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Country, climate change adaptation and colonisation: insights from an Indigenous adaptation planning process, Australia

Melissa Nursey-Bray [a,*]**, Robert Palmer** [b]

[a] *Department of Geography, Environment and Population, Faculty of Arts, University of Adelaide, Adelaide, South Australia, 5005, Australia*

[b] *Department of Media, Faculty of Arts, University of Adelaide, Adelaide, South Australia, 5005, Australia*

[*] Corresponding author.

E-mail address: Melissa.Nursey-Bray@adelaide.edu.au (M. Nursey-Bray).

Abstract

Indigenous peoples are going to be disproportionately affected by climate change. Developing tailored, place based, and culturally appropriate solutions will be necessary. Yet finding cultural and institutional 'fit' within and between competing values-based climate and environmental management governance regimes remains an ongoing challenge. This paper reports on a collaborative research project with the Arabana people of central Australia, that resulted in the production of the first Indigenous community-based climate change adaptation strategy in Australia. We aimed to try and understand what conditions are needed to support Indigenous driven adaptation initiatives, if there are any cultural differences that need accounting for and how, once developed they be integrated into existing governance arrangements. Our analysis found that climate change adaptation is based on the centrality of the connection to 'country' (traditional land), it needs to be aligned with cultural values, and focus on the building of adaptive capacity. We find that the development of climate change adaptation initiatives cannot be divorced from the historical context of how the

Arabana experienced and collectively remember colonisation. We argue that in developing culturally responsive climate governance for and with Indigenous peoples, that that the history of colonisation and the ongoing dominance of entrenched Western governance regimes needs acknowledging and redressing into contemporary environmental/climate management.

Keywords: Environmental science, Anthropology, Geography

1. Introduction

Anthropogenic climate change is already changing the world's weather patterns (Rickard et al., 2016) and is predicted to have far reaching and disproportionate impacts upon Indigenous peoples (Macchi, 2008; Reisinger et al., 2014, 2014; Bardsley and Wiseman, 2012; Government of Australia, 2015) and in Australia, they will be particularly vulnerable to temperature increases, health, social and cultural impacts on their country and people (Basher et al., 2001; Berry et al., 2010; Green, 2008; Bird et al., 2013; Green et al., 2009; Reisinger et al., 2014; Race et al., 2016; Green and Minchin, 2014). This is of particular importance, as for Indigenous Australians, country is a fundamental concept. The term 'country' is commonly used to denote the traditional land/seas that belong to an Aboriginal or Torres Strait Islander cultural group. Indigenous peoples identify each other by their country, and 'caring for country' is a term used to denote the traditional and ongoing management of Indigenous land and seas. Country is a holistic concept that prescribes ways of seeing and doing for Indigenous peoples and is underpinned by a belief that all things are connected, and that Indigenous peoples belong to and are part of their own country.

Due to the predicted impacts of climate change, Green et al. (2009) concluded that it is imperative to develop:

> Well-articulated adaptation strategies for Indigenous people in collaboration and partnerships between Indigenous communities, government, research, and non-governmental organisations (Green et al., 2009, p. 2).

However, such initiatives do not occur in a vacuum. As Veland et al. (2012) highlight, environmental management initiatives are not as successful if universal assumptions about Indigenous vulnerability do not also recognise the ongoing legacy of colonisation and overlook the cosmologically determined risks that determine Indigenous capacity to care for their country. They argue that when conducting adaptation planning, researchers should "epistemologically ground proof risk assessments and to listen and engage in conversations that create ways of 'seeing with both eyes, while not being blind to the hazards of colonisation".

This paper reports on a such a project — a detailed case study of Indigenous adaptation in Australia, (a collaborative partnership between the Arabana people from central Australia, and a team of Indigenous and non-Indigenous researchers) which resulted in the production of Australia's first Indigenous adaptation strategy. For the Arabana, climate change adaptation is based on the centrality of country, it needs to be aligned with cultural values, and focus on the building of adaptive capacity. However, overall, we found that any discussion of adaptation cannot be divorced from the historical context of the Arabana experience and collective memory of colonisation. We argue that in developing culturally responsive climate governance for and with Indigenous peoples, that that the history of colonisation and the ongoing dominance of entrenched Western governance regimes is acknowledged and then redressed in contemporary environmental/climate change management.

2. Background

'Adaptation' as defined by the Intergovernmental Panel on Climate Change (IPCC) is an "adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm of exploits beneficial opportunities" (IPCC, 2007, 869). This definition has been interpreted in multiple ways. While top-down adaptation approaches have merit, community-based adaptation initiatives add further nuance (Collen et al., 2016) and are particularly appropriate for engaging Indigenous communities (Alam et al., 2012; Ford et al., 2016; Heltberg et al., 2010). They also differ from top-down models of environmental management in two key ways. First, the developmental process encourages close involvement of local stakeholders, so they become participants (not just subjects) in the study, and the integration of culturally appropriate knowledge into adaptation plans is facilitated (McNamara, 2013).

