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RESEARCH ARTICLE

Future sea changes: Indigenous women's preferences for adaptation to climate change on South Goulburn Island, Northern Territory (Australia)

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Research on South Goulburn Island aimed to improve understanding of Indigenous perspectives on climate change and options for adaptation within the scope of the local coastal, marine environment and resources utilized by the community. We also aimed to promote awareness among community members of western scientific concepts of climate change. Workshops and interviews with participants emphasized the use of participatory, visual techniques to encourage discussion and visioning of the future. Participants indicated very limited understanding of western concepts and English language terms associated with climate change and why change was occurring. However, in deeper conversations, many reported observing unusual patterns of environmental change they could not explain by other means. These observations, combined with changes in customary practices and loss of local knowledge in recent years, worried participants, particularly the elderly. The idea that climate change was resulting from human impacts on the environment was an easy concept for most participants to grasp. The demonstrated worldviews of participants was dominated by social and cultural links to the past and present, but had weaker links to western concepts of 'the future'. Thus, discussions around planning adaptation did not generally fit easily into peoples' framings of their worlds. People's preferences for adaptation included building general community capacity, drawing from customary knowledge, being more involved in decision-making and learning more about scientific knowledge on climate change. Enabling collection of plant and animal foods and associated interaction with the landscape was also considered important for improving community independence, resilience and well-being for adaptation.

Keywords: Indigenous; climate change; adaptation; coastal; women

1. Background

With growing recognition of the immediacy and seriousness of the consequences of anthropogenic climate change, there has been a strong shift in international debates from a focus (in research and development) on mitigation, towards adaptation for climate change (Adger, Hughes, Folke, Carpenter, & Rockstro, 2005; Intergovernmental Panel on Climate Change [IPCC], 2007; Liverman, 2009). Adaptation is a process by which communities and/or countries seek to adjust natural or human systems in response to actual or expected consequences of climate change and variability. In this context, adaptation involves precautionary or anticipatory adjustment(s) to shifts already occurring or that may happen in the future (Smit, Burton, Klein, & Wandel, 2000). Although there is strong emphasis in current global debates on the need for adaptation, this is not a new challenge; humans have always adapted and made management decisions and strategies to deal with variability (Burton,

Diringer, & Smith, 2006). However, rarely have communities or countries incorporated long-term dangers, such as future climate risk, into planning or policy-making. The literature on this topic shows that worldwide, adaptation presents difficulties because it involves accommodating very different cultures, their worldviews and perceptions of concepts such as change in general, climate change, uncertainty, scale, governance, power and control (Moser & Ekstom, 2010; Pelling, High, Dearing, & Smith, 2008; Smit & Wandel, 2006; Tambo & Abdoulye, 2013).

According to Nelson, Adger, and Brown (2007) and Green, Niall, and Morrison (2012), the unpredictability and complexity of human–environment systems mean that creating accurate models and predictions on which to base adaptation is impractical. Yet a strong drive continues to develop more accurate models to assist in developing single 'optimal' climate change adaptation solutions (Brooks, Adger, & Kelly, 2005; Dessai, O'Brien, &

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Hulme, 2007). The benefit of this approach is widely debated. Some suggest that models should be used mainly as exploratory aids to provide broad, robust scenarios that acknowledge uncertainties and allow flexible options.

In contrast, to the approach of quantitative modelling, is the use of social science-based and qualitative approaches in exploring and developing practical options for adaptation to climate change by vulnerable communities (e.g. Burton, Huq, Lim, Pilifosova, & Schipper, 2002; Haalboom & Natcher, 2012; Hovelsrud & Smit, 2010). Such approaches seem particularly valid in remote, Indigenous communities where few quantitative biophysical data have been collected, and where little is known by external groups of relationships with and perceptions of environment, or cultural concepts or preferences relating to adaptation to future change. Additionally, it has been argued that at times external groups have claimed a right to govern and control Indigenous responses to risk and environmental change, despite a lack of knowledge of local preferences (Haalboom & Natcher, 2012). The case of an Indigenous community interacting with a marine ecosystem (on which scant data are available) and facing future climate uncertainty would seem to be best considered by qualitative and adaptive research methods, rather than by quantitative modelling.

Especially important to consider in these qualitative approaches to exploring climate adaptation are concepts of resilience and well-being. In recent work and research that links people and nature, resilience refers to the

amount of change the system can undergo and still retain its function and structure; the degree to which the system is capable of self-organization; and the ability to build and increase the capacity for learning, adapting, and where necessary, transforming. (Armitage, Bene, Charles, Johnson, & Allison, 2012, p. 17)

For the purposes of this paper we regard resilience as an improved ability to cope with uncertainty – which in some cases may lead to new kinds of adaptability or possibly to transformational change (Folke et al., 2010). However, we also acknowledge that there are different types of resilience that can involve resistance or different degrees of change (Handmer & Dovers, 1996), and that even though adaptation responses can help build resilience, these responses can in some instances undermine resilience (Nelson, 2011).

Concepts of well-being are commonly derived from development economics (Alkire, 2002) and social psychology (Gasper, 2004) and are becoming increasingly popular in public policy and international environment and development discourse and literature (Weeratunge et al., 2013). The synthesis report of the Millennium Ecosystem Assessment (2005) is one of the first attempts to integrate human well-being concepts with understandings of ecosystem dynamics. In more recent years other definitions have

been developed, such as those by Gough and McGregor (2007) and Armitage et al. (2012, p. 17) who describe a

social conception of wellbeing ... as a state of being with others and the natural environment that arises where human needs are met, where individuals and groups can act meaningfully to pursue their goals, and where they are satisfied with their way of life.

This research follows a similar definition and also emphasizes the importance of considering the way adaptation at different scales can inhibit or enhance well-being. As Coulthard (2012) explains, there can be tensions between adapting to change and the pursuit of well-being, and trade-offs can operate at different scales. Also important is the role human agency has in negotiating adaptation strategies, and ways this interacts with peoples' resilience and well-being.

1.1. Indigenous adaptation to climate change

It is understood that marginalized Indigenous people and small island populations will face the brunt of negative climate change effects (Adger et al., 2005). There are concerns that disadvantaged Indigenous groups will fall even deeper into poverty and face further livelihood problems (Eriksen & O'Brien, 2007). Indigenous people and their perspectives and local histories must be included in discussion of development issues, for reasons of equity and justice and to ensure effectiveness of adaptation policy (Patt & Schroter, 2008; Sakona & Denton, 2001). However, Indigenous and poor people are commonly marginalized in debates on climate change at local, national and international levels (Salick & Ross, 2009). Some argue that Indigenous people in some countries have developed knowledge and strategies over millennia to deal with climate variability and environmental change (Bourke, Brockwell, Faulkner, & Meehan, 2007; Turner & Clifton, 2009). These experiences and knowledge are often dismissed in current-day adaption strategies and planning (Nyong, Adesina, & Osman-Elasha, 2007).

Although Australian Indigenous people comprise only 2.5% of the Australian population (ABS, 2012), they own and occupy approximately 23% of the land, much of which encompasses vast expanses of the country's remote areas (Altman & Kerins, 2012). Many of these people and the adaptation strategies they adopt in their diverse locations could therefore have a significant impact on the nation's ecology and economy.

Predictions for changes in climate in Northern Australia include higher temperatures, sea level rise, more extreme cyclonic events and associated storm surges. Sea levels rose 7–10 mm/year along Australia's northern coastline between 1993 and 2009 – about three times the rate on southern and eastern coastlines (CSIRO & BOM, 2010).

Many offshore islands, wetland areas and coastlines are believed to be vulnerable to erosion and salt water intrusion (Fulton, 2011; Green, Jackson, & Morrison, 2009). Furthermore, significant impacts are expected on the future abundance and distribution of plant and animal species (Dunlop & Brown, 2008).

Various reports have forewarned of the vulnerability of remote Indigenous communities, especially in northern Australian coastal areas, to climate changes (e.g. Altman & Jordan, 2008; Green, 2008; Hennessy et al., 2007; Leonard et al., 2013; Zander, Petheram, & Garnett, 2013). Several have also discussed negative impacts on community health (e.g. Braaf, 1999; Green, 2006) and difficulties in emergency evacuation (Veland, Howitt, & Dominey-Howes, 2010). Many Indigenous leaders, communities and organizations have expressed concern about these future changes (Mackie & Hanslow, 2010; Sinnamon, 2009). However, research with Indigenous communities suggests that the wide array of socio-economic problems that many Indigenous communities face are primarily at the forefront of peoples' minds and need to be considered in tandem with climate change issues (Bird et al., 2013; Braaf, 1999; Leonard, Parsons, Olawsky, & Kofoy, 2013; Petheram, Fleming, Stacey, & Perry, 2013; Petheram, Zander, Campbell, High, & Stacey, 2010; Veland, Howitt, Dominey-Howes, Thomalla, & Houston, 2013).

In Australia, adaptation work occurs at local and regional levels, but with little coordination by national agencies. Although Australia was categorized by the IPCC as having 'high adaptive capacity' (Hennessy et al., 2007), this national-level assessment hides the considerable heterogeneity in the population (Green et al., 2012). Remote northern Indigenous communities differ significantly from most Australian (urban) communities in most social and economic indicators (Carson, 2007). To date there has been little research conducted or action undertaken among Indigenous people to engage them in efforts towards adapting to climate change (Green et al., 2012; HREOC, 2009; Wiseman & Bardsley, 2013). And remote regions in Australia are reported to receive much less Federal Government funding than regions closer to centres of power (Robins & Dovers, 2007; Wiseman & Bardsley, 2013). There is even a line of argument that remote Indigenous communities, such as Waruwi settlement in the Northern Territory (NT) and the focus of this study, should be closed as they are too expensive (Hughes, 2005).

2. Research objectives

The NT Indigenous people own 85% of coastline (Altman & Kerins, 2012). Tropical coastal Indigenous communities and Small Island States are believed to be among the most vulnerable to dangerous impacts of climate change (IPCC, 2007). However, some researchers have questioned this

colonial conflation of vulnerability of traditional and Indigenous peoples in the Australian context (e.g. Veland et al., 2013). Indigenous communities will be affected by climate change like everyone else, but perhaps because proportionally they live in more marginal environments, the impacts of climate change on them may be felt earlier, or in greater intensity, than by other Australians (Altman & Jordan, 2008; Hunt, Altman, & May, 2009). Some others suggest they are vulnerable due to their existing social and economic disadvantage (Braaf, 1999), traditionally high dependence on their terrestrial and marine environments for food¹ (Meehan, 1977) and their compromised physical health (Buchanan & May, 2012; Burgess, Mileran, & Bailie, 2008). Remote communities in the NT are at the end of long, vulnerable food supply chains, the vulnerability of which is highly likely to be exacerbated by amplified climate variability, more intense and extreme weather events, longer periods with roads cut due to flooding, sea level rise in the intertidal zone and rising energy prices (Australian Commonwealth Government, 2010).

The objective of this research project was to investigate Indigenous dependence on marine resources, and their perspectives on climate change and adaptation.² The research was designed to improve understanding of Indigenous tropical, coastal community perspectives on climate change, adaptation and impacts on Indigenous aquaculture enterprises currently in development – to help guide policy- and decision-making across the north of Australia (see Petheram et al., 2013 for full report).

The project focused on women, as previous global studies of resource use and planning, especially relating to climate change adaptation, have tended to focus on men (Allison, personal communication, February, 2012). Global studies from rural and Indigenous agricultural societies demonstrate the distinct advantages of a gendered approach to climate change adaptation by building on the unique knowledge and capabilities of both men and women to deliver sustainable resource and development programmes in a changing climate (IFAD, 2014). In rural agricultural contexts, studies have shown that women are often left out of decision-making opportunities regarding climate change adaptation strategies (IFAD, 2014). Adopting a gendered approach has proven to increase resilience of communities to a changing climate (IFAD, 2014). It is also suggested by some that women may be potentially more vulnerable and impacted greater than men from climate change, thus requiring gender-sensitive approaches to adaptation (Arora-Jonsson, 2011). Furthermore, there is a paucity of research focusing on women and the linkages between climate change, coastal resources and food insecