those changes. Water availability and access were raised as was the link between cultural sites/stories and the viability of mound springs. The relationship between mining and water also came up often, with Arabana people clearly worried that the water allocation to the mining companies operating in the region is affecting their own supplies. This is also an issue of particular concern to scientists and policy makers.. Arabana country in being within the Lake Eyre Basin, also falls under the institutional gaze of the Lake Eyre Management Forum, and its related committees including the Lake Eyre Basin Scientific Advisory Committee. These bodies have commissioned a number of reports and environmental assessments during their tenure, including at time of writing undertaking climate change work. Of specific note is the role that the mound springs play not only in maintaining and having significance for the sustainability of ecological and evolutionary refugia (Davis et al 2013) and in relation to wetland flow (White and Lewis 2011), For example, Davis et al. (2013, 8) note that “The springs support endemic and relict species, dominated by hydrobiid molluscs and crustaceans (including isopods, amphipods and ostracods), with limited mobility and dispersal potential.” These spring systems also play an important role regarding water availability and run off. As our science report highlighted,, the inter-relationship between climate impacts, natural hydrological regimes and other uses such as mining water extraction, will have implications in the long term for water availability and timing of rain events.

Table 4.7: Water

Value	Expression	Exemplary Quote
Water	Access	<p>“I have only been to the land once - ten years ago – I don’t really know much about the land, Alice Springs two things I thought of – the water - on the telegraph station – remember water hole there – right at tip of it, the water hole where it started - now you go there is barely any water there at all – not swimming water anyways. The other thing I wonder about – we don’t have water restrictions in – no restrictions at all – other cities you see that – we are in the middle of the desert here – amazes me – how long the water will last – am sure they would have done research to allow this to happen, good adaption for future - water restrictions – what of in future for my kids it will be tight restrictions, no middle bit” (Alice Springs respondent 3, 2012).</p> <p>“Costs fuel too to go out and get a roo – can’t afford it - the rain cycle not happening any more. We haven’t had rain for 7-8 months supposed to have summer rain and we didn’t have it. A constant worry - where is it leading into? Where is it taking us? How will people survive without water when the tanks run out? Can’t afford to buy in water here” (Oodnadatta respondent 2, 2012).</p>
	Mining	<p>“Probably a lot more to do with the mining – the water they taking out - I have seen a little bit and hearing from Mum how much water was in Coward Springs in her day compared to what it is now”(Alice Springs respondent 3 2012).</p> <p>“Over the hill there used to be big pond, dam thing there where we went swimming but no more now. Terrible, really sad to go out there now...terms of water – it’s not only the bubbler – I haven’t been to bubbler for a while – but other one at Finniss there – it’s very dry but used to run - I think they capped it - Roxby or whatever Western Mining, no more now” (Marree respondent 1, 2012).</p>
	Tradition and history	<p>“We could find water in soakages in old days – that’s what we grew up on - nowadays hard to find water even in those soakages. That kept us alive then! What a marvellous job the old people done! We done hard yakka like the old people then, we started off with nothing. Everything done special way. Old people prepared for everything had to work in with the land, the weather, the climate and we had watering points, bores, water holes, the rain was far apart, so we’d go from spring to spring - happen no more, water going...”(Marree respondent 1, 2012).</p> <p>“We not getting the rain we did before. Lots of places grandfather could dig for soaks, could get them nearly anywhere. I think if we did that now wouldn’t find it down there, quite easy them days very lack of water, don’t get water now” (William Creek respondent 2, 2012).</p>

Value	Expression	Exemplary Quote
	Loss	<p>“Bubbler – we used to swim in that when we was a kid, it held you up, - we'd jump in there – you'd go just to watch it big bubbles whole of the water- used to bubble all day long....don't know what causes that but it is near Roxby Downs and they take a lot of water...”(Macumba respondent 1, 2012).</p> <p>“In the old days you could throw in a railway sleeper and it would throw it back at you! That's how high and strong that pressure was in the Bubbler, not like now” (William Creek Respondent 2, 2012).</p>
	Effect on land	<p>“In the last 25 years, like mobs of water are drying up earlier and quicker and vegetation around it is starting to die off- with the water dries quicker than it used to. Rainfall changed – we used to get mobs of good rains here – last good rain last year February then little rains after that, used to get a lot of rain around here” (Macumba Respondent 2, 2012).</p> <p>“We worry as we got mound springs up north and water levels dropping just like the bubbler that's a big worry and cos of that our water quality is not good either. We used to drink that water but no more. If you go to Dalhousie can't use that either. Bit further out it's pure spring water. You can drink it it's just beautiful. Water is a big thing in this arid area” (Oodnadatta respondent 1, 2012).</p>

Country

Arabana also identified a number of changes to the flora and fauna. Specifically, they talked about how many trees were dying, how the landscape had changed and in some cases where groups of trees represented dreaming stories or sites, how they were being affected by climate change. Most people talked about the effect these changes are having on their access to bush tucker and also how this in turn affects health. There have been many observed changes to the fauna as well. Most importantly perhaps is the change Arabana have witnessed in relation to the loss of sightings of the reptiles they used to catch and see, especially the Perenti. This animal is a totem species for the Arabana. Again the diminished capacity to access and harvest bush tucker was discussed.

Table 4.8: Country

Value	Expression	Exemplary Quote/s
Country	Loss of flora	<p>“Trees and stuff - they talking in media about mulgas and stuff - mulgas everywhere, to the Arabana it is good tree for food, get the utensils of that to make the boomerang - cooking stuff whatever you know, the mulgas there – they used to be really tall and now they are stunted and everywhere they used to be - hardly see any mulgas anymore” (Alice Springs respondent 1, 2012).</p> <p>“When we used to go to creek and get spring onions out, and used to eat all those berries, the wild tomato – you see them sometime now but used to be thick eh, and those poppas we used to step on them eh. No more. And the trees are not really shady now eh, they are starting to die off, mulla – mulgas going, used to be thick but no these here now you can look straight through them” (Marree respondent 2, 2012).</p>
	Subsistence	<p>“Plants - used to go out hunting you know - those mulga trees - have three different types of fruit. Little grub inside - really juicy, and then one like peas but you don't see them anymore, Grannie used to take us out to the hills, now there is nothing now, trees are gone, and whats there are dying anyway. Not news ones coming up nothing” (Marree respondent 1, 2012).</p> <p>“That wild onion. Dig that one out. Little things – only small but you peel it and it has a white fruit and you can eat it, raw or cooked. Cook it in the ashes - oh beautiful! Now you can't fill a match box up with them - used to fill a pillow slip!” (Port Augusta respondent 1, 2012).</p>
	Loss	<p>“Bush flowers – it's make us sad, things are not the same, we used to get out and we used to get so many flowers, so many kinds, now you just get a few and there not whole areas in flower, used to pick whole bunches!” (Oodnadatta respondent 1, 2012).</p>
	Change in fauna	<p>“Lizards we had, they big, used to be lots and in great numbers, big goannas and stuff like that hardly any now except for little ones, beaded dragons hardly any round now. See them everywhere, the shingleback, the sleepy lizard - hardly any more, in olden days they were in great numbers” (Alice Springs respondent 1, 2012).</p>
	Connection to dreamtime	<p>“In Marree, Mum used to go hunting for perenti. Our dreaming. One of the things in our stories. Used to get them and eat them but not sure you get them so much today” (Darwin respondent 1, 2012).</p> <p>“Used to be could get 17 lizards in just 20 k drive, not now - no goannas, or lizards - we got one on the road recently and it was fat, gee it was beautiful, and a couple of rabbit's. perenti is my father's dreaming, goanna is the smaller one, there is the frill necked ones and galta...used to eat wild pigeons too, the boys would get them with shanghai and galahs, there was no shop them days...” (Marree respondent 2, 2012).</p>

Livelihoods

A key theme was the importance of ensuring opportunities for Arabana to be employed. Many were of the view that without employment people could not or would not return to country or implement adaptation. In places like Oodnadatta this was reiterated as a major concern in relation to making sure Arabana youth did not get bored.

Table 4.9: Livelihoods

Value	Expression	Exemplary quotes
Livelihoods	Independence	“How are you going to accommodate projects on our country that can provide economic independence on our own two feet – don’t always have to go cap in hand to government for assistance” (Darwin respondent 7, 2012).
	Vulnerability	“I think Arabana are vulnerable to climate change – when you go out there - there is nothing there, if there was something there for people to live in Marree, Finnis Springs but there is nothing there - no working in the area, there is work in the mines if you want that sort of thing eh? - but there are other issues - a lot of issues – there’s work, there’s schooling for your kids, water is the biggest thing – having water, don’t know what is happening to those springs, persons like me may want to go sit down there, can’t do that unless you are on a pension got a decent car, yeah and our traditional people, that’s not there, there is no water, old people too hard, same as those two houses built at Dalhousie – employment too - why would you want to go live way out there unless you are working as a ranger unless there is work there? Got to be some kind of work you know, if there is work there, you don’t mind going living there. It does matter - work creates need for schools, health services....”(Alice Springs respondent 3, 2012).
	Connection to country	“In terms of overarching priorities – we must be able to organise means of generate income on country and water – keep water in places where we want to generate an income...if food and water goes back to land, so will Arabana especially if you can find way to stimulate an income” (Adelaide respondent 2, 2012).
	Youth	“Give them [youth] the possibility of earning income out here you will see a lot of them come back. Only too happy to be out there they love it, not so happy to go back to city life. So if there is an opportunity to come out here earn money and support their future family, they will come, they will come back” (Port Augusta respondent 2, 2012).

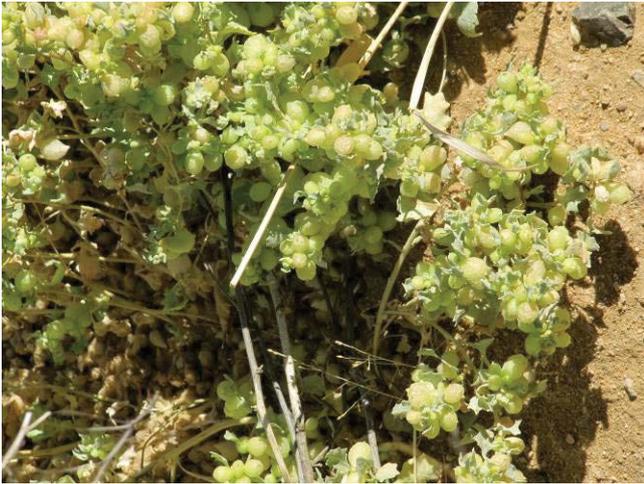
Culture

Cultural issues were very important to Arabana and raised in the context of ensuring effective adaptation. It was strongly reiterated that without cultural identity and revitalisation opportunities that adaptation would be constrained. In the context of this discussion about culture, the importance of engaging youth in the process of dealing with the challenges and issues Arabana face was raised often. A conviction that if some Arabana started to do some things and invest in opportunities came up often, and the following quotes typify this belief. This process has already started with at least one Arabana person moving back with her family and another, a key elder, has started the process of moving to Alberrie. Moves like this require great commitment, and in the former case, meant leaving a safe job in Port Augusta for the less certain life in the much more remote town of Marree.

Table 4.10: Culture

Value	Expression	Exemplary Quotes
Culture	Language	“Learned language in Finniss never talked anything else but Arabana when I went to school I couldn’t talk English. Other kids laugh at me, including other Arabana! Some others speak language, me and Millie, maybe Mervyn Dodd, many understand like Esther and Maisie and others can talk a bit, there are alot understand it well but cant speak it. Need to know language - easy to lose it see, I was lucky I was born into it. Talked nothing else when I was little see” (Alice Springs respondent 1, 2012).
	Loss	“I think it’s the loss of culture and traditions, the language, I don’t have any language I tried to learn It and it is hard – a lot of this will be lost and that is a real shame” (Alice Springs respondent 3, 2012).
	Impact of mining	“The biggest problem for Arabana is the mining” (William Creek respondent 1, 2012). “I think I am pretty certain the mining has affected our water – it was fine before, springs running and flowing all over the place, nowadays there is nothing and the pressure has gone as well – bubble another one we used to in the past we used to bubble so huge, the noise you could hear it from coward springs, where is that water?” (William Creek respondent 2, 2012).
	Role of young people	“Young people – definitely have role to play, the thing is you are either in it or you’re not. There are quite a few that are in it and do respect it and do care and do things. Others that abuse it – don’t care - simple things like recycling – Alice bit more work, don’t have recycle bins most cities, even for two bins we don’t do this – if we want to have to drive to plant to recycle – so that’s north of town – people don’t do it – now opening up a plant so at least get 10 – 15 back so that’s better one good thing – daughter at pre-school – class did thing on recycling so now at home she is ‘we got to recycle’ – so it is about teaching kids to do that stuff – in my time growing up not their place to do it. Having the facilities – how can you teach us without having the facilities If you don’t have tools to adapt how can you do that?” (Alice Springs respondent 3, 2012). “We need to try and get young people interested but they got to have something to do. Maybe tourism or something, need to try. There are some young Arabana in Alice – maybe 20 or more not a lot this way...we need to try” (Alice Springs respondent 1, 2012).

Value	Expression	Exemplary Quotes
	Barriers to cultural vitalisation	<p>“You up against a lot of things with young people - they got TV, football, discos, games, hard to drag them away but when you get them up there they love it - the ones that are interested they really good. They love going out once they here. It's getting them here. We should get busload of youth up here every fortnight – not years apart, but regular, then they know, finish jobs off, see the country. We got to be there to look after country and then hand over to the young people. Otherwise it will fall away. As soon as it starts they will click then” (Port Augusta Respondent 1, 2012).</p> <p>“No jobs here, young people move but come back but sad story is they more not in our way but cos we got to live two cultures they think drugs and alcohol, videos, flash clothes, facebook that's the go – ebay. You know where someone would fill up a Toyota and say 'come on jump in', would take their own tucker and go out do things together, don't see a lot of it these days though some family groups try to do it. Anyway, it's too expensive to put fuel in the tank and take family out to go hunting, gathering and camp out” (Oodhadatta respondent 20012).</p>
	Role models	<p>“If we start something off here, even if for short time for holiday come back it will happen – cant take Arabana back to nothing” (Marree respondent 1, 2012).</p> <p>“Well I just thinking about moving back - once someone starts you will have followers, need to get young ones out, get them out on country otherwise they not going to know and they going to lose it and they the generation – the future you know. They live in town now so doesn't mean much to them but get them out, let's get them on country then they will see” (Marree respondent 2, 2012).</p>



Plants, such as these “poppers” are becoming scarce and flower for much shorter periods of time.



For generations, Arabana people relied upon hidden wells for their water but now they are drying or being polluted by salt intrusion.



Sacred sites, such as this 6000 year old (est) male smoking ceremony place are in danger of being washed away as flood levels from nearby creeks get closer each year.



Places where Arabana people camped just 20 years ago are degrading and in some places the vegetation is dying out completely.



Dreamtime sites, including the Bubbler, are changing rapidly threatening the whole creation story for Arabana people.

Figure 4.2: Examples of change

5. BUILDING ADAPTATION

Arabana people across Australia suggested a range of adaptation options. These include individual to collective actions, and urban and on country adaptations. They are summarised below. A very important point is that for Arabana people, adaptation is not just about adapting to climate or environmental change but about ensuring culture is maintained and that Arabana identity is reinforced and built up over time as well. Thus adapting to change also involves cultural maintenance as a form of adaptation. It also goes beyond the individual to address overall societal practice, a thought process consistent with Shove et al's (2012) argument, yet, unsurprising in this context, given the holistic conceptualisation of life that so often characterises Aboriginal approaches to problem solving.

In terms of importance, the establishment of cultural centres, land management centres and ranger programs are prioritised. Scoping and development of economic opportunities and the implementation of revegetation and re-stocking programs were suggested most often. Again, we choose to present this information in the words and voices of the Arabana, a technique we deliberately employ to make the research we did and the people involved more vivid to the reader. An academic analysis follows in the discussion.

5.1 Need for adaptation

All Arabana agreed with the need for adaptation but interpreted it in a context wider than climate change pointing out that Arabana had adapted to a lot of things over centuries:-

“You definitely need adaptation for the country. To keep it to be the beautiful place that it is. The place is changing so need to keep up with the change. That place is my heritage is my family – I want to take my kids out one day to show it to them. It does get lost in towns very easily – for example, I don't even look aboriginal, who is there to teach me. Show me. Much harder to do in towns and cities than communities and lands” (Alice Springs respondent 3 2012).

“Climate change is an issue - but you can adapt to anything - you got to do it with what you got” (Adelaide respondent 1, 2012).

“Water is the crucial thing. Finding ways of keeping water in country – you see mound springs drying up it is really sad. Huge vulnerability. Need food for plants, shelter, not just about finessing modern options it's about survival out here. Not just putting in air conditioning there's a lot more to it than putting in an air con and getting petrol to fuel it” (Adelaide respondent 2, 2012).

“I don't know how we going to do it – let's do something about Roxby Downs first, they draining water out of the Lake Eyre here – had big rains – all that water runs in and didn't even fill up- it wasn't full” (Macumba respondent 2, 2012).

“Some of us have adapted. Older ones know how to adapt and they teach their children and they teach their children. Not sure about other ones that live in the town and don't get/come out here. Well the younger people not sure how they will adapt. When there is water there is wildlife, there is bush tucker people can move around, if there is no water we can't adapt” (William Creek respondent 2, 2012).

5.2 General vision

A number of broad visions were expressed in terms of what adaptation to change might look like. These express in practice some interesting synergies between how Arabana people conceptualised their past experience in ideas about the present and future.

“Buildings – make shelters for summer time so you can sleep at night time, build to what you need for the conditions. Get the water going. Storage of good water is the thing – old people made brush sheds, just living in air conditioner- this was wind and water proof. Could do that. Was important to have the door right way not into the sun or the north wind. Rangers will be happening here. Say you get Finnis there and one area where housing, and area where the spring can protect springs – all over, all the springs, make sure they do the right thinking, don’t let stick in, and then bottom end have cattle. Away from the springs and inside them springs can plant new trees too” (Adelaide respondent 1 2012).

“We can try plant trees, everyone do their bit, try to make change in a small community we need to try and work together but not always easy – have conflicting views and personality clashes” (Oodnadatta respondent 1, 2012).

5.3 Adaptation options

Cultural revitalisation/centres

A strong theme in all interviews was the importance of culture and hence the role of cultural revitalisation as being a fundamental principle that would underpin any adaptation strategy. The idea of a cultural centre also provides an option for Arabana, wherever they are living, to become re-connected to their culture, family and country: -

“I am a strong believer - we talk about cultural survival – I’d like to see Arabana include in their future plans a cultural revival plan. Module or whatever to get that language and stores of country and histories happening” (Darwin respondent 7, 2012).

“We could set up cultural centres. Where the people can go and meet. People only got their own houses where they can meet but if you got an Arabana centre, all your history there, your family names things you could go there and see – a video about climate change like that – your kids and grandchildren can see, get continuity - keep that information coming through to the families. Have that country look/meet every two years. Centres will help people where they live and not make them stress out about having to go to country as they can still learn about country – have it for the future – might get our kids and grandchildren know where they come from” (Alice Springs respondent 4 201

“Only culture I know that worked pretty good was living in Finnis, all of us together and we learn every day - you lose it once you leave unless parents make effort and tell you show these things otherwise you can lose it your language and your culture got to keep learning keep at on it I think- yeah” (William Creek respondent, 2, 2012).

Building communications to enable cultural revitalisation in this context was another aspiration as this quote shows: -

“It keeps that knowing where you come from right through from older generations and keeps it alive. It’s just about - any country, any community you got to be aware of how you treat the environment, you got to be aware of those things, coming here today not really aware of climate change, what it’s all about, it’s knowing that’s – having maybe an internet site you can access going forward with this technology – maybe you don’t need centres if you had good web site you could go to – tying in with what you guys are doing, what is happening in country and a cultural history of the area on that web site that’s a way of going forward – kids with computers these days – my daughter is on facebook all the time now” (Alice Springs respondent 4, 2012).

Getting back to country

Getting back to country was raised by all respondents. Some people talked about living there, others about creating opportunities to visit but all perceived access to and visiting and seeing country as crucial:-

“Need to be on country to actually monitor changes and other things” (Darwin respondent 1 2012).

“Need to strengthen people to withstand climate change and get them to look after that country respect that land. Lots of people would jump on the opportunity to go back to country” (Darwin respondent 7 2012).

“Would be good to have annual reunion or every two years to see everyone then you start taking your kids and it goes on - it’s the only way to go, keep in touch with the land, only way we can do it. That way also you notice how climate change affects your country” (Alice Springs respondent 3, 2012).

“Living on country is what some people want to do, some do live here but rest have moved away for work, but their heart is here, would live here all year round if they had income - income is a definite thing. Proper housing, proper cooling systems, have to have proper access to water and to make the area sustainable again – say you get flooded in you need to live off country, need to be able to hunt” (Adelaide respondent 2, 2012).

“I reckon coming back to country is an option – even my sister thinking about it, would be good to see them back there, back on Finniss, want someone there sit around, put up your toilet facility and all that, liven it up a little bit – as it is now it’s just sad” (Macumba respondent 2, 2012).

Establish ranger land management centres

The need to establish a permanent management base for Arabana was considered a form of adaptation that could be realised fairly soon. The importance of education in this context was also reiterated:-

“Have some rangers. Look after it as a cultural place properly” (Darwin respondent 7 2012).

“We need to set up land management, in Marree, maybe Finniss...” (Marree respondent 2, 2012).

One priority is to set up outstations, rangers, monitoring programs for our country (Port Augusta respondent 2, 2012).

“Get young kids to go out on camps to country, get young kids taken out by old folks” (Darwin respondent 7 2012).

Build a local economy

The lack of sustainable livelihoods was identified as major risk. Therefore, building livelihoods is seen as a key dimension of future adaptation planning –

“I think we need to get something like tourism back on country there now we have native title. There has to be something back there whether in Marree or Finnis Springs something so that people can visit it a cultural centre there, something big for the tourists to see, if you got tourists visiting it gets all over the world. All our history – those travelling the Oodnadatta track – grey nomads to Darwin – last weekend it’s just not funny the amount of people going through, but not stopping – if there was something there for them to see get knowledge, take a tour think that would be good” (Alice Springs respondent 4, 2012).

“Having our own board to develop economic development projects that provide employment and opportunities for our people” (Darwin respondent 3, 2012).

Fire burning

Respondents in Darwin suggested that fire burning, such as is undertaken across the Territory, was a potential adaptation tool for managing vegetation and land in Arabana country:-

“Aboriginal people do burning – can do adaptation like that – my husband used to be on the land – he used to burn every March but now you need permit’s all the time to do it. They let grass grow to big then it gets away. Do it for a purpose. Even now, you can see in places green cos of it” (Darwin respondent 3 2012).

Nurseries/Revegetation

Arabana people consistently raised various forms of revegetation, whether for regeneration, bush tucker, shade and cultural activity:-

“I wonder if they could do that on our country, animals going to disappear, that’s all our stories you know it will affect our country, even thought – let’s have a nursery to regenerate the plants” (Darwin respondent 6, 2012).

“Even revegetating then like I was saying, sort the water for that – no water no plants but if you had like a 4wd and one of them tanks on a trailer thing – if you planted – need someone out there all the time to water. Get trucks to go out there, make deal with council and get them go out there” (Darwin respondent 7, 2012).

“Peoples got to start planting trees – you can see we planted lots of trees and we trying to get shade and you know wind break and all those things and to help the climate” (Oodnadatta respondent, 1, 2012).

Re-stocking fauna and native wildlife

Many Arabana people, particularly those who had experience in the pastoral industry noted that re-stocking flora and fauna would be one option for adaptation:

“There used to be lots of stumpies there, and cadnis – frilled neck, used to be lots but don’t see them anymore- this would be good program to restock those” (Darwin respondent 7 2012).

“We have a little plan at Finnis to grow some trees, bush tucker trees, we had fruit trees and all out there, chillies and all that can do that and revegetate” (Marree respondent 2, 2012).

“Bring the land back, bring it back to life! Hopefully then will help with climate change, with everything” (Port Augusta respondent 1, 2012).

Dealing with heat

When discussing specific impacts, such as the predicted rise in temperature, Arabana people considered the importance of trees: -

“Create shade via vegetation big shady trees – like councils here plant native trees don’t need much water there is those desert rose don’t need much water- get mahoganies down that way – and have big mob of shade – would they grow out there? Have to be fast growing. Get advice on what will grow out there. What about those trees that grow along the river. Tree that will get them something too. Planting food trees as well. There is a lot of original trees there, like big yams, the little banana ones, Arabana bush banana, the yalkas, another little tree, that little passionfruit one” (Darwin respondent 7 2012).

“Make the trees stay alive. Getting shade. Suppose we could plant more, our bush trees, muntharra, wattle yellow or the mulga. They grow well. Grow big and high as a house” (Marree respondent 3, 2102).

Politics and Planning for country

Many discussions were overlain with a reflection on the importance and role of politics, and Native Title as part of future adaptation on the basis it would create access to funds and resources that could be used to implement programs for responding to change. Many Arabana people raised the determination and in one case, a respondent discussed the possibility of Arabana people entering politics: -

“We need a better form of title – shouldn’t be the be all and end all, this is just our foot on the door” (Darwin respondent 7 2012).

“Having a good Indigenous person representing Indigenous people in parliament would be handy that can influence amendments to acts and legislation” (Darwin respondent 7 2012).

“If people are there on Finnis River station – then – get back to Country. Needs to be some plans in future for people that wishing to live on country that can be passed on through the board to government - some sort of brain storming workshop re things that people think should be for the future and set some goals, aims and objectives and loose time frames, if one of the demands is to live on country – demand government for more infrastructure in Marree or permanent residential living area on Finnis. Can’t have it both ways, we are tax payers, members of the community, entitled to accommodation, to call on you for extra assistance” (Darwin respondent 7 2012).

5.4 The Arabana climate change adaptation strategy

Outside of these specific adaptation options that Arabana discussed throughout our fieldwork, in November 2012, we coordinated a major climate change adaptation workshop, which was held in Port Augusta, South Australia. We employed a facilitator

for two days and conducted the workshop in two parts. On the first day we invited and flew in Arabana people from all across Australia to workshop the results to date and then tried to achieve a consensus about what priorities for adaptation should be pursued. In the morning and in two teams, we presented the results of the social sustainability and the risk/adaptation work undertaken so far. This was a good way of ensuring validity and checking the veracity of our results while ensuring they were disseminated to Arabana from all places. After morning tea, the rest of the day was spent on discussing priorities for and ideas about climate change adaptation. We held a community BBQ on the first day and thus also brought in many young people, who stayed for the rest of the workshop after lunch.

On the second day, the results of this workshop were presented to the Arabana Board of Directors, most of whom had not attended the previous day. The Board then discussed and endorsed the adaptation priorities suggested by the group the day prior, and this became the core of the climate change adaptation strategy. We then built a document called “The Climate Change Adaptation Strategy” which was presented to the Arabana Board of Directors on Dec 23rd 2012 (full text of which can be found in Appendix 2).



Figure 5.1: Arabana climate change adaptation workshop

The adaptation strategy was endorsed by formal motion and now constitutes the Arabana response to climate change, signalling their future direction in implementation of climate change adaptation. At time of writing, Arabana are working on a media launch of the strategy. This launch will be driven by and owned by the Arabana, and shows that the one of the aims of the project – to build a community based product and understanding of climate change adaptation is met.

Of interest is the fact that when we mapped the values against the adaptation options they correlated, and ended up as priorities in the adaptation strategy as shown in Table 5.1 below. This suggests that while identifying impacts is an important dimension of obtaining the baselines needed for developing adaptation, it is in fact the values underpinning responses (perceived or otherwise) that drive and will hinder or help adaptation now and into the future.

Table 5.1: Values/adaptation map.

Value	Adaptation Options suggested
History	Cultural keeping Centres and enhanced use of ICT Getting youth involved
Place	Going back to country Re-stocking native vegetation and wildlife
Water	Access, developing partnerships with government, mining
Livelihoods	Pastoralism on Finniss, Cultural Tourism, Rangers
Culture	Cultural revitalization Centres
Country	Setting up ranger stations Revegetation programs

5.5 Summary of risk perception/adaptation research

- Given the relative certainty of the science predictions over the next twenty years, the multiplicity of other competing pressures on resources via mining and pastoralism, and the fact that employment, housing and other opportunities are scarce in the region of Arabana Country *per se* we conclude that it is highly vulnerable to the impacts of climate change.
- This presents a priority for adaptation planning for **country and places** rather than for Arabana **people** in places where they live.
- Arabana people do identify as a people despite being dispersed across Australia.
- Arabana people still have deep connection to country.
- Arabana people have observed many changes to their country over the years and do believe climate change is a major risk.
- Arabana people do not divorce the impact of climate change from other risks, which include the impact of mining, the loss of cultural knowledge and Elders, and the capacity to obtain and maintain livelihoods.
- Arabana people had plenty of ideas around how to adapt to these changes, and the suggested adaptations were holistic rather than individual, and acknowledged the variable situatedness of Arabana across time and scale. All Arabana people, no matter where they lived, wanted adaptation for Arabana country to happen.

6. THE NEXT STEP: IMPLEMENTING CLIMATE CHANGE ADAPTATION FOR THE ARABANA

Across the world, other Indigenous peoples have already faced some of the challenges and impacts of climate change that are projected to occur be experienced by the Arabana people. Some examples of adaptation that have already been implemented include traditional and innovative adaptation practices such as: shoreline reinforcement, improved building technologies, rainwater harvesting, supplementary irrigation, traditional farming techniques to protect watersheds, changing hunting and gathering periods and habit's, crop and livelihood diversification, use of new materials, and community-based disaster risk reduction.

As was mentioned by the IPCC report (2001), adaptations come in a huge variety of forms. They include spontaneous and planned (both reactive and anticipatory) adaptations, short or long term, localised or widespread, amongst many others. The few examples above represent a mixture of responses, from increased preparedness against natural hazards, accommodation of traditional ways of life (housing or hunting, for instance) to actual shifts towards less traditional ways of life, which could indicate the beginning of a possible loss of traditional cultures.

The value of traditional knowledge and observations made by Indigenous people on climate change has been clearly recognized in the Arctic. The Arctic Climate Impact Assessment (ACIA) report, a four-year study of Arctic climate released in November 2004 (ACIA 2005), benefited from the input of traditional people. It further recognizes that traditional knowledge provides a good supplement to and enrichment of scientific data. One of the authors of the report cited by *Science* said that "The [ACIA] report was very instrumental in awakening people to the value of traditional knowledge as 'very solid science'" (Couzin, 2007). The partnership between traditional peoples and scientists is also meant to make science useful to local peoples, and give them another perspective on the changes that are taking place in the Arctic.

This type of collaboration with Indigenous communities seems however more focused on improving understanding of physical and ecological impacts of climate change in the Arctic than social and cultural impacts. It will be equally important to include Indigenous peoples at the decision-making level, so that their experience and successful adaptation strategies can help shape new forms of governance and livelihoods to meet the challenge of climate change.

The following sections sum up some of the initiatives, (including Australian examples) for climate change adaptation in Aboriginal contexts. They are the results of an international review we undertook in Indigenous adaptation initiatives to climate change, specifically in the areas identified by Arabana as of major concern (like water) and which were used as part of the discussions by Arabana regarding how to build adaptation in their country. In doing so , we are not intending to construct Arabana as "Indigenous" in a way that diminishes their unique circumstances to culture. Indeed, we acknowledge that one of the strengths of the Arabana response to climate change is the fact that they are *Arabana* rather than *Indigenous* peoples and in this context some, effort has been made to make explicit via commentary in the following section, the relevance of particular options *for the Arabana*, However, we also note, that the description and identification of adaptation options - which are broader while not necessarily specifically useful to Arabana per se - were requested by them. Arabana people also see themselves as part of a global network of Indigenous peoples responding to such issues, and presented an argument that understanding what other Indigenous peoples are doing in the wider world was not only a means of identifying themselves as part of this group, but was also as a potential pathway to approach and start to build networks with those groups.

6.1 Preserving/managing/accessing water

Water, its availability, quality and access remains one of the most pressing and urgent adaptation issues for the Arabana. However, there are many ways in which other Indigenous groups are meeting this challenge (Pandey et al. 2003). We present a few here.

The Qhuthañas in Bolivia

The Aymaran Indigenous peoples of Bolivia have faced water insecurity and scarcity issues for centuries. As such they have developed various methods for collecting and harvesting water – especially rainwater harvesting. They collect rainwater in the mountains and pampas (fields) via the construction of small dams which they call ‘qhuthañas’. This technique has helped them in times of drought as well as protected their livestock (UNFCCC, 2007).

Drought ready communities – a guide

Based in Oklahoma, this guide found at the following link - www.drought.unl.edu/Planning/PlanningProcesses/DroughtReadyCommunities.aspx 4/9/26/11:sw outlines a process for making communities able to cope with drought. It tells people how to reduce their drought risk, how to build capacity to respond, and gives examples and tips for how lots of other communities have done this.

Technologies for climate change adaptation - water sector

Published by the United Nations Environment Programme (UNEP) and found at the following link: www.waterinstitute.unc.edu/unep-project, this is a guidebook that presents adaptation strategies for water conservation; storm water control and capture; resilience to water quality degradation; preparation for extreme weather events; diversification of water supply; and mitigation. It offers great advice on how to build resilience and capacity in the face of uncertain water supplies.

Table 6.1: Case study 1: Indigenous peoples of the Arctic and adaptation

The Indigenous peoples of the Arctic are also facing many issues as a result of climate change. The responses presented here are of course very different from that which might be appropriate for the Arabana. However, the issues *per se* are also some of those faced by the Arabana. They also face housing issues as a result of heat stress, their subsistence activities are affected by water availability, and in relation to places such as Darwin, emergency preparedness will be crucial in the event of cyclones, and flood etc. This case study highlights some examples of adaptation that they are currently undertaking.(Aboriginal Affairs and Northern Development, 2007), and they provide food for thought, not only as examples relevant to place, but to show that adaptation can be diverse.

Housing

- Shorelines reinforcement and moving buildings from the shoreline, due to soil erosion caused by decreasing permafrost.
- Use of innovative building material to support structures, due to ground instability caused by changing permafrost patterns.

Subsistence

- Increased water quality testing and consumption of bottled water due decreasing water quality and accessibility.
- Changing hunting habit's, by either hunting with boats or switching to fishing as well as hunting quotas.
- Increased consumption of store-bought foods due to scarcer local foods.

Emergency preparedness

- Extension of danger zones in avalanche prone areas and expansion of research and rescue teams due to increased snow slides and avalanches.
- Development of better emergency preparedness plans by having more supplies during travel or avoiding travel during periods of bad weather.
- Increasing use of Global Positioning Systems (GPS), cellular phones and CB radio.

6.2 Communicating and monitoring change

One of the priorities for Arabana is to develop ongoing communication strategies that enable them not only to connect with Country and their Elders but also communicate across the many places that Arabana people live. Below are some options that give some good ideas regarding how to do that. Some of these, such as the Climate Wizard or UK Adaptation Wizard are designed to help institutions to develop climate change adaptation plans. Others such as the tribal climate change newsletter are examples of how other Indigenous people are approaching climate change adaptation. Finally, programs such as Snowchange show how Indigenous peoples can build information for cultural and language transmission programs for their people. This is very important given a key theme in the fieldwork was the perceived linkage between healthy culture and the capacity to adapt to change.

Again, the point is made that while Arabana will no doubt develop place and context specific means of communicating and monitoring change, these examples highlight the wide range of techniques and programs trialled elsewhere, and provide templates and ideas which could be adapted to their own circumstances. For example, the 'snowchange' idea, could be extrapolated to a 'desertchange' or 'lakechange' program. A web site or program specific to assisting Arabana to continue to build their own adaptation actions could be modelled on the Adaptation Wizard. Many Arabana did talk to us about their wish to establish programs that would provide a mechanism by which they could document and chart change in their country – the Climate Witness program similarly could be adapted. The establishment of an Arabana Climate Change or similar newsletter could be modelled on some of, or draw upon the ideas in the production of the Tribal Newsletter discussed below.

Climate Wizard

Climate Wizard is an online tool that allows you to choose a state or country and assess how climate has changed over time and project what future changes are predicted to occur in a given area. You can view historic temperature and rainfall maps for anywhere in the world, view future predictions of temperature and rainfall, and view and download climate change maps. Find the link at: www.climatewizard.org/index.html

UK Climate Adapt Wizard

Found at the following link, <http://www.ukcip.org.uk/wizard/> this tool takes you through a five-step process that will help you to assess your organisation's vulnerability to current climate and future climate change, identify options to address your organisation's key climate risks, and help you develop and implement a climate change adaptation strategy.

Tribal Climate Change Newsletter

This newsletter provided by the Institute for Tribal Environmental Professionals (ITEP) includes: updates on ITEP's Climate Change Program; news items about tribes and climate change; useful resources; announcements about funding opportunities and upcoming events; and other information relevant to tribes and climate change issues.

Climate Witness Community Toolkit

This toolkit is designed to establish a 'climate witness' project that assists communities to document local impacts of climate change and to devise appropriate adaptation measures that local communities can implement themselves. The tool kit provides a suite of activities that is to engage the community to identify climate change impacts, concerns and opportunities, community values, adaptation options and a community action plan. The link for this tool is wwf.panda.org/about_our_earth/all_publications/?uNewsID=162722

6.3 Transmission

A key theme from our interviews and discussions about climate change was the need to develop ways for the Arabana to build their own cultural keeping centres and modes of information transmission and storage. Other studies show this is a common aspiration worldwide (Pearce et al. 2011, Pearce et al. 2009, Pearce et al. 2006). The following showcase some ways in which people are doing this - including pioneering work on this in Australia. These adaptations highlight the importance of investing in cultural capital to ensure the sustainable use of natural capital (Berkes and Folke 1994) and provide ideas and approaches for the Arabana.

The Indigenous Peoples Climate Change Assessment initiative (IPCCA) is one such initiative. It focuses on empowering Indigenous peoples to develop and apply their own frameworks and practices for assessing climate change impacts on their lands and cultures and how to build adaptation to them. Arabana could build on this model to ensure ongoing documentation of impacts on their country over time, which would provide a level of scientific and other types of knowledge at a very local scale.

Promoting Generations of Self-Reliance - Stories and Examples of Tribal Adaptation to Change

This is a collection of adaptation practices and strategies present practical examples for tribal environmental managers and leadership and includes a Tribes and Climate Change website. This website developed by the Institute for Tribal Environmental Professionals (ITEP) includes profiles of tribes being impacted by climate change and how they are addressing those impacts, audio recordings of tribal elders offering their views on climate change, general information about climate change and its impacts, and links to numerous online resources, announcements about upcoming events, and funding opportunities. As a result of this project, Arabana people now have access to and ownership of a climate change adaptation web site. This site is set up in such a way that Arabana can access climate information but also upload it. They could easily develop a part of that web site to include their own stories about change, and adaptation to it in their country and all other places they live.

The Knowledge Revival project

This program led by Victor Steffensen, a north Queensland Aboriginal man, is a program that assists and teaches Indigenous people how to record and revive their cultural traditions. The project utilises multimedia to do so, and works closely with Elders to ensure cultural transmission occurs. His work/approach is now being used by many Aboriginal and Torres Strait Islander groups across Australia, and provides another opportunity for Arabana to undertake some of the cultural re-vitalisation and re-connection with country they talked about throughout this project.

6.4 Building livelihoods: the hybrid economy

One pathway Arabana could consider in building adaptation options is to build economic bases that enable them to live on country, manage it and yet be employed. One way of doing this is to develop what Altman (2008) calls the hybrid economy, here defined by Green et al. (2009, 67) as: “the unusual economic structure of many remote Indigenous communities in the 21st century. It includes market, state and customary sectors that overlap and interlink significantly”. In this case different economic endeavours may include cultural tourism, pastoralism at Finnis Springs, language and cultural camps amongst many other things. Developing community based conservation enterprises, while challenging, is one way to manage global problems as they manifest at local scales (Berkes and Davidson-Hunt 2008, Berkes 2007).

Ranger Stations and Land Management Centres – some options

A recurrent suggestion made by Arabana people for adaptation was to establish ranger stations or land management centres, whether on Finnis Springs or Marree. In Australia currently, there is a vast **Indigenous Ranger Network**, with over 800 rangers working on and managing Country. Therefore, there already exists the experience, networks and training needed and for Arabana to kick start such an endeavour. The following is a selection of key resources that could be used to assist Arabana in setting up caring for country programs.

For example, information about ranger programs and how to go about getting funds for them can be found at:

<http://www.environment.gov.au/Indigenous/workingoncountry/index.html>
and <http://www.environment.gov.au/Indigenous/grants.html>

There are other groups and institutions who have historically given funds to Indigenous peoples to manage cultural and environmental issues. For example, the **Christensen Fund** is one of these and their link is <http://www.christensenfund.org/>

Ecotrust Australia has also recently established in Australia and the link for them is: <http://ecotrust.org.au/>

Another program of interest is the work being undertaken on **Biolinks** across Australia. This program aims to create ecological linkages between areas and regions, between people and the environment, and is another area that Arabana people might be interested in exploring as a means to implement adaptation programs and receive some funding (see <http://www.centralvicbiolinks.org.au/> for an example in Victoria).

Finally, there are many accredited courses Arabana could enrol in to get training as rangers. The link for professionals who conduct this training in South Australia is at: <http://www.environment.gov.au/Indigenous/workingoncountry/training-providers/tafesa.html>

6.5 Co-management options

Co-management is one option that Arabana might pursue as it offers a conceptual frame within which to build the partnerships (such as with mining and government) that will help progress their adaptation and other plans, while ensuring they do not lose their sovereignty. Various models for co-management are described in the literature and

worth exploring (Ostrom 1990, Berkes 2007, Nursey-Bray and Rist 2009, Dodson 2007). Olsson et al. (2004) explore the opportunities for developing adaptive co-management as a means of building resilience in social-ecological systems.

Indigenous protected areas

There are now 51 declared Indigenous Protected Areas covering 36 million hectares and over 40 consultation projects across Australia. The Australian Government's Caring for our Country initiative plans to increase Indigenous Protected Areas by at least 40 per cent over the next five years - an increase of at least eight million hectares. The goals of the Indigenous Protected Areas element of the Caring for our Country initiative are to:

- Support Indigenous land owners to develop, declare and manage Indigenous Protected Areas on their lands as part of Australia's National Reserve System.
- Support Indigenous interests to develop cooperative management arrangements with Government agencies managing protected areas.
- Support the integration of Indigenous ecological and cultural knowledge with contemporary protected area management practices.

For more information see link: -

<http://www.environment.gov.au/Indigenous/ipa/background.html>

6.6 Urban Arabana – leaders of change: case studies of international best practice

Arabana people live in cities, and as such will be subject to the decisions made by local councils and other governance arrangements about what will happen regarding climate change adaptation. However, there are nonetheless a huge range of initiatives undertaken by cities, or collectives within cities across the world which offer great ideas for how to conduct projects that can reduce emissions, cut household costs and build adaptive capacity. C40 is one such initiative which documents current examples of best practice worldwide and highlights that it is not necessary for Arabana people to reinvent the wheel but work within their own communities, and with others to build effective responses, that both save energy, as well as help adapt to change. Further detail can be accessed from the following web site: <http://www.c40cities.org/about>.

7. MOVING FORWARD: LESSONS LEARNED IN BUILDING CLIMATE CHANGE ADAPTATION

Author: Melissa Nursey-Bray

7.1 Introduction

The Arabana people are one of the first Aboriginal and Torres Strait Islander peoples in Australia to build a climate change adaptation strategy. In so doing, they have learnt many lessons, as have the researchers working alongside them. What are some of the key insights that can be gleaned from this experience? What do our findings tell us about developing community based adaptation strategies in Indigenous contexts and is it possible to extrapolate some wider lessons for adaptation practice? This chapter presents some reflections on this question, and points to some of the dimensions that are worth thinking about in similar projects.

7.2 The role of history

In any context, when working with Australian First Nation peoples, it is crucial to acknowledge that climate change adaptation planning will be occurring in the historical context of colonisation. It is easy to make the mistake that it is a thing of the past rather than a lived reality today. As Green et al. (2012) note:

“What originated as racism, and gradually evolved into paternalism, continues to shape Indigenous policy in Australia. This legacy has fuelled a failure to recognise the legitimacy of Indigenous culture (Maddox 1999), and the right of Indigenous people to genuinely participate in developing a vision for their own communities’ future (AHRC 2009)...The failure of adequate Indigenous participation, along with an emphasis on data collection, combined to challenge all levels of government with respect to developing new Indigenous policy that is inclusive and engaged. ... There is also a concern that such centralised agencies are too detached from the reality of the lives of Indigenous people living in remote communities to produce effective policy for them. Yet it is against this backdrop that Indigenous policy on climate adaptation must be produced”.

Over and over again Arabana people linked the present climate dilemmas to discussion of past colonial impacts such as working on the railway or being moved around by the missionaries. These experiences are not divorced from one another at any point. As the findings show, Arabana people still have within their living memory the experience of being members of or affected by the stolen generation, of living in a mission, of receiving rations. The fact they live in so many places today is a function of the dislocation, removal and dispossession caused by colonisation and its associated impacts.

As such, the development of effective adaptation needs to be underpinned by the acknowledgement of the relationship between and legacy of, colonisation, in combination with the ongoing issues that climate change and other environmental changes are having on Indigenous communities (Baldwin 2009). As Rigney (2011) puts it, the settler state needs to settle with whom it colonises. This also requires researchers and policy makers to re-conceptualise the notion of time and adaptation. Our research and other studies highlight First Nations peoples have been adapting to

change for millennia (Brannlund and Axelsson 2011, Turner 1999). While scientists and policy makers argue that the climate challenge this time round is happening much more quickly and hence is a different and more difficult challenge, the Arabana offer another perspective. For them, that the period of colonisation was also, in the context of these time scales, very short but a period that inflicted disastrous damage to their way of life and country but which they nonetheless survived. As Arbon (pers comm. 2013) notes:

“We survived colonisation, we are fragmented and damaged but we survived; all that happened in such a small space of time, how is that different to, well, it is exactly the same with climate change, and we will adapt to that too, again maybe not unscathed, but we will survive”.

Cameron (2012) in reflecting on a study of the Inuit argues that the very way scientists talk about vulnerability and adaptation frameworks can limit the ways in which Indigenous peoples can have an input and that it acts effectively as another form of colonisation. It is a truism that the most vulnerable peoples of the world are also those who usually have contributed the least (GHF, 2009). However, automatic adherence to the view of Indigenous peoples as vulnerable and/or resilience can in turn, entrench existing and historical (i.e. colonially derived) structures that make the “other” invisible in decision making. As the AIPP (2011, 5) argue ““Indigenous peoples should not be looked upon as just ‘vulnerable people’ to climate change. What is being missed out is that Indigenous peoples are *ecosystem peoples* who have sound knowledge and intimate relationship with their environment” (AIPP 2011, 5). Mortreux and Barnett (2009) point out the discourses of vulnerability under-estimate the resilience of communities by casting them as powerless, and without agency; which as they show in the Pacific is often simply untrue.

Indeed, McIntyre-Tamwoy et al. (2012) show that in fact in some cases, such as Warraber Island in the Torres Strait, how adaptation itself is constructed - or the need for it, is rejected. Some people and societies simply do not accept solutions offered by (primarily) Western ‘others’, such as migration. Their connection to place is so strong they simply do not even countenance the notion of leaving. Thus pre-empting what is even conceived of as adaptation is a conceptual and possibly colonialist ‘trap’ that needs avoiding.

We tried to overcome this by the development of communications which aimed to develop a cross cultural conversation about vulnerability and adaptation, and by only investigating existing adaptations in the areas Arabana had *already* identified We had discussions about impacts only *when* they had been raised by Arabana first. In this way we tried to build on Arabana conceptions of climate impact and adaptation rather than lead those ideas. Notwithstanding this is an area that is still evolving and is an area we suggest needs deep thinking so as to encourage stronger engagement with adaptation and encourage Arabana and other peoples to be at the centre of adaptation frameworks.

Moreover, we found that Arabana people conceived of themselves as both Arabana, and as Australian citizens and in both roles expected to and did act with agency and with the expectation that climate change adaptation was something they would be part of. It is for this reason we characterise the vulnerability we have identified in this part of the project as the vulnerability of the *Country* rather than the *people*.

However, analysis of this aspect must go deeper – how do we accommodate different epistemological frameworks within vulnerability and adaptation programs. Trying to *develop* an adaptation process, which is inclusive *along the way*, as much as seeking an end point is invaluable. Ensuring that there is room also to discuss what may seem

'non climate' related issues, as we found, is also essential and facilitates at the end, a much wider and inclusive result. As Veland et al. (2013) note, without embedding a process that accommodates multiple fields and frames of inquiry, the research can inadvertently create 'procedural vulnerability'.

7.3 Justice and equity

Adaptation must also embed justice and equity (Adger et al. 2003, Adger et al. 2004, Adger and Kelly 1999, Trainor et al. 2007). This is not just for the Arabana people to create but requires the co-engagement of other parties – government, industry, ENGOs, and researchers to work together to ensure socially just outcomes. It is not just about developing a program or two that employs one or two Arabana people. It is about the co-production of adaptation systems that can enjoin many parties to co-jointly manage the impacts of and build adaptive solutions to climate change. Ones that will enhance wellbeing by ensuring equality while recognising difference (Jordon et al. 2010).

A system that allows collaborative decision making, that recognises different Aboriginal knowledge systems (pre and postcolonial), that encourages gender equity, that facilitates hybrid economies, and builds community capacity and resilience.

Howitt et al. (2012, 47) express this well arguing that "state policies can compound and contribute to vulnerability of indigenous groups to both natural and policy-driven disasters in many places. State-sponsored programmes that fail to respect indigenous rights and fail to acknowledge the relevance of indigenous knowledge to both social and environmental recovery entrench patterns of racialised disadvantage and marginalisation and set in train future vulnerabilities and disaster,"and that therefore "partnerships based on recognition, respect, and explicit commitment to justice" must be established.

Given the strong link between poverty, climate disadvantage, and successful adaptation (World Bank et al. 2002. WHO 2005) and the fact that social-economic indicators of wellbeing still place Aboriginal and Torres Strait Islanders peoples amongst the poorest and most disadvantaged in Australia (Yap 2011), justice and equity remain core issues. These are the hallmarks of socially just policy and remind us that addressing climate change in Indigenous contexts is also about building socially just conversation enterprises, that are holistic and go beyond a narrow analytic focussed on impacts. A socially just adaptation policy must also acknowledge the continuum of space Arabana occupy today. Hence, building capacity and socially inclusive adaptation practice also means it will be incorporating the interests of Arabana across the nation and also thinking about how to support them, in the places they live, to combat climate change.

Currently, the Arabana people are experiencing many positive and dynamic changes, starting in May 2012 with the consent determination to a large area of their Country. This is an important milestone that goes a little way towards addressing or recognising the impacts of colonisation and the fact that they are the original owners of this region. However, this event, and the associated establishment of a new Board of Directors, and an Incorporated Association means that Arabana need time to re-group and coalesce as a people and work out a way forward. Adaptation planning needs to be undertaken recognising this historical and contemporary backdrop. It is crucial and consistent with the understanding that dealing with climate change for Arabana people is only one part of their future vision.

7.4 Agents of change

Our findings highlight that Arabana people do feel change is happening, and that they have observed this change over a long period of time. However, one of the challenges in doing such a project is ensuring correct attribution of the causes of such changes. Certainly, it is interesting that many of the observed changes marry with scientific observation. This correlation is strong enough to suggest that Arabana people face some significant climate related changes into the future and in particular, as the science report highlights, the next twenty years. However, again, this is a simplistic interpretation of our results.

Managing and adapting to change for the Arabana, as with most Indigenous peoples, will also be about also forging the links between climate change and other equally pressing impacts or change agents:

“For many indigenous peoples, they do not dichotomize between the effects of onslaughts of climate change and the onslaughts of human development. A storm upsurge has as much the same effect as large-scale open pit mining: massive soil erosions and community displacement. A drought has as much the same effect as large-scale logging: destruction of forests, drying of rivers and loss of source of food, among others. Indigenous people’s adaptations to these forces have the same objectives—to effectively defend life” (AIPP 2011 pg 7 -8).

For the Arabana, these change agents include ongoing and future mining in the region, and potential future pastoral enterprises. While many Arabana will be and expressed concern to us about the impacts of this, others saw there were job opportunities for them as well. This causes not only an internal tension between competing but equally strong aspirations, but also creates uncertainty around the exact nature of the ripple or cascading effects of all these drivers when combined.

For example, Roxby Downs mine currently extracts 35 million litres of water a day from the Great Artesian Basin. The effects of this extraction are uncertain but need to be incorporated into consideration in the context of climate change. The recent report by Linc Energy which purports to have discovered oil deposits worth up to Aus\$20 trillion in the Coober Pedy – Arkaringa Basin will have significant ramifications on how Arabana deal with climate change adaptation. Similarly, pastoralism is having an impact and has caused various environmental changes. The change or declines in flora and fauna are unlikely to be attributable totally to climate change *per se*, but be also partly attributable to baiting practices and the introduction of exotic flora and fauna. While regional in nature and relevant to Arabana, these examples also highlight the need to contextualise the Arabana in the wider context of other risks they must negotiate daily, and over which they may have minimal control or decision making power. While these examples are from Arabana country, this principle would apply to Arabana living across all of Australia, where they also face other wider climate issues and risks that need managing.

This insight has two implications for climate change adaptation planning. Firstly, it means that management approaches need to consider other dimensions and how to manage them, over and above climate adaptation in and of itself. Bardsley and Wiseman (2012) find this is the case in their own work with the Aboriginal groups of the Eyre Peninsula, South Australia, arguing that the research analytic and adaptation planning must avoid being limited to a climate change impacts focus, but consider also the broader social/ecological contours such as wellness, resilience, health etc. How have these other transformative experiences in place and time (such as mining or

pastoralism) shaped the Arabana people? While we began to explore this dimension in this project, there is much more work that needs to be done to obtain the kind of detailed insights that will be useful.

Understanding these wider links also means that it is easier to 'see' opportunities; in developing adaptation in the long term. The Arabana people will need to engage with the mining and pastoral communities, perhaps build partnerships with them so as to develop joint strategies for managing issues such as water access and availability.

The second dimension is that one of the effects or characteristics of climate change is that its impact is often to amplify and/or intensify what is an existing problem. Thus, in this case, while climate change may not be the sole reason that change is occurring, it will certainly amplify that change and this is what needs management planning.

7.5 Integrating scale and place

Integrating scale and place will also be an important consideration for climate change adaptation planning (Adger et al. 2005a, 2005b). Scale as defined by Cash et al. (2006, 8) is defined as "the spatial, temporal, quantitative, or analytical dimensions used to measure and study any phenomenon, and "levels" as the units of analysis that are located at different positions on a scale". Case based literature highlights the importance of place (Kenyon and Black 2001) while other studies show that negotiating relevant processes and engagement strategies on a case by case basis enhances the likelihood of success. Framing scale appropriately within vulnerability and adaptation analyses can help address risk or determine institutional barriers (Bisaro et al. 2010). Pahl-Wostl (2007, 2009) shows that the transition to adaptive management (of water) necessitates multi-level learning processes, thus reinforcing the centrality of scale for adaptation. Prout (2008, i) reminds us of this centrality in Australia with the following: "understanding Indigenous spatiality is critical to redressing the inequitable and often inefficient nature of service delivery that has lingered in rural and remote Australia since colonisation began".

In Russia, Graybill (2012) notes in a case study of the Kamatchka that "by seeking to understand perceptions about climate change from within a place and about a place, our knowledge of climate change is increased and becomes polycentric, moving beyond knowledge produced about regions but inclusive of understandings developed by people in regions". In developing local adaptations then, we tried to generate place specific perceptions, climate variations, and moral and spiritual aspects to develop locally relevant solutions, a process trialled in Tibet and documented Byg and Salick (2009). Agius et al. (2002) document the importance of incorporating new scales of justice in native title negotiations in South Australia.

Another dimension worth reflection is the notion of *Indigeneity* per se. As Cameron (2012, 105) states, a number of Indigenous leaders and scholars "explicitly reject the delimitation of Indigeneity to an externally defined understanding of the local, traditional, or Indigenous". Given the dispersed nature of the Arabana, this is an especially valid point, and we suggest begets a responsibility to undertake research and adaptation planning that re-constitutes the local and the locale as and how the respective group constructs it, and not automatically assume one is planning for 'country'.

There are also significant governance issues to consider in respect of scale and space. For example, as shown in Chapter 3, governance systems within the current Arabana, include formal and informal mechanisms, and which are in turn overlain with Western and colonial laws and systems. In South Australia alone, where adaptation planning is

occurring at state, local government and sectoral scales, the challenge for both policy makers and Arabana is to find ways of working with each other's governance systems without conflict and in ways that build collaborative implementation of each others' adaptation programs (Brooks et al. 2005, Richards et al. 2006). For the Arabana, their own planning will also be occurring across states, and within their own groups. The future opportunity and challenge will be in establishing ongoing adaptive planning that does not overlap with other initiatives, occurs at multiple scales, enables all parties to value add to and build capacity within each process (Young 2006, Folke et al. 2005) and to get the challenge of scale right, yet not problematize it (Veland et al. 2012).

This approach presents a real opportunity for Arabana people to build partnerships and alliances. The development of such partnerships will enable access to resources, integrated adaptation at multiple scales, and help to build capacity over time. As Veland et al. (2010) highlight in a discussion of Tropical Cyclone Monica in the Northern Territory, recognition of local scale Indigenous institutions, in this case the community member of Waruwi, can ensure effective strengthening of resilience and relationship building from the community upwards. Addressing scale also requires development of evaluative mechanisms. To this end, Adger et al. (2009) argue that effective evaluation over scales could be done by using effectiveness, efficiency, equity and legitimacy as criteria.

7.6 Integrating scientific and traditional knowledge systems

Indigenous peoples have been managing complex problems within their territories for much longer than western society has and they potentially still hold valuable knowledge for dealing with complex societal problems (Turner et al. 2000, Ford et al. 2006; Posey, 2001; Stevens & De Lacy, 1997, Gilchrist et al. 2005).

Such approaches are less about producing high quality specialised knowledge that can be used to solve a 'problem', and more about bringing different knowledge systems and people together to improve a complex situation (Berkes 1995, Berkes and Folke 1998).

One of our challenges in developing the adaptation strategy was trying to assess how to integrate different knowledge systems into adaptation. In the case of the Arabana, and as a function of dispersal, we found knowledge about country, law, history, language and culture was fragmented, and scattered across the nation, vested in different individuals in place and time. As our quotes show, many Arabana people feel sad about this, yet, in being situated also in many other worlds (Western, professional, familial), they often have competing priorities and little time to invest in Arabana business. How knowledge is constructed was also debated. Like many other First Nation's peoples in Australia, the Arabana have also lost much traditional knowledge. We met this challenge in two ways: (i) by documenting all knowledge imparted to us without discrimination and (ii) by taking Arabana people out onto country and /or visiting them in their current places of residence, and then talking to them about adaptation *in situ*. As a result the adaptation actions reflect an integration of historical colonial and twentieth century experience and memories, with cultural information about sites, stories, language names and flora and fauna, generated while on country and via employment of memory. In many instances they could also act as drivers to assist the re-discovery and revitalisation of traditional ecological knowledge as adaptive management (Berkes et al. 2000).

We note however that in climate change adaptation planning, there is also a need to find ways of integrating science with Indigenous knowledge in ways that will speak to

all readers and users of such plans. As such it is important to recognise some of the differences and contours of each knowledge system. Knowledge is not an accepted 'truth' but is in fact constituted differently in different cultural contexts. Western knowledge systems tend to be linear, sequential, and follow scientific principles, whereas Indigenous people's knowledge systems are more circular and different knowledge systems operate concurrently and feedback within a community in various ways (Sillitoe et al. 2002, Croal and Darou 2002).

The co-existence of both paradigms can create a management tension caused by the fact that each knowledge system operates in practice in entirely different ways. In the western world, for example while access to knowledge is mediated by power and resource constraints, it is theoretically 'open' to access by all and science is a 'common pool' resource (Ostrom 1990). Yet in a community context, knowledge is distributed, held and maintained by different members of society and strictly adheres to various delineations which prescribe specific responsibilities in relation to that knowledge.

Another important difference between the two is the local nature of Indigenous knowledge and the global nature of Western scientific knowledge. This has obvious implications for management especially in relation to managing to respond to climate change. While the local emphasis is important to obtain community involvement and support in management, the reality is that local societies now also operate in a modern globalised world, and depend on outside goods and services to survive (Lebel in press). In this context, the prominence and dominance of Western science plays a crucial role, especially in the realm of obtaining funds and ongoing support. Too often, the community's link to place along with the "temporal and spatial elements of knowledge generation" lacks translation into policy and needs building in to any adaptation arrangements (Adams 2004, 38), especially as Arabana live across such a wide spatial realm. We advocate in this context taking an adaptive systems approach, one where the focus is not on seeking the answers but to one that tries to make sense of the situation, thus unleashing what Salick and Byg (2007) call the dynamic potential of the system and provoking interaction between the knowledge systems.

This also has implications for the power sharing arrangements within the adaptation planning that evolves. Arabana people will need external parties and expertise to help them build, implement and resource climate change adaptation, but in so doing need to ensure they do not lose power and maintain their own knowledge domains. Hunt et al. (2008) in a comprehensive review of culture, power and institutions in Indigenous Australia, highlight the complexity of this challenge. They reflect: "It is simply impossible to understand the governance of Australian Indigenous communities and organisations as separate from the encapsulating governance environment of the Australian state" (Hunt et al. 2008, 3). Power sharing implies an equitable distribution of decision making power both within the Arabana, and also in relation to external parties, so that Arabana are actually equitably involved and consulted on matters affecting their country or lands.

Power sharing will need to include a shift in management understanding of what 'local' and 'cultural' knowledge is and the role it plays in the decision-making processes. Being explicit about the development of power sharing mechanisms up front and where appropriate will assist this process. Flexible mechanisms that take into account differences in cultural perspectives need to be negotiated. On the other hand, community organisations are themselves "enmeshed within the webs of social, ceremonial, political and resource relationships that characterise Indigenous societies [and which are] influenced by Indigenous 'traditional' or 'classical' systems of governance where groups exercise rights, interests and responsibilities that are derived

from traditional jurisdictions, laws and customs, recognised codes of behaviour, institutions and shared values” (Hunt and Smith 2004, 10).

Effective governance will underpin effective adaptation, and working on these arrangements, an ongoing challenge for any Aboriginal people. However, some guiding principles around governance for climate change can be derived from Hunt and Smith (2004, 2) who argue that Aboriginal peoples need to make decisions about: (i) group membership and identity, (ii) who has authority within the group and over what, (iii) the agreed rules of engagement and enforcement, (iv) negotiation of rights and interest with others and (v) how they develop arrangements to best meet their goals. This will also help build resilience within policy (Adger et al. 2011).

7.7 ‘Adaptable’ adaptation

The form, type and nature the adaptation process is also worth discussion. We are not suggesting any prescription for what Arabana ‘should’ do in relation to their adaptation program. However, ensuring that adaptation evolves and is capable of responding and changing over time will ensure it has longevity and utility. It is clear at present that adaptation at the very least needs to consider **what** solutions Arabana might pursue and **how** they are going to do this. Berrang-Ford et al. (2011) argue that to do this effectively adaptation, rather than vulnerability must become the focus, and be in the context of understanding that climate change is rarely the sole motivator for action. This suggests that the Arabana, in order now to progress their adaptation planning, could also use other motivators, to set these processes in motion. Indeed, the Arabana are currently very active in applying for funds to set up land management centres and other initiatives, which while identified in their adaptation plan as priorities, also fulfil a number of other functions and aspirations. Thus they offer multiple opportunities to build motivation.

We suggest that embedding formal learning as a process of adaptation (Myers et al. 2012) is also an aspect that bears further work in the context of implementing adaptation for the Arabana (Armitage 2010, Armitage et al. 2009, Hinkel et al. 2009, Allen and Kilvington 2002). As Pelling et al. (2008, 867) argue, “seeing adaptation in terms of learning highlights both material adaptation and institutional modification as valid adaptive strategies. If learning itself is considered a kind of adaptive behaviour, then this opens up questions surrounding the process through which actors can learn to learn (or learn to be adaptive)”. Hill et al. (2012) suggest a typology of engagement that facilitates Indigenous participation in environmental management. In this context, this would mean facilitating Arabana engagement with other adaptation process outside of their own, where there can be an integration of Indigenous perspectives with government policy (Newton et al. 2005). This process will also encourage reflexive problem focussed knowledge integration (Raymond et al. 2010). It can also encourage adaptive governance, as Bisaro et al. (2010) highlight in their work on adaptive management in Lesotho.

Many conditions may change in the near and middle term that will affect how the adaptation process evolves. For example, Arabana people may start moving to or visiting their country more often. The impacts of climate change or the predictions about it may need updating or changing. Governance structures and fora for decision making may change or be established in different places where Arabana live. Resources to assist implementation will wax and wane.

Incorporating ‘adaptive management’ principles into adaptation practice then is one way of building ‘key stones’ for climate change decision making at local and domestic

policy levels. As Arvai et al. (2008) show, adaptive management can help bridge the gap between climate research and climate policy. Adaptive management is based on the assumption that circumstances change (Leach 2006). It is a technique that provides a framework for continually improving managerial practices. Employing adaptive management techniques can enable policy makers to focus on variation over time within policy, and enable Arabana to review their adaptation planning at intervals over time.

7.8 Reflections on a methodological fusion

Our approach attempted to fuse three methodological styles: (i) a scientific conceptualisation of vulnerability/adaptation, (ii) participatory action based research driven by different disciplines, and (iii) community based, bottom up research. The aim was to end up with community owned and collaborative research outputs which in their inter-disciplinarity and cultural diversity would build capacity of Arabana people to not only build adaptation, but conduct research. This was a bold undertaking and a model worth pursuing. However, it was not without its challenges, which we now discuss.

Firstly in attempting this methodological fusion, the notion of inter-disciplinarity was tested. Christie (2006) notes, a founding assumption in environmental decision making has been that what is needed is an understanding of “biology, non-human population dynamics, ecological communities and ecosystem function” to create effective policy. He argues that if environmental problems are constructed as coupled social-ecological systems then interdisciplinary research has a role in framing policy.

As such, interdisciplinary research and projects such as these can provide scope for shifting the perception of humans as perpetrators of environmental degradation to agents of change, and providers of solutions:

“Addressing these interlinked problems requires that we move beyond isolated disciplinary research towards problem driven inquiry with participation of the key stakeholders involved. (Apgar et al. 2009, 2)”

While we tried to integrate scientific, anthropological, Arabana, social scientific and communications expertise together, this was a major challenge and not one we totally surmounted. We had to work hard to avoid simple listing of/documentation of our respective disciplinary data sets to try and forge a coherent integrated narrative, culminating in this report (Brewer 1999). We also had to work hard as a group to make our individual contributions sympathetic to a more integrated whole, and relationships between team members frayed at various times, to then re-constitute at others.

However, pursuing this integration has provided us with a picture of the relationship between Arabana people and climate change over a temporal and spatial continuum that we would not otherwise have been afforded. We were able to examine issues beyond climate change *per se* to reflect on governance, wellness, and communications leading to the constructing of adaptation in a much more holistic way. In the risk perception exercise we uncovered value systems about culture, climate, adaptation and country, intangible elements often overlooked in studies such as these.

Our overall commitment to the Arabana, and the project, enabled us to transcend these difficulties but we acknowledge the pain of inter-disciplinary research as an important insight for us. We suggest that government departments, who are siloed at best, need to think about how to build such integration in their own contexts, as do future research teams, in order to ensure adaptation strategies are appropriate and diverse.

We also advocate thinking about the notion of trans-disciplinarity as a way of overcoming the dilemmas of trying to integrate multiple differences via inter-disciplinarity. Attempting inter-disciplinarity also means you run the danger of confronting the maxim “All disciplines are equal but some are more equal than others”. Rather, climate change adaptation is well suited to the trans-disciplinary endeavour as it effectively provides an opportunity to build a new whole and is “research that addresses the knowledge demands for societal problem solving regarding complex societal concerns and is a process that can put knowledge generation at the service of society to deal with complex societal problems” (Hadorn et al. 2006, p. 122). Such an approach can also enable stakeholder groups to understand there are multiple interacting parts in any adaptation program, while allowing for self-organisation (Apgar 2009 5).

7.9 Communication

Communication emerged as a big dimension in implementing our methodological approach and it was also an issue for the Arabana and manifest in various ways. There was a concern about the communication of Arabana culture, and also a worry about the development of communication tools and centres, plus the challenge of communicating climate change *per se*. The actual communication and interpretation of climate change terms and practice was a challenge for most.

International experience shows that there are a number of ways in which climate change can be communicated effectively (Moser 2005). A local climate change adaptation framework needs to have a communications component so the need both to develop and then implement climate change management can be accepted. Within this there are two key principles: transparency and ensuring the right language is used. For example, all people involved in the planning exercise, need to be transparent about communicating the issue by: communicating the existence of increasing climate change and variability using the science to explain current climate events and possible future ramifications; communicating the need to take proactive action to ameliorate negative impacts; and create the conditions for discussing positive adaptation strategies and shared experiences and lessons.

It is useful to employ other strategies to ensure communication about climate change is appropriate, by: choosing language that is appropriate to the audience (a good first step); concentrating on what is feasible for different groups (important); and maximising opportunities by aligning climate change as an issue with other contemporary issues that resonate with local interests and local agendas (Nurse-Bray 2009, Nurse-Bray and Ferrier 2009).

We adopted all these principles in developing communications for and with the Arabana and we used a diversity of media to do so. These communications were extremely successful and popular with the Arabana. This was because we used Arabana people to be the voice and face of the project and we worked with Arabana people across Australia to do this. We provided access to all our footage and photos to Arabana. Secondly, audio – visual communications worked particularly well as a medium for translating adaptation issues. The key lesson here was understanding the importance of facilitating trust, fun and two way engagement in such projects.

7.10 In summary: advice to policy makers

Responding to climate change is, like all planning, a tricky endeavour, and too often obscured by the white noise of politics, power and the consumptive needs and aspirations of society. This project has demonstrated that despite these influences, capacity and intent can and does exist at local scales and within and between communities and peoples such as the Arabana to respond and develop adaptation options for climate change.

However, in order to ensure successful implementation and resourcing of this kind of initiative Arabana people need the support of policy makers and other stakeholders in the region. This support needs to go beyond investment of funds, but acknowledge the particular circumstantial, historical and locale constraints Arabana face in the wider institutional and policy context. Moreover, policy makers could build flexibility into their ongoing adaptation decision making to find ways in which Arabana aspirations and goals could be integrated at regional and local scales. The following is a summary of some areas, principles and actions policy makers and other stakeholders could consider in future policy making and adaptation planning in this and all other regions where Arabana people live:

1. Acknowledge that adaptation in Indigenous contexts cannot be extricated from the history of colonization.
2. When conducting assessments and adaptation, find ways of integrating both the vulnerability of people and vulnerability of country.
3. Embed justice and equity in all adaptation options and policy.
4. Recognise that adaptation needs to incorporate the lived reality of Arabana, that they live in urban as well as remote places, adaptation policy needs to integrate place and scale.
5. Document and identify other drivers or agents of change such as mining, and their impact on and implications for adaptation policy and planning.
6. Integrate knowledge sets. Integration is not just about integrating science and knowledge but also re-vitalising knowledge and acknowledging history and memory as a form of knowledge.
7. Design adaptation in ways that will assist building community capacity.
8. Develop communications about climate change not only at the local scale; Aboriginal people *can* engage with international dimensions.
9. Ensure flexible governance arrangements that facilitate integration or co-existence between formal and informal and traditional and Western laws and mores thus assisting effective development and implementation of adaptation.
10. Build trans-disciplinarity into research.
11. Employ communications expertise in into research and other projects

8. SUMMARY

Climate change is an international problem and Indigenous people will be affected by it. This report presents the results of an adaptation research project conducted in three frames: (i) science, (ii) risk, environmental change and adaptation, and (ii) social sustainability, with the Arabana people of South Australia.

Science suggests that Arabana regions will get hotter, in some places wetter, and in others much dryer and that in Arabana Country, water availability overall will decrease. Flora, fauna, cultural sites and the liveability in the regions will be affected by climate change.

Findings from the risk and adaptation study show that Arabana people consider climate change to be a risk and that they have a number of specific concerns. In particular, Arabana are worried about availability, access, quality and drying up of water, especially in relation to their culturally significant mound springs. They are concerned about the destruction of and eroding away of cultural sites via wind, erosion or flooding. The maintenance of livelihoods is another major issue as is how to build family and cultural networks across the nation. Arabana across Australia also identified and described a number of changes (mainly environmental) that they had observed over time (a 90 year period). These include observed changes to flora, fauna, settlements, sea level, and the frequency of climatic factors including heat, cold, ice, dust, wind and cyclones.

Based on the findings of this fieldwork, the relative certainty of the science predictions over the next twenty years and the multiplicity of other pressures such as mining, pastoralism and the fact that employment, housing and other opportunities are scarce in the region of Arabana Country, we conclude that the country itself is highly vulnerable to the impacts of climate change.

However, results from the social sustainability study reveal a people highly resilient to change and who have been adapting to change for millennia. This resilience today is manifest in the way in which Arabana people have moved around the country, withstood the pressures of colonisation and remained culturally strong with a resilient sense of identity, no matter where they live. This highlights that the Arabana people are potentially less vulnerable to the impacts of climate change, as they have adaptive capacity to respond to this change.

Arabana people now have an adaptation strategy and are working on its implementation. However, as with all the other challenges they face, they cannot do this alone. Government, researchers and industry have an opportunity to support and learn from the Arabana.

Ultimately, the challenge facing the Arabana; that of reconciling economy and environment, making distinctions between urban and remote experience, and dealing with the legacy of a collective past, is a universal one. It is one we all need to work on together in order to adapt to the difficulties the future will bring.

As Elder Ken Buzzacott (2012) concludes:

“We got to talk together, stick together and try to do something there.....work together, and everybody....can get success”

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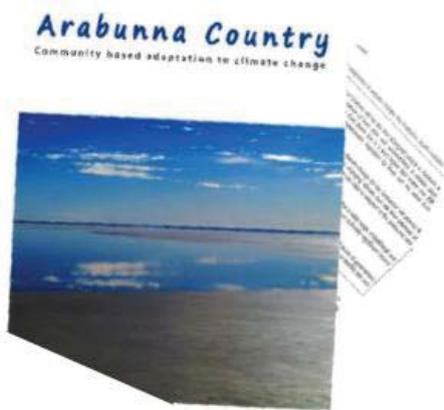
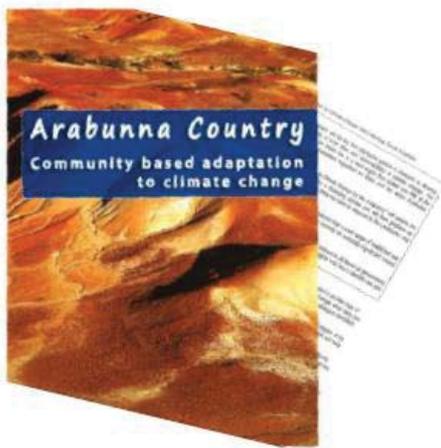
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APPENDIX 1: SCANS OF COMMUNICATIONS TOOLS AND BROCHURES



Climate change and Arabunna Country

Scientists predict that Arabunna Country might experience some of the most substantial climate change in Australia!

They say it might get hotter and wetter. Average annual temperatures could rise by more than 4°C, and an increase in rainfall would mean more plant growth increasing the risk of bigger bushfires.

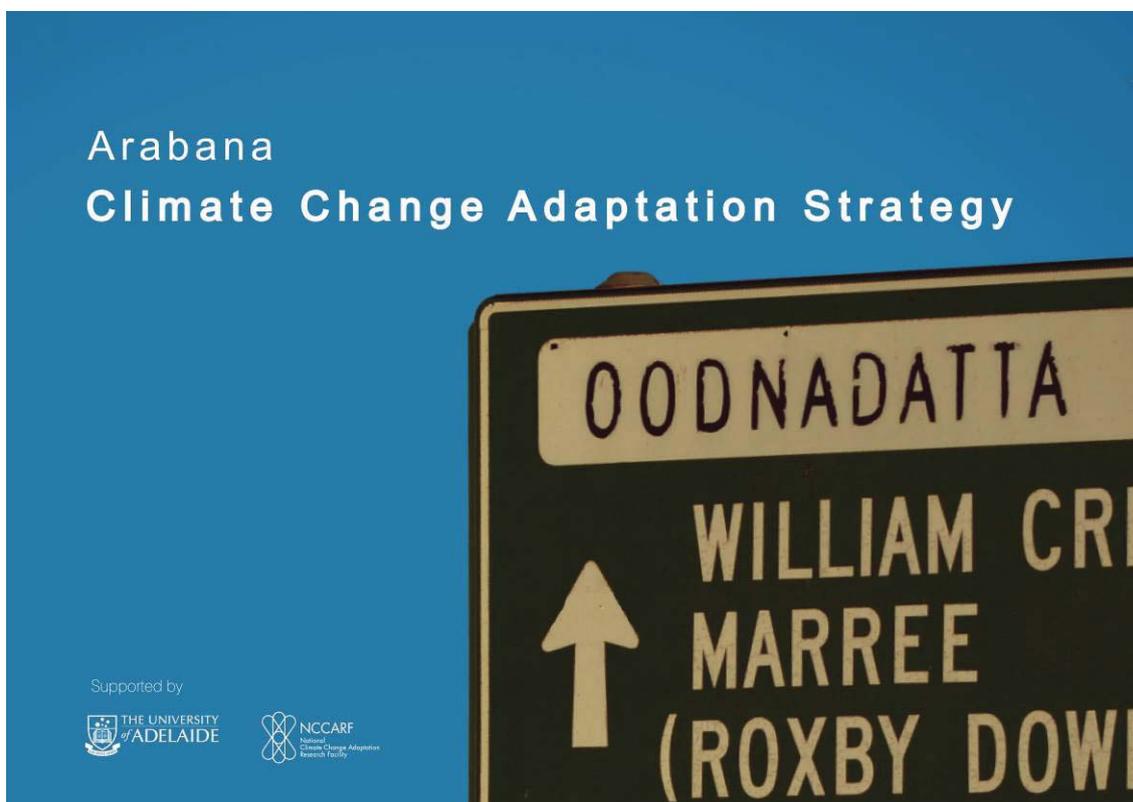
What is this project? If the climate does change by that amount, it could have a big impact on Arabunna Country and its people. This project, a collaboration between The University of Adelaide and Arabunna, aims to identify how vulnerable the community and country is to climate change and how to adapt to those changes.

Why are we doing this? The aim is to contribute to the development of climate change adaptation plans for Indigenous Australians. Many Indigenous Australians have connections to country but also live elsewhere – how do we manage something like climate change across the places we live and work? By collaborating with Arabunna we can develop some collaborative-generated know about community based adaptation.

What have we done so far? We have developed a consultation protocol for conducting this research project. We are developing a scientific report which sums up the key impacts of climate change for Arabunna and their country. Researchers have been visiting regions around Australia to find out about what capacity Arabunna have to respond to climate change. In particular information has been collected about wellbeing, governance and infrastructure.

What's next? We will continue to undertake 'network' research into country governance, wellbeing and infrastructure capacity of the Arabunna people. The scientific report will be reviewed by experts and turned into information materials to give to the Arabunna people. We will then meet with Arabunna people to present the science and give about perceptions and ideas about climate change predictions, risks and how to adapt to a changing climate. Information collected will then be presented in a series of reports about options for climate change adaptation. Any Arabunna person will be able to access copies of all formal project outputs.

APPENDIX 2: ARABANA CLIMATE CHANGE ADAPTATION STRATEGY



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Disclaimer:

At time of printing, this is the version endorsed by the Arabana Board of Directors via formal motion in December 2012. It is however a living document, subject to change and amendments over time. This Report has been written with the support of the University of Adelaide and was funded by the National Climate Change Adaptation Research Facility (NCCARF). The views expressed in this report are not necessarily the views of the University of Adelaide or the NCCARF and they do not accept responsibility for any information or advice contained therein. While every effort has been made to ensure that the contents of this report are factually correct, neither the University of Adelaide or NCCARF nor the authors accept responsibility for the accuracy or completeness of the contents of this Report, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this report.

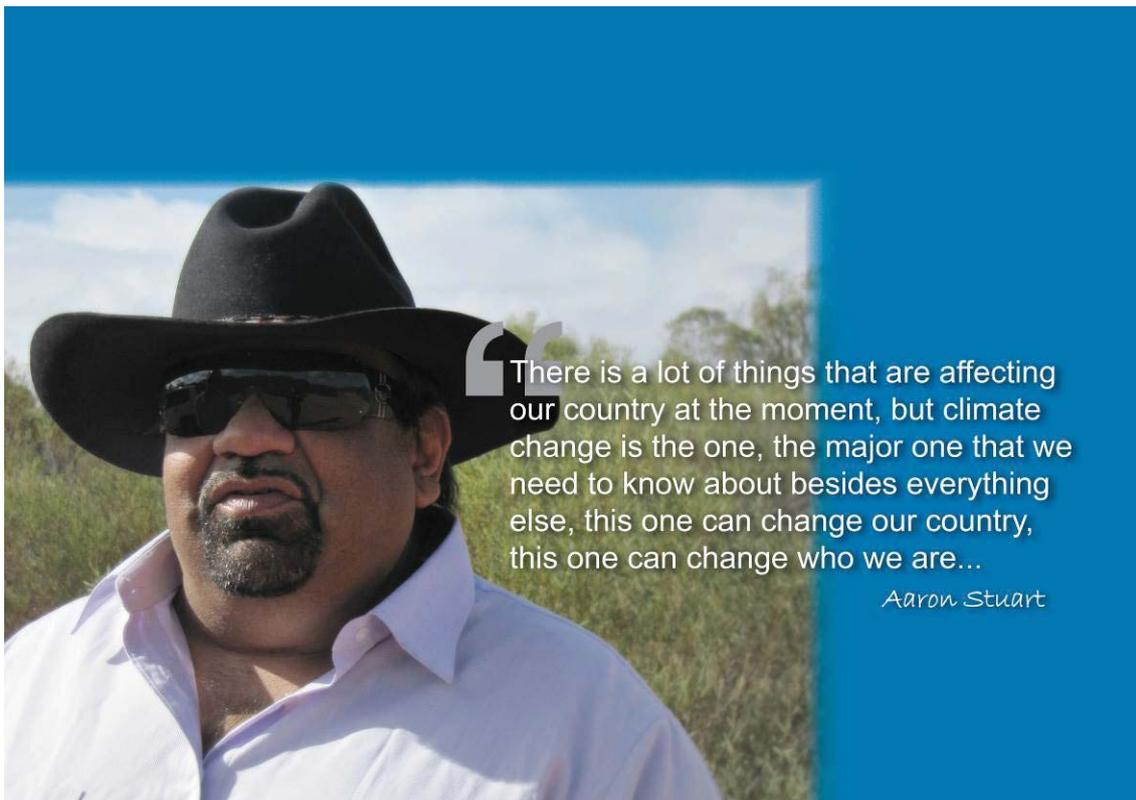
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Arabana

Climate Change Adaptation Strategy

April 2013

3



Introduction

Climate change is a major challenge facing the world. The United Nations has said that Indigenous peoples like the Arabana the whole world over will be affected by climate change. This means that Indigenous peoples will need to build adaptation strategies.

We the Arabana, are one of the peoples of the Lake Eyre. Due to colonisation, relocation, missionisation and the old Ghan Railway, we are now living across all of Australia, including Alice Springs, Oodnadatta, Maree, Adelaide. Some of us still work on country in the pastoral stations of Macumba, Peake, Anna and William Creeks.

This document sums up how we, the Arabana, are thinking about climate change, how it affects us, and what priorities we have decided are important in relation to climate adaptation. This document is a living document, that will be built on over time as we start to get actions happening. It is based on information we gathered during a year long project into climate change where we worked with University researchers to identify the science, risk, governance, technology and resilience dimensions of climate change for Arabana people and country. We learned that while Arabana people are very resilient and have a history of adaptation that the challenges of climate change are immense, and will affect our country and people. So we must work together to do something about it.

This document expresses our intent to build on our current strength, and our history of adapting to change over thousands of years to work together as a people to respond to this next challenge – that of climate change.

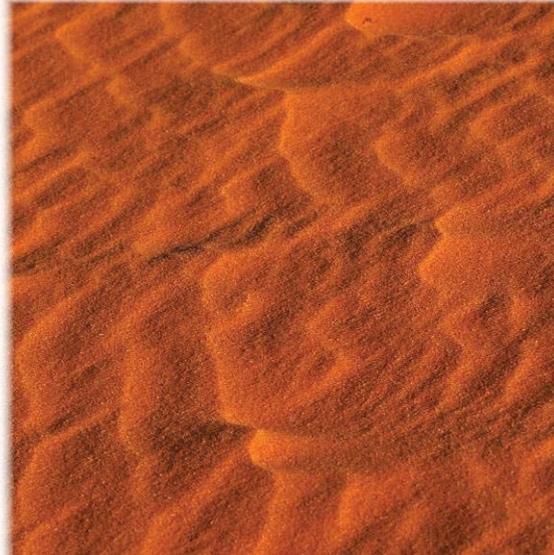
What do we mean by adaptation?

Adaptation is the process we use to respond to changes in our lives once the effect has occurred.

What do we mean by climate change?

Climate change is occurring when there is a change in the long term (over years) weather patterns, such as in rainfall, or storm/cyclone events, and which can cause impacts such as flooding, drought or sea level rise.

This is different from the weather which is the day to day climate – the temperature, wind, rain or sun we get on a day to day basis.



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Climate Change - what is likely to happen in Arabana country and places where Arabana people live? Why do we need to adapt?

A climate science report written by Dr. John Tibby (2012) shows that whether we live in Darwin, Alice, Adelaide, Port Augusta or Maree, our people will experience the impacts of climate change. Our country too, is going to be affected.

What are the main impacts that Arabana need to prepare for?

Projected changes to Arabana Country

The report has found that a significant degree of climate change across Arabana Country now seems inevitable, and is likely to become increasingly apparent during the second half of the 21st century.

The report says this is a big challenge for Arabana people because the changes to climate might not be gradual but could happen in a series of steps, starting in the next twenty years.

For Arabana people living in Country, this is more challenging as we already live in a place with a very unreliable climate. This means Arabana people will have to adapt to the double challenge of dealing with natural variability plus climate change.

In population centres such as Maree and Coober Pedy, the climate is projected to warm by between 1.0 and 1.5°C.

This amount of warming is equivalent to the current temperature difference between Port Augusta and Roxby Downs. For Port Augusta, change is more moderate and likely to be between 0.5°C and 1.0°C.

It is probable that the degree of warming that will be experienced in the period 1990 to 2030 will be greater than that experienced in the 20th Century.

Arabana Country cont...

This highlights that it is not only the degree, but the rate and manner, of warming that will present adaptation challenges for Arabana people in Country.

By the year 2070, the next step in change is projected with temperature increases in Arabana Country by between 1.2 and 4.7°C. Warming will be greatest in Summer and Spring with warming of 1.3°C to 5.1°C and 1.3°C to 5.3°C depending on how much carbon people keep polluting the atmosphere with.

In Maree the number of really hot days above 40°C will rise from 28 to 37°C. In Oodnadatta, the number of really hot days above 40°C will increase from 37 to 47 by 2030. By 2070, projections indicate a doubling of the number of days above 40°C.

Predicting rainfall changes is more difficult. Some scientists suggest more, others less. However, when combined with predicted increases in temperature, substantial declines in the availability of surface water, run off and soil moisture can be expected as a result of substantial increases in evaporation.

Projected changes to Adelaide

In many ways the projected changes predicted for Adelaide are similar but more moderate than those that are projected for Arabana Country.

Under moderate scientific models the number of days predicted to exceed 40°C is likely to double (from 2.3 to 4.8).

Rainfall is projected to decrease 4% by 2030. By 2070, based on average model outcomes, a decrease in rainfall of between 4% and 7% is projected.

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Projected changes to Alice Springs

Annual average temperatures in Alice Springs are projected to increase by between 0.8 and 1.6°C by the year 2030.

Under moderate scientific models the number of days above 35°C will increase from 90 per year to 109 per year.

Scientists are less certain about the rate of temperature change in Alice Springs by 2070. Some suggest increases from 1.9 to 3.7°C, whilst others indicate a warming of 5.2°C.

Rainfall in Alice Springs by 2030 could decrease by 6%.

By 2070, the level of rainfall could decrease by 7% or increase by 6%.

Projected changes to Darwin

By 2030, annual average temperatures in Darwin are projected to rise by 1.0°C, with an increase of up to 1.4°C possible.

Median climate model predictions for Darwin indicate the number of days where the maximum temperature exceeds 35°C could rise from the current rate of 18 to 44.

By 2070, Darwin could see temperature increases in the range of 1.7 to 3.2°C.

Although this increase in temperature is less than other areas where Arabana people live, because Darwin is already a very hot place, the number of extreme days over 35°C could increase between 89 and 227 days depending on the level of carbon emissions humans continue to pollute the atmosphere with.



Dr. John Tibby

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Key issues

Our people have seen much change over many decades. The quotes on this page and the information in the tables on pages 10 and 11 are the key issues raised when the University people talked with Arabana about climate change.

"The old people say that if the land is sad, the people are sad. If you look at it now it's not like it was when they were growing up, so they are sad."

"Changes are mainly around where we went hunting and camping around Lake Eyre – now it's all dead, even the trees and bushes even around Finnis Springs, all dead, and here at four mile sand hills, much less. Another one the Bubbler – water today hardly any water there. Used to be birdlife, ducks and swans it sad to see that. Belly button plants don't see them so much on sand hills – parachelia too – another plant cattle used to thrive on, live on it, so could live on sand hills for weeks on end – couldn't find it now, but maybe cos of climate change, maybe cos of lack of rain."

"All the time I visit country – there's been a big change. Everything has changed, Completely changed. In my days when I was there, when I was a child, well, there seemed to be lots of plants and animals around – now they are dying out and there hardly any animals left and there are other animals there now like cats and stuff. They moved in. That's a big change –when I lived in Kurdimurka, it was a big sandy creek with gum trees, but there no trees or sand anymore. Even Kurdimurka itself we used to gather lots of yams and stuff nothing there now salt and sand killed it all."

"With climate change – the whole cycle of bush food as in kangaroos, you know, ...we can't get enough of that bush food and I know roos going into national park getting sanctuary – our country was good place years ago, lots of roos, turkeys, emus, and lots of goannas, lots of Perentie. Where now it's like hard to find – you know there is supposed to be fruit ready for this time of year but they not ripe at right time or even there to fruit. Climate change is affecting growing of things and also affecting trees."

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Water	
"Water is a big issue for us. Over the years we have witnessed many changes to the water courses and flows. Overall we have seen there is less water, whether from mining or climate change. If we are to move forwards as a people, we need to work out how to respond to the issue of less water, more intense storms, flooding and sea level rise".	"We could find water in soakages in old days – that's what we grew up on - nowadays hard to find water even in those soakages. That kept us alive then! What a marvellous job the old people done! We done hard yakka like the old people then, we started off with nothing. Everything done special way. Old people prepared for everything, had to work in with the land, the weather, the climate and we had watering points, bores, water holes, the rain was far apart, so we'd go from spring to spring.. happen no more, water going..."
Flora	
"As a people we have relied on plants and animals for food, medicine and for our traditions and culture. We have noticed many changes to the land, our plants and our animals. We need to work out how to bring some for plants and animals to come back, how to look after them and how to continue our cultural traditions and stories that relate to them. For example, the Perentie, the Perentie monitor is one of our totems, important for our dreaming but they are harder to find these days."	"When we used to go to creek and get spring onions out – yonkas used to eat all those berries- thinka – wild tomato – you see them sometime now but used to be thick eh, and those poppers we used to step on them eh. No more. And the trees are not really shady now eh, they are starting to die off, mulla – mulgas going, used to be thick but now these here now you can look straight through them."
Fauna	
"Lizards we had, big and used to be lots and in great numbers, big goannas and stuff like that hardly any now except for little ones, bearded dragons hardly any round now. See them everywhere, the shingleback, the sleepy lizard – hardly any more, in olden days they were in great numbers."	"In Marree, Mum used to go hunting for Perentie. Our dreaming. One of the things in our stories. Used to get them and eat them but not sure you get them so much today."
Weather	
"Over time, wherever we live we have seen a big change in the weather. This has included feeling it get hotter, but colder in winter, from seeing ice to not seeing it any more, to experiencing more intense rains and floods, but also it being dryer than it used to be, for longer."	"Used to be cold like it is now, and used to get a lot of wind and stuff, now the wind doesn't seem to be as strong, ground is all eroded, even camp at Kur-dimurka, plenty of sand, level, now more or less on a sand hill, high! Country sand hills all gone, sunk down earth or soil there before all blown away! Wind has had effect and it's hotter now too in summer time, and winter time bloody cold. Hotter now, hotter for longer maybe, always hot but more days now that are hot."
"Big dust storms and droughts those days -such big red dust you couldn't see anything wind just blew everything."	"You know there is some change – weather has changed when I first came here used to get ice on the windscreen a lot haven't noticed that so much, used to be regular thing you know."
"Tides and everything changes, coming up higher all the time – washing the grass areas and have to put matting stuff up where we sit, it is changing, ocean levels are rising in Indonesia places are sinking."	"Look here when I was a kid it would rain for months, even when it slowed down it still sprinkles – doesn't happen anymore."

Livelihoods

"A key priority for us is to work out how Arabana people, especially young people, can find work – wherever we live, and especially on and in country. If we want Arabana people to return to country, there has to be something there to assist them to live. A key way of us adapting successfully is being able to live sustainable and within our country. We need to find ways of living and earning a living via some form of livelihood."

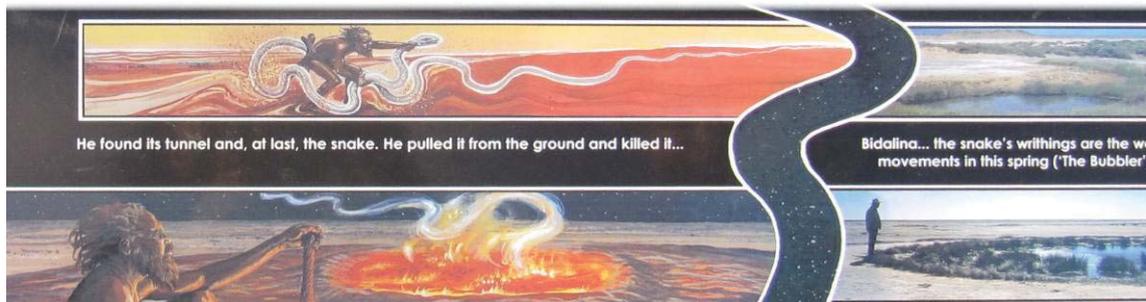
"I think Arabana are vulnerable to climate change – when you go out there – there is nothing there, if there was something there for people to live in Marree, Finnis Springs but there is nothing there- no working in the area, there is work in the mines if you want that sort of thing eh? ... persons like me may want to go sit down there, can't do that unless you are on a pension got a decent car, yeah and our traditional people, that's not there, there is no water, old people too hard for them, same as those two houses built at Dalhousie – employment too -why would you want to go live way out there unless you are working as a ranger unless there is work there? Got to be some kind of work you know, If there is work there, you don't mind going living there. It does matter - work creates need for schools, health services..."

Keeping culture

"Arabana people need to maintain culture and cultural tradition. We also need to keep our sites. Climate change has the potential to damage and in some cases erode our sacred and cultural sites altogether. This is something we need to think about and develop strategies to manage this issue".

"Dreamtime sites, including the Bubbler, are changing rapidly threatening the whole creation story for Arabana people."

"I think it's the loss of culture and traditions, the language, I don't know any language I tried to learn it and it is hard – a lot of this will be lost and that is a real shame."



Building on past strength by adapting forwards

"Arabana are strong, we'll be resolute, whatever we need to do we will do" (Syd Strangways 2012).

Goals

Based on the science, the consultation and the key issues that we are facing, we have identified a number of key priorities.

These are:

1	To keep connection to country as a pathway to building community, cultural regeneration and adaptation
2	To ensure that any action on climate change will also build the Arabana community
3	To ensure that our governance and communication of the issue of climate change represents Arabana across all of Australia, and covers not just Arabana country but builds the resilience of and connection between all Arabana, wherever they live

As a result of the above priorities we assert that action on climate change needs to be via the bringing together of three key issues: culture; environment; and people.



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Adaptation Actions

"You definitely need adaptation for the country. To keep it to be the beautiful place that it is. The place is changing so need to keep up with the change. That place is my heritage is my family – I want to take my kids out one day to show it to them "

1. CULTURE (Rekindling the Spirit)

Actions:

- Establish an annual May 22nd on-country gathering.
- Undertake a cultural audit (in partnership with universities).
- Prepare a cultural development plan.
- Establish *Cultural Keeping Centres* in Arabana Country and the places where Arabana people live..
 - o Initially for Arabana people to promote culture.
 - o Access to others (for a fee) to follow.
- Establish an Elders Sub-Committee.
- Support people returning to country by engaging them in cultural activities.
- Undertake cultural camps for young people on country.
- Establish an Arabana genealogy.
- Promote Arabana language.
 - o Arabana dictionary.
 - o Teach young people (e.g. on summer cultural camps).

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ENVIRONMENT (Taking Control of Country)

Actions:

- Develop an Environmental Management Plan incorporating:
 - o All country, not just Finniss.
 - o Environmental monitoring.
 - o Revegetation (focus on bush tucker plants).
 - o Establishment of a ranger station with rangers to implement the plan.
 - o Engagement with adjoining national parks.
- Establish a Land Management Sub-Committee.
- Have a caretaker at Finniss.
- Improve physical access to country including:
 - o Developing more tracks in Finniss.
 - o Develop access to other places (e.g. graves).
- Protect, restore and put plaques on sites of cultural importance.
- Establish infrastructure at Finniss to encourage more Arabana to visit including:
 - o Systems for rainwater collection/storage.
 - o Toilets.
 - o Power.
- Initiate political engagement with the mining industry relating to water extraction.
- Purchase more country through ILC.
- Tourism development.
- Lobby for place names to be returned to the Arabana names.

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PEOPLE

Actions:

- Build or adjust housing so that it is designed for climate change impacts.
- Encourage healthier living that will help Arabana people cope with a hotter climate and other climate change impacts.
- Establish education initiatives that will:
 - o Reinforce Arabana culture.
 - o Enable meaningful work to be undertaken.
 - o Access scholarship opportunities to support our brightest.
- Promote young people by:
 - o Understanding respect needs to go both ways.
 - o Encouraging them to continue the fight for country.
- Record the history of elders while they are still here.
- Generate and seek employment and livelihood opportunities.
- Make country more financially accessible to all Arabana.
- Establish a digital communication sub-committee.

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Priorities for Adaptation Actions

We cannot do everything at once, so we have to make some decisions about what is most important and build slowly to undertaking all the adaptation actions suggested above. It is also important to remember that a lot of the things we might do about climate change will also help us overall as a people, so we need to prioritise actions that bring together and help people, culture and the environment.

For now, we have identified a few pressing issues that we think represent people, culture and environment and which would be important first steps to working towards climate adaptation. They are not in order of priority of importance as they are all important to us. Some of these will be easier for us to do on our own or lead – such as getting back to country or developing land management, while others, such as the water situation will take a lot of work from us, in partnership with other groups and organisations.

Our strategy now is to maximise opportunities that become available to us. This could be accessing grant schemes, exchange programs, access to expertise and researchers and participation in research, climate change, cultural, environmental or Indigenous networks.



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PRIORITY

Setting up land management centres

"Set up outstations, rangers, monitoring programs for our country."

"This includes programs to undertake monitoring, fire burning, setting up nurseries, developing plans to develop heat management programs."

"Need to be on country to actually monitor changes and other things."

PRIORITY

Building connection and culture - bringing people back on/to country

"Need to strengthen people to withstand climate change, get them to look after that country, respect that land. Lots of people would jump on the opportunity to go back to country."

PRIORITY

Sorting out the water situation

"Water is the crucial thing. Finding ways of keeping water in country – you see mound springs drying up, it's really sad. Huge vulnerability. Need food for plants, shelter, not just about finessing modern options it's about survival out here. Not just putting in air conditioning there's a lot more to it that putting in an air con and getting petrol to fuel it."

PRIORITY

Getting young people involved

"You up against a lot of things with young people- they got TV, football, discos, games, hard to drag them away but when you get them up there they love it- the ones that are interested they really good. They love going out once they here. It's getting them here. We should get busload of youth up here every fortnight – not years apart, but regular, then they know, finish jobs off, see the country. We got to be there to look after country and then hand over to the young people. Otherwise it will fall away, As soon as it starts they will click then."

"Get young kids to go out on camps to country, get young kids taken out by old folks."

PRIORITY

Building local economies

"I think we need to get something like tourism back on country there now we have native title. There has to be something back there, whether in Marree or Finnis Springs, something so that people can visit it, a cultural centre there, something big for the tourists to see, if you got tourists visiting it gets all over the world."

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Some good ideas

Now we have thought about climate change, understand the impacts of climate change, what we might experience and how we have adapted to change over thousands of years, we can now think about adapting forwards.

Based on the priorities we have just outlined, here are some good ideas about groups and programs we might use and access to help us start implementing our adaptation actions and build connection between Arabana people, our culture and the environment.

Drought prevention:	www.drought.unl.edu/Planning/PlanningProcesses/DroughtReadyCommunities.aspx 4 9/26/11:sw
Climate adaptation	http://www.ukcip.org.uk/wizard/
Engaging communities	wwf.panda.org/about_our_earth/all_publications/?uNewsID=162722
Adaptation database and planning tool	www.icleiusa.org/programs/climate/Climate_Adaptation/adaptation-database-and-planning-tool-adapt
The Traditional Knowledge Revival Pathways Project	http://www.tkrp.com.au/
Tribal Climate Change toolkit	www4.nau.edu/itep/index.asp
Grant options	The Christensen fund: http://www.christensenfund.org/
Working on Country	http://www.environment.gov.au/Indigenous/workingoncountry/index.html and http://www.environment.gov.au/Indigenous/grants.html
Ranger and Land Management Training options	http://www.environment.gov.au/Indigenous/workingoncountry/training-providers/tafesa.html
Setting up Indigenous Protected Areas	http://www.environment.gov.au/Indigenous/ipa/background.html
Urban Adaptations	http://www.c40cities.org/about
Climate Friendly Building Design	Centre for Appropriate Technology: http://www.icat.org.au/

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Not the end...

We have started the journey of adapting to climate change. This document sums up some of our issues and plans for how we could deal with it. It will be a long journey but we are a resilient people and this is an opportunity for us to continue to build ourselves, our country and our traditions.

“ We got to talk together, stick together and try to do something there... work together, and everybody can get success.

Ken Buzzacott ”

APPENDIX 3: RESEARCH PROTOCOL

**Community based adaptation to climate change:
the Arabunna, South Australia**

Research Protocol



April 2012



Introduction

This research protocol relates to the project called: *Community based adaptation to climate change: the Arabunna, South Australia*, funded by the National Climate Change adaptation Research Facility and hosted by the University of Adelaide.

The Protocol provides a guide to how the research team will work with the Arabunna people on this research project.

We are doing this project because it is now clear that our climate is changing and that the rate of change will get greater and greater as time goes by. It is also clear that the changes will be different from place to place in Australia and the world.

Some places will get much hotter. Some places will get drier, others wetter. Things that grow now, won't grow in the same places in the future. Animals and people won't be able to live on the same things. So what does climate change mean in Arabunna country and in the main places where Arabunna people live? How can Arabunna people, and other Indigenous people adapt to the changes and challenges that are coming? How can Arabunna people set things up to look after their country and support the lives of the grannies and grannies to come? These are the kind of questions that this project is about.

This protocol sets down some principles on how we will all work together to answer these questions. This protocol is founded on some important principles.

Context

We agree with the principle that Indigenous people must be full participants in research projects that concern them, be aware of the aims and methods of the research, and understand the results of the work.

Research undertaken by, with or about Indigenous peoples must be founded on a negotiated process of engagement and reciprocity between the researchers and Aboriginal people. This position is founded within the Declaration on the Rights of Indigenous Peoples (UN 2007) which states, in Article 31:

"Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts".

Numerous other documents including The Protection of Traditional Cultural Expressions/ Expressions of Folklore: Revised objectives and principles (WIPO 2006a) and The Protection of Traditional Knowledge: Revised objectives and principles (WIPO 2006b), as well as the UNESCO (2003) Convention for the Safeguarding of the Intangible Cultural Heritage along with the Convention on Biological Diversity (1992) are also important to note in this research context.

The project, *Community based adaptation to climate change: the Arabunna, South Australia* is an innovative project bringing together the Arabunna people and a team of researchers including Indigenous researchers, to work from both the Indigenous and Western knowledge as well as disciplinary positions.

Therefore, respecting Indigenous rights, acknowledging and sharing authority within the research process, and ongoing responsibilities of discussion and negotiation and demonstrating research outcomes are central to this protocol.

Purpose

The research will be conducted by all research team members respectfully of these standards and consistent with the standards set out in the Australian Institute of Aboriginal and Torres Strait Islander Studies Guidelines for Ethical Research in Aboriginal Studies.

The Australian Institute of Aboriginal Studies (2011) defines fourteen key principles and these too are to be considered and drawn on to develop an agreed set of protocols in relation to this research project with the Arabunna people. The protocol sets standards for how research with the Arabunna is conducted which:

- respects Arabunna cultural values and obligations;
- respects Arabunna people's right to self-determination;
- acknowledges Arabunna rights to natural and cultural resources;
- recognises the rights of Arabunna people in their cultural and intellectual property; and
- seeks benefit for Arabunna from research conducted on their land, in their waters and in their communities.

Overall Principles of Practice

All members of the research team will:

- respect Arabunna rights and authority over their knowledge.
- be aware of the diversity of the Arabunna people.
- while acknowledging the diversity between Arabunna peoples and families, we commit to speaking, where possible, to those with appropriate responsibility and the right to speak to us during our research consultation.
- commit to keeping Arabunna informed through the Arabunna Ularaka Association of our movements on and off country. The Arabunna Ularaka Association will act as the main point of contact with the research team and will help the research team establish contacts with Arabunna people.
- commit to the appropriate taking and use of images and video. This will be negotiated on an individual basis as part of the informed consent process, and for overall publications, agreed to with the Arabunna Ularaka Association. Agreements will be made on an ongoing basis.
- seek to keep Arabunna people informed about what we are using written and verbal methods (internally within the project team and externally with the Arabunna) to (i) establish and maintain updates about the project progress and (ii) provide a means by which Arabunna may input into the project at any time (i.e. via blogs, or email, or face to face etc.).

Prior informed consent

1. All researchers on the team will talk to Arabunna people about participating in the project and get their informed consent before starting research with them.
2. It is understood that consent is an on-going process. Any Arabunna person may withdraw from the research/process at any time up until draft reports or publications are presented for comment.
3. The research team will have regular meetings with the Arabunna Ularaka Association to discuss the progress of the project.
4. The research team will keep the Arabunna Ularaka Association informed about the project and its progress. Drafts of reports and publications arising from the project will be sent to Arabunna for comment in a reasonable time.
5. The Arabunna Ularaka Association may require removal of any part of the report or publication that contains confidential information, or interferes with their intellectual property rights.
6. On completion of the project, the Arabunna Ularaka Association will receive copies of all final reports and publications resulting from the project. A plain English summary of the project will also be provided by the project manager.
7. Arabunna people will be given the opportunity to participate at all stages of the project, where appropriate. This will include ongoing negotiation about issues of storage, access and attribution as they arise.

Attribution

Researchers will as a first step, reach agreement with the Arabunna Ularaka Association about the identification of individuals involved in the research. Other individuals and families will be identified over the life of the research project.

Information obtained from the Arabunna will be acknowledged in any publication or report.

Consideration of whether or not Arabunna individuals are co-authors on any formal peer reviewed publication will be negotiated between the research team and the Arabunna Ularaka Association on a case by case basis.

Benefits

Where possible, the research team will provide employment, training and capacity-building opportunities for the Arabunna people as part of this project (i.e. as cultural advisors, assistant field staff and as community facilitators for the collection and analysis of research data).

The project is unable to pay informants for their participation in interview and other processes.

The research team will commit to facilitating, wherever possible, benefits to Arabunna people arising from the project.

Intellectual Property Rights

Researchers will respect the rights of the Arabunna people to ownership and control over their Aboriginal cultural and intellectual property which includes the rights to cultural knowledge.

Specifically, any intellectual property considered sacred and/or culturally restricted (including Indigenous stories) will remain owned by those custodians who provide stories and cultural knowledge to the researcher.

Confidentiality

Researchers will respect cultural restrictions on knowledge.

As such, researchers will consider all information gained in undertaking the research project as, *prime facie*, confidential and not use or disclose any of that information until they receive full and prior consent from the Arabunna Ularaka Association or the individuals who know the restrictions and manage them as part of their cultural responsibilities.

Media

Any media interest generated from this project will be discussed with the Arabunna Ularaka Association prior to responding.

We commit to where possible doing joint media with the Arabunna.

Ethics Approval

This project has been formally approved by the University of Adelaide's Human Ethics Research Committee, Number H- 296 – 2011.

Access and Storage

Researchers will ensure that appropriate procedures are in place for the storage and subsequent access to the research in consultation with Arabunna.

For further details contact:

Dr. Melissa Nursey-Bray, Project Manager and Leader of Climate Adaptation Fieldwork:
0437 738 635

Mr. Aaron Stuart, Chair, Arabunna Ularaka Association:
0419842464.

Professor Veronica Arbon, Leader, Wellbeing Project:
0488909449

Dr. Deane Fergie, Leader, Social Sustainability Fieldwork:
0459846551