This bottom-up, participatory approach to adaptation planning also allows for the identification of specific local vulnerabilities, which builds upon experiences and knowledge at local levels by democratizing the enquiry (Huq and Reid, 2003; Krimerman, 2001; Olsson et al., 2004; Rojas Blanco, 2006). Giving a voice to local stakeholders early in a process also makes it harder to ignore identified priorities and issues (Garcia and Lescuyer, 2008) and helps make environmental management outcomes more sustainable (Bodin and Norberg, 2005; Balteneu et al., 2014). Community-based approaches can also build social capital (Ebi and Semenza, 2008, p. 502) and build understanding of generational observations and perceptions about change over time (Herman-Mercer et al., 2016).

Local knowledge is a key resource (McNamara and Buggy, 2016; Ensor and Berger, 2009) enabling observations of change at local levels to be factored into adaptation planning (Riedlinger and Berkes, 2001) thus adding value to

larger scale climate observations (Barnett and Campbell, 2010). Indigenous farmers in Bolivia for example, associate their observations of climate change with other social and environmental changes, with climate change all part of a cycle (Boillat and Berkes, 2013). The incorporation of scale is an argument advanced by MacKinnon (2010) who says that community-based adaptation needs to be cognisant of wider scalar practice, a point particularly relevant in the multi-level and scalar governance regime that occurs in the Australian context. Environmental management can then occur as a social process that acknowledges heterogeneity and different socio-cultural contexts and supports adaptation at multiple scales and within multi-governance regimes (McNamara and Buggy, 2016). Local adaptation planning can also help build resilience as shown in examples from toolkits for climate adaptation planning in Cambodia and Vietnam show (Jacobson and Chanseng, 2016, Tran et al., 2013).

Nonetheless, there remain many challenges in executing adaptation, including understanding the role of values, and the need to understand institutions (Ford et al., 2016; Spires et al., 2014). There are also psychological barriers to adaptation, typified by Gifford (2011) as the 'dragons of inaction' which include limited cognition about the problem, and a contest between different world views. In other words, it is too easy to over romanticise the notion of 'community' and run the danger of over-emphasising the vulnerability rather than agency of such groups. It is important to acknowledge the fact that Indigenous peoples have often been active agents in landscape and environmental change (over millennia). Studies of the Cree community of Wemindji (Sayles and Mulrennan, 2010), Panama (Apgar et al., 2015) and Indigenous Australia (Gammage, 2011) are just two examples highlighting how cultural practices build leadership, social networks and the capacity to support transformative adaptation (Apgar et al., 2015).

The investigation of power relations is another important determinant that affects the success (or not) of community adaptation trials; the legitimacy of the community to speak is crucial (Panditharatne, 2016). As Dodman and Mitlin (2013, p. 645) note, there is a tendency "to assume that communities are simple homogeneous entities, yet communities also involve a variety of power relationships and exclusions". Community based adaptation programs in Indonesia (Yoseph-Paulus and Hindmarsh, 2016) and Nepal (Regmi et al., 2016), have also been hampered by a lack of inter-sectoral coordination and inability to accrue benefits equally across the community.

The building of community-based adaptation in Indigenous contexts therefore is a challenging enterprise and adds yet another layer to the already often huge set of challenges Indigenous people face. Investigating how they can be supported, and

what cultural difference may affect their development and implementation, can yield important insights that can help refine current and contribute to the success of future programs. Given this context, we now specifically report the results of a five-year research project that resulted in a community-based adaptation program developed by the Arabana people, traditional owners of the Kathi Thanda-Lake Eyre region of central Australia, which is in the state of South Australia (2010–2015). The aim of the project was first to assess the vulnerability of the Arabana to climate change, and second, to build a community-based climate change adaptation strategy responding to the findings of the assessment. We report on the results of the latter. In so doing we sought to understand what conditions are needed to support Indigenous driven adaptation initiatives, if there are any cultural differences that need accounting for and how, once developed they be re-integrated into existing governance arrangements. While our results are based on our work with the Arabana people, we suggest they offer useful reflections relevant to other Indigenous peoples and climate change adaptation planning projects.

2.1. The Arabana people

The Arabana people are an Indigenous group, whose traditional country is located in central Australia and includes Kathi Thanda-Lake Eyre. Kathi Thanda-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. The catchment is described as comprising between one fifth to one sixth of the Australian continent. Its drainage basin is over 1.2 million square kilometres, and at 15.2 metres below sea level in its eastern perimeter, it is Australia's lowest point (Nursey-Bray et al., 2013). The region experiences little rain, and the lake floods on average only four times a century; although between 2006 and 2016 there have been many more rain events than usual.

Originally named after the English explorer Edward John Eyre, the lake was re-named from Lake Eyre to Kathi Thanda-Lake Eyre in 2012 to recognise the ongoing traditional Indigenous ownership by the Arabana people. The region is also the traditional land for the Anangu Pitjantjatjara Yankunytjatjata (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 Kathi Thanda-Lake Eyre basin working in pastoralism, tourism, mining and petroleum; as well as township-based work such as retail, education, medical and other services. The traditional country of the Arabana people is at the centre of this region and includes many sites of sacred spiritual significance to them.

The impact of colonisation was significant for the Arabana, and resulted in their dispersal from their country, with populations now living in Darwin, Alice Springs, Marree, Port Augusta and Adelaide (see Figs. 1 and 2 for details). As Fergie et al. (2013, 32) note: "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". This included the incursion during the late 1850s by explorers, who arrived hoping to establish pastoral businesses on land they took from the Arabana and other groups in the region. In particular, the explorer John Stuart used mound springs (which carry significant cultural value to the Arabana), as "a conduit of colonial invasion and Arabana control and care of their country and their people had been usurped" (Fergie et al., 2013, 36). Following this appropriation of land for pastoralism, between 1870 and 1872, the overland Telegraph route was laid in 1884, also cutting through Arabana country. During 1889, a railway was then laid along the mound springs, also facilitating further colonial intrusion upon Arabana country (Litchfield, 1983). For the Arabana, these events meant that they were moved into ration stations, and to work on pastoral properties as well as the railway (Paterson, 2005). As with many Indigenous peoples at the time, the Arabana also suffered from the introduction of diseases such as influenza, documented in 1919 by Dr Herbert Basedow, who writes:

> 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], cited in Shaw, 1995).

Finniss Springs Station, one of the pastoral ventures, emerged as particularly significant for Arabana people and has become an important part of their history. This is because its owner, Francis Warren, married an Arabana woman. In the 1930s, he invited the United Aborigines Mission to set up a school and church on Finniss Springs and a settlement was established. This history is important because the legacy of colonisation remains very real to many Arabana people, with some having grown-up in and around Finniss Springs and with many holding memories of dispersion, most notably caused by the railway that moved through their country. Consequently, the course of this history is influential in how Arabana people construct knowledge and respond to land management issues about their country, including climate change adaptation.
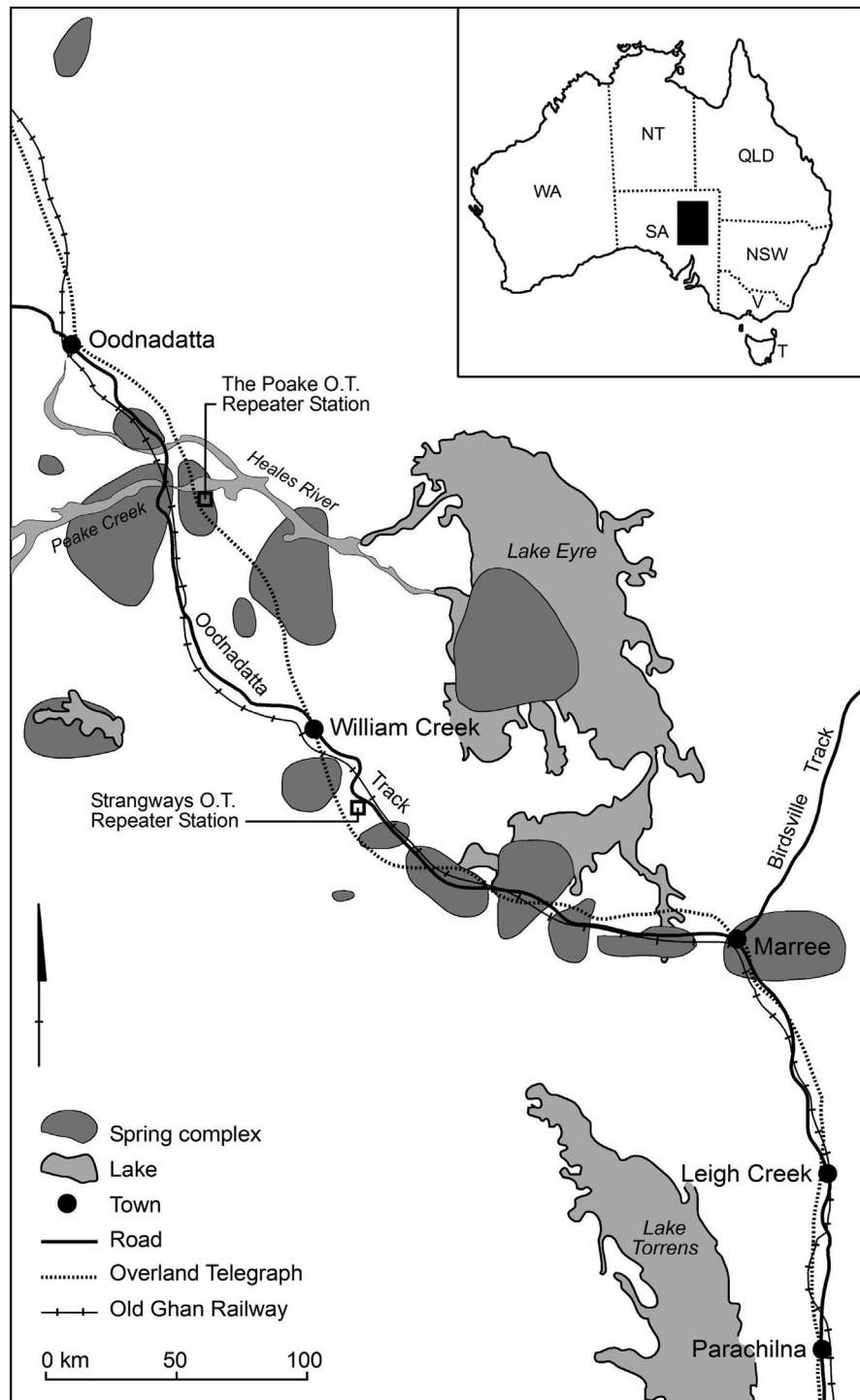
Fig. 1. The historical routes of colonisation mapped against the line of traditional mound springs (Reproduced with permission from C Crothers).
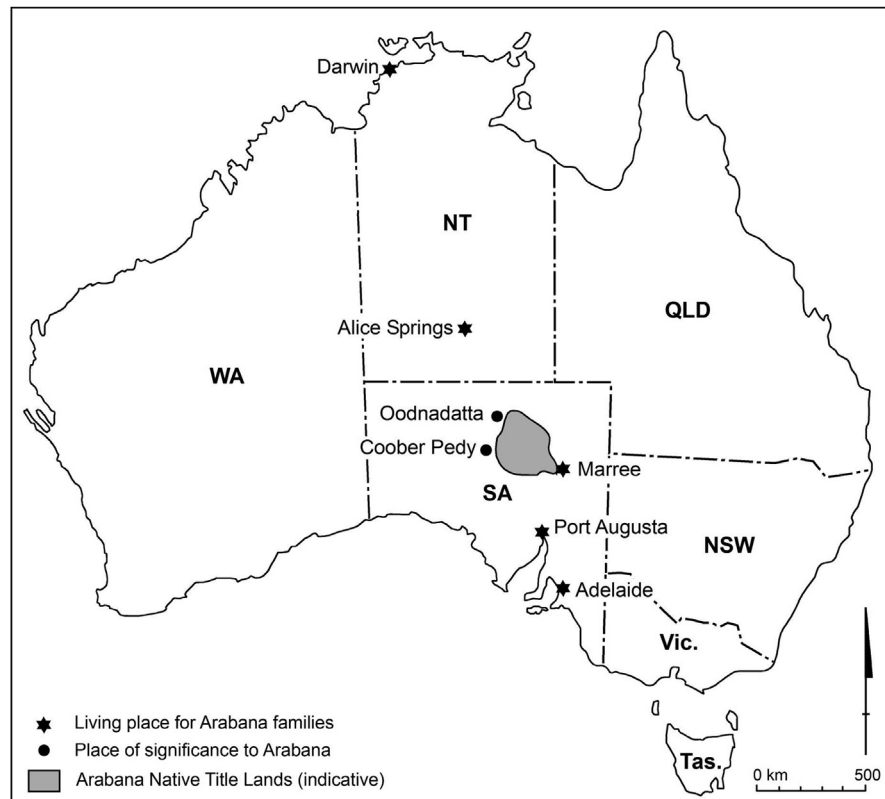
Fig. 2. Arabana Country, within Australia. Reproduced with permission from C Crothers.

3. Materials and methods

This project was conducted by an interdisciplinary team which included anthropologists, climate scientists, adaptation researchers, a communication specialist, two Indigenous Professors, (one of whom is an Arabana woman) and the Chairman of the Arabana Aboriginal Corporation. The Arabana Aboriginal Corporation (AAC) is the focal (and legal) point for all formal business on behalf of the Arabana. Based on community-based and participatory methodologies, (Arbon, 2008, Rigney, 2011, AIATSIS 2012) we worked with the Arabana Corporation and people at all stages of the research, co-involving them in development of the research questions, fieldwork, analysis of results, and preparation of the final reports. We also aimed to build community capacity in research, which took the form of training Arabana people to undertake research interviews for the team. Fourteen Arabana people were employed to work on the project. As such, we ensured that Arabana people were at the heart of the research, a process outlined by Arbon and Rigney (2014) who were the two Indigenous researchers involved in the research team. This paper is the complement to theirs.

The project received ethics approval from the Human Ethics Research Committee, at the University of Adelaide and it was formally endorsed (in minutes) and approved

to proceed by the Arabana Board of Directors. We conducted two periods of field-work, in which time we interviewed over 120 Arabana people and a further 25 participated in a community-based adaptation workshop. Arabana people were interviewed from across all the places that they now live, not just those living near or on traditional country, and we worked with both men and women, youth and Elders. By doing so, we not only documented information about Arabana country but contemporary places of residence, over a period of 100 years.

The process we used to collect information took place in four stages. In stage one, we commissioned a science impact report which identified what climate impacts had been observed and were predicted to be; not only for Arabana country but also for all the major population settlements where Arabana people now live. The second stage involved working together with Indigenous team members and the community to craft appropriate communications about these impacts, including a short film, flyers, and a web site. These communications were then used throughout the project to engage Arabana people in the project. The third stage involved two teams going out into the field. One team undertook a study into the adaptive capacity of the Arabana. The second team undertook a perception of risk and vulnerability study and documented Arabana suggestions for ideas of adaptation to those risks. A community adaptation workshop concluded the project and was attended by Arabana people from all over Australia. This meeting was used to present final project results, and then workshop and get agreement on the final Arabana adaptation strategy. This strategy was then endorsed formally by the Arabana Board of Directors (See Nursey-Bray et al., 2013).

We adopted a *values-based* approach for conducting the research work and then analysing our data. Values-based approaches have merit in helping understand the causes and significance of different cultural responses to climate change; indeed culture and values can affect adaptive pathways (Adger et al., 2012). Such values can be 'held' as in they are associated with ideas, behaviours, outcomes and experiences, while values attaching worth to an asset may be delineated as 'assigned values'. Reser and Bentrupperbaumer (2005) also discuss the difference between 'intrinsic' values, those that designate value to an asset in and of itself to 'use' values, that is those that are 'used' in some way. After Heberlein (1981) and as cited by MacDonald et al. (2013, p. 29) we define values as:

> Single, stable beliefs, which are used as a standard to evaluate action and attitudes. Values have two table characteristics which differentiate them from most attitudes. First, they transcend objects… Second, values are most central in a person's belief system. Values are the basis for emulating beliefs, and other linkages among beliefs.

O'Brien and Wolf (2010) argue that in order to play a significant role in climate change management, that values must be understood in their widest sense, and that values-based approaches assist in understanding adaptation needs and community perceptions of them: such as an approach is paramount to understanding how adaptations can be made equitable, legitimate, and culturally sensitive in the face of potentially irreversible losses (O'Brien and Wolf, 2010, 233). Understanding how Indigenous peoples value place and knowledge can give insight into what adaptation pathways to adopt (O'Flaherty et al., 2008; Harmsworth et al., 2016).

We thus applied a thematic values analysis to synthesise the results and drew on the approach used by Wolf et al. (2013) in a case study of two communities in Labrador Canada, whereby in mapping values via themes, they found that distinct values (e.g. tradition, freedom or harmony) affected interpretations of impacts while others acted as barriers to adaptation. In our case, by incorporating values as part of the process we could identify the more nuanced meanings that people attach to their everyday life, as well as the social determinants of vulnerability (Wolf et al., 2013). This enabled us to gather rich insights into how climate change *and* adaptation is understood and constructed by the Arabana people.

4. Results

Our results show that the Arabana have a millennia long history of responding to social and environmental change. They have a high level of local traditional and historical knowledge about climate change and as the following indicative quotes show, the Arabana people are not only worried about climate change, but have observed changes to the weather, flora and fauna over time:

> "I think climate change has a fair bit to do with it and I think it 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 perentie [large lizards]. 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).

Overall, our major finding is that climate adaptation emerged as a mechanism by which to redress the legacy of dislocation caused by colonisation, heal ongoing wounds, and build capacity by facilitating a return to country. One Arabana leader said: "just get people back on country and you will be fine" (Stuart, 2013 pers. comm.). As the following sections highlight, colonisation as subject and process, was the anchor point and conceptual lens that framed all discussions about climate change and managing or adapting to it. These results provide important insights for delivering environmental governance in this area, and we provide a synthesis of them below. Given the diversity of Indigenous nations in Australia and the world, we do not suggest any universality about these insights, but they do provide food for thought in relation to some of the challenges inherent in developing and then operationalising community based environmental management programs in the longer term.

4.1. Adaptation is for Arabana country rather than Arabana people

From the very beginning, we found that the impacts of colonisation set the discursive frame for discussion about climate change adaptation; initial decisions about the scope of the adaptation process focussed on the need to re-connect people with Arabana country. Over and again, interviews that began with discussions about climate change and adaptation turned to the history of the Arabana people and the ways in which they had been moved around and off their country. The cultural value and centrality of traditional country to Arabana identity, was so influential that the Arabana differentiated between place and people in the adaptation planning process:

> "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)

> "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).

"Think it needs to be for country cos like when they are living in town got [sic] all they need, but on country that's where you feel the heat and coldness" (Marree respondent 2, 2012).

This assertion of the importance of country is also a reminder that the Arabana, notwithstanding their removal and re-settlement across the nation, still prioritise their traditional lands; it is still their 'heart'.

4.2. Legitimacy to speak

This deep and enduring value placed on culture and attachment to traditional country also meant that across all the places Arabana people now live, there was tension between how Arabana people felt about impacts on their traditional country as against their experience of climate impacts in the places they might live now. This in turn raised questions about who or what they had the rights to speak for and whether adaptation should be 'here or there'. This concern over the legitimacy of 'traditional rights to speak' is typified by the (many) Arabana people from Darwin who were consistently wary of commenting on how to respond to climate change *in Darwin*, because "that is Larrakia country, not mine" (Darwin respondent 4, 2014). Thus, despite having lived in multiple other places since colonisation, in some cases almost all of their lifetime, Arabana people still do not feel they belong to those areas and cannot speak about or for it.

This was an ongoing refrain throughout the project and reinforced a collective decision that the adaptation strategy must be for Arabana *country*. This decision was also partly made on the basis that they felt as a *people* that they would adapt over time: "Climate change is an issue, but you can adapt to anything, you got to do it with what you got" (Adelaide respondent 1, 2012). In this way, colonisation was also used to assert the resilience of the Arabana people and ground the decision for adaptation planning to focus on country; they reasoned that if they could adapt and survive colonisation, they could also survive/adapt to climate change, but they were not sure the country could do the same.

4.3. Values matter: adaptation priorities align with Indigenous cultural values

In subsequently developing their ideas for adaptation action per se, Arabana core values, (as shown in Table 1) were aligned to the adaptation options they put forward. We identified a correlation between multiple adaptation options and a series of core Arabana values, including the values of country, culture, history and livelihood (shelter, food and water). For example, the right to have and maintain economic livelihoods was asserted as a value that needed embedding in adaptation and became inextricably linked to the assertion that it would redress some of the

Table 1. Arabana core values and aligned adaptation options within the Arabana adaptation strategy.

Value	Arabana words (indicative quotes)	Adaptation options suggested
History	"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 Finniss 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 that historical knowledge, take a tour think that would be good" (Alice Springs respondent 4, 2012).	Cultural keeping Centres Getting youth involved in tourism Teaching youth their family history
Place	"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). "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).	Going back to country Restocking native vegetation and wildlife
Livelihoods	"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).	Pastoralism on Finniss Cultural Tourism Rangers
Culture	"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).	Cultural revitalization Centres Enhanced use of ICT

Table 1. (*Continued*)

Value	Arabana words (indicative quotes)	Adaptation options suggested
Country	"Have some rangers. Look after it as a cultural place properly" (Darwin respondent 7 2012). "We need to set up one and management, in Marree, maybe Finniss…" (Marree respondent 2, 2012).	Setting up ranger stations Revegetation programs

economic and social inequalities that remain the legacy of this history of colonial dislocation for the Arabana. Adaptation was constructed as a means by which economic options could be reinforced and the building of adaptive capacity achieved by the resourcing of Arabana people to go back and live on country:

> "How are you going to accommodate projects on our country that can provide economic independence on our own two feet — don't want always to have to go cap in hand to government for assistance" (Darwin respondent 7, 2012)

> "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)

The maintenance and assertion of maintaining Arabana culture and values was also articulated as a means by which to revive and offset any cultural loss caused by colonisation and was mapped against the idea of developing cultural keeping centres. Cultural centres are perceived as fundamental to achieving adaptation as they could facilitate the conditions to revitalise the youth, keep knowledge safe and ultimately enable Arabana to care for their country 'the right way'. Thus, adapting to climate change involves cultural maintenance as a form of adaptation. This insight is consistent with work undertaken by Race et al. (2016) in central Australia, who also found that cultural components really matter in adaptation practice.

Table 2. Arabana criteria for effective climate change adaptation.

(i) That adaptation is holistic in nature;

(ii) That adaptation builds on the connection between economies and livelihoods and the environment/ country;

(iii) That adaptation has the capacity to redress old wrongs (derived from colonisation);

(iv) That adaptation recognise all forms of Indigenous knowledge

(v) That adaptation maintains a foci on building adaptive capacity rather than individual measures;

(vi) That adaptation assists in addressing wider governance challenges (not just climate, but other issues like mining) and;

(vii) That adaptation is consistent with or respects cultural and local forms of governance without iconising them in inappropriate ways.

4.4. Adaptation is holistic in nature

The final stage of the adaptation process, working out what it *actually looked like* resulted in a set of criteria that the Arabana people constructed as constituting effective adaptation (outlined in the Arabana Climate Change Adaptation Strategy, see Table 2 below). Given the cultural diversity that characterises Indigenous peoples, we do not presume to argue these criteria would be applicable across all Indigenous groups; yet we argue that working out what these are for each group would ensure better engagement and success. These criteria reveal a holistic appreciation of how to embed adaptation in everyday priorities. While the criteria reflect a desire to find some redress for the past, they also show a pragmatic take on the idea of climate change adaptation, and a willingness to use it to achieve other wider aims. In subsequent consultation with policy makers on this strategy, one participant commented that the Arabana adaptation strategy 'wasn't really adaptation, it's just more of the same'. Yet this synergy is the *point* of culturally situated adaptation such as this one; unless adaptation is holistic in nature, and achieves multiple aims, in effect value adding to existing social, cultural and economic goals, it is unlikely to progress. The holistic nature of these criteria also shows how the connection to country and the inextricability of land and people that are part of Arabana culture and history becomes embedded and manifest in their own policy.

4.5. Historical knowledge is relevant

The assertion of the value of multiple types of cultural knowledge, particularly historical knowledge was an enduring characteristic of this project. As Turner and Spalding (2013) note in a case study of Indigenous knowledge in British Columbia, the integration and incorporation of traditional knowledge into policy is an important element in adaptation overall. Traditional knowledge can help Indigenous peoples perceive and remember past climate variations (Leclerc et al., 2013). In this study, Arabana people did use traditional knowledge as the baseline around which observations of change were mapped, and aspects of traditional knowledge did inform adaptation measures. However, as the quotes in Table 3 show, it was the use of historical knowledge, spanning a period of one-hundred years in the region that was relayed by the Arabana, thus providing a localised interpretation of change in this period. These observations also chart changes to traditional knowledge about country.

This historical knowledge about observed change, is largely derived from the results of the Arabana experience of forced relocation, employment (on the railway and pastoral stations) and other impacts caused by colonisation. The following quotes exemplify these reflections:

Table 3. Examples of Arabana historical knowledge and observed change.

"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 are 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" (Alice Springs respondent 1, 2102)

"Weather unpredictable, it's getting hotter whereas one time you knew the season 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).

"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 Kurdimurka, 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 its 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).

"Used to be could get 17 lizards in just 20 km 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. Printi 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).

"Lizards we had big ones, 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 sleep lizard, hardly any more, in olden days they were in great numbers" (Alice Springs respondent 1, 2012).

"When we used to go to creek and get spring onions out, yonkas used to eat all those berries, thunka, 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).

"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).

"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).

"Got job on railways, followed jobs, big drought Finniss, 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).

"We moved to Alice Springs with Dad's 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).

Collectively, Barber et al. (2014) construct this as 'working knowledge', that is, the mix of historical and traditional knowledge that so often characterises Indigenous knowledge systems today. It is however often ignored by policy makers in the prioritising of what is constructed within Western epistemes as the 'real' traditional

knowledge. This study highlights that there is a vast store of recent historical Indigenous climatic, ecological knowledge and social history held by the Arabana people and we would suggest by many other Indigenous peoples. We argue that to ignore this historical knowledge is not only ignoring a valuable data source but reinforces colonial practice in the choosing of what is considered 'appropriate' cultural knowledge (according to Western mores) for inclusion into policy.

4.6. Circular not linear implementation

Finally, analysis of the process of implementation of the Arabana Adaptation Strategy, launched in 2014 shows the fracture points between and the challenges of bringing together Western and Indigenous environmental governance regimes. Consistent with Indigenous ways of doing (Howitt, 2001), the way in which the Arabana have approached implementation of the strategy is not as a linear process focussed around the paper *product*; instead, they have used the strategy in a circular manner, employing multiple dimensions of it, as a part of ongoing and *other* planning *processes*. This is because the adaptation options they suggested have multiple uses, and so their implementation will also help the Arabana meet and succeed in a number of their other goals. For example, the adaptation strategy ignited interest from the Nature Conservancy, a non-government organisation, which, along with the Indigenous Land Corporation, provided funding for a Healthy Country Plan for parts of Arabana Country in 2014. This plan drew extensively from the adaptation strategy and built on its objectives by making climate change adaptation a key priority. In turn, that plan provided the Arabana with an opportunity to enter into discussions with government about the key issues identified in the adaptation strategy, including obtaining funding for rangers, negotiations about mining proposals on their country and for the development of management frameworks such as Indigenous Land Use Agreements. Further, the Arabana people are now members of a small group of Indigenous peoples in Australia that are working on adaptation options for Indigenous peoples more broadly, facilitated by the Social, Economic and Institutional Dimensions Network that is coordinated by the National Climate Change Adaptation Research Facility (NCCARF). This circular, rather than linear approach, focussing on adaptation process and principles rather than the paper product, provides a more holistic and opportunistic perspective to adaptation overall; and ensures that Arabana values remain front and centre.

However, this approach to implementation is *not* consistent with Western (colonial) modes of decision making and hence achieving a cultural 'fit' between this initiative and the multiple other forms of environmental management arrangements in the State and nationally remains a challenge. In the Kati Thanda-Lake Eyre region, multiple jurisdictional and policy arrangements exist at local institutional, government,

state, and national levels. For example, at a national level, Australia has been divided up into 56 Natural Resource Management (NRM) regions, where resources have been devolved by the government to NRM Boards (composed of community representatives and paid staff), who in turn implement a range of environmental management activities. Yet as highlighted in Curtis et al. (2014), both in Australia and New Zealand, even models of devolved NRM governance are incompatible with adaptive management. There remain gaps between the 'haves' and 'have nots' in NRM regions in Australia (Robins and Dovers, 2007). Further, a range of co-management initiatives have been trialled that explicitly involve Indigenous peoples in a number of partnerships including Indigenous Protected Areas, jointly managed national parks (see Uluru and Kakadu) and Indigenous Land Use Agreements (ILUA). These programs provide overlapping jurisdictional spheres to what may be occurring at State or regional levels: in South Australia, the State Government has produced an award-winning Climate Change Adaptation Plan, with devolved governance a central plank to its implementation. Yet it does not resource the implementation of specific strategies such as the one developed by the Arabana, largely due to the fact it does not 'fit' within existing recognised governance bodies or the criteria developed by other institutions.

Further, organisational disjuncture, relating to lack of coordination between government departments, and in turn with communities, is a recurring theme in the implementation of community-based adaptation (Srinivasan et al., 2011). In Australia, while different government departments and policies are relevant to the management of the multiple (not all climate) risks identified by the Arabana (and at multiple scales), they are not institutionally linked to each other, nor obliged to connect to each other in day-to-day business operations. Indeed, other studies find that attempts to 'upscale' context specific adaptation projects, such as this one, into wider governance frames, results in piecemeal adaptation (Spires et al., 2014; Ayre and Forsyth, 2009).

Thus, while climate change impacts remain, the capacity to implement the core elements of the adaptation plan for the Arabana remains piecemeal and opportunistic and within most of these arrangements, the Arabana have minimal control or decision-making power. They remain both subject to wider, as well their own internal, governance regimes across multiple scales and geographical regions. Their own culturally driven and often informal modes of governance are largely invisible and certainly not catered for in planning.

5. Discussion

5.1. Collaborative and shared governance?

These results, while specific to the Arabana, can provide some wider implications of meaning and relevance to other Indigenous contexts. The Arabana are trying to

assert their own sovereignty by building their own responses to a challenge like climate change but need to find ways to integrate their activities with pre-existing, and largely, Western dominated land management models. These models are constructed within Western conservation paradigms and embedded within colonial frames which still influence how NRM is practiced and how broader policy is established (Barbour and Schlesinger, 2012). Further such formal governance regimes can camouflage the abuse of power imbalances that can occur, and which are often avoided in more informal governance processes, such as those occurring within and between Indigenous communities (Carter and Hill, 2007).

The development of the adaptation strategy for the Arabana highlights that policy around Indigenous climate adaptation must include a recognition of the legacy of colonisation, be holistically connected with livelihoods and the environment, and aim to build adaptive capacity. Our analysis shows that adaptation is not and cannot be divorced from wider and higher priority issues of cultural survival, political power, and place based economic autonomy. We argue that the success of adaptation as a form of environmental management requires new models of collaborative and shared environmental governance, underpinned by an acknowledgement of the relationship between, and legacy of, colonisation (Howitt et al., 2012; Jordan et al., 2010). Or as Rigney (2011) puts it, the settler state needs to settle with whom it colonises.

Incorporating Indigenous historical (or working) knowledge into adaptation planning is one such step. As Barber and Jackson (2015) find in a study on the management of dams and diversions in northern Australia, historical knowledge plays an informative role in understanding Indigenous perspectives in environmental management. Finding ways of embedding justice and equity as key governance principles is also a key step and implies not just recognition of Indigenous agency within and equitable involvement in climate adaptation policy (Adger, 2003; Adger and Kelly, 1999; Razzaque et al., 2004) but a re-distribution of power in decision making. As Barbour and Schlesinger (2012, p.36) note:

> Indigenous Australians do not want to become spectators… [give] away knowledge or be labourers to Western conservation agendas. They want to be active partners in developing better understandings of the environment and implementers of management that reflects shared agendas.

Such a collaborative decision-making system would also recognise different Indigenous knowledge systems (pre-and postcolonial), that include an explicit commitment to the co-production of knowledge which can then help to promote the cross transfer of skills, build trust and recognise the validity of Indigenous knowledge systems (MacLean and Cullen, 2009; Bohensky et al., 2013).

As such, governments and other actors who have the power to make decisions within multiple governance regimes (such as the Kati Thanda-Lake Eyre region is), can

work together to find cultural entry points for Indigenous groups to actively participate in governance, in ways that are appropriate for them (Brooks et al., 2005; Folke et al., 2005). Understanding that Indigenous people engage in environmental management activities for multiple reasons (over and above economic remuneration), in order to 'look after country' is fundamentally important (Zander et al., 2013). New forms of environmental management could be polycentric "comprising multiple decision centres located across different levels of decision making and able to perform their respective roles with substantive autonomy" (Curtis et al., 2014, 185).

There are multiple benefits to undertaking collaborative governance approaches, ones that recognise colonial impacts, to building adaptation for and with Indigenous peoples. For example, healthy country is often correlated with healthy people, with studies highlighting the many health benefits that accrue as a result of Indigenous involvement in resource management (Burgess et al., 2005; Garnett et al., 2009). This is clear in our own conversations with the Arabana people, where the [ill] health of the country makes the Elders sad: "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).

6. Conclusion

Ultimately, our study demonstrates not only the endurance of values such as country, culture, and livelihoods, but also the fact that they are understood within an historical continuum going back millennia. Within this continuum, colonisation remains an active agent in how environmental management is constructed and then implemented in the present by the Arabana people.

The development of future community-based climate change adaptation initiatives is partly dependent on the capacity of other environmental management institutions to adapt their regimes in ways that recognise and incorporate different forms of governance and models of environmental management in socially just and equitable ways. As Carter and Hill (2007, 43) note: "linking informal and formal governance structures and canvassing a range of governance modalities will ultimately connect the human behaviours and governance structures needed to progress indigenous environmental management in Australia".

This is both the future opportunity and collective challenge for groups such as the Arabana and policy makers in the effort to establish and persist with adaptation initiatives that are decolonised and enable all parties to build more effective environmental management.

Declarations

Author contribution statement

Melissa Nursey-Bray: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Robert Palmer: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

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Additional information

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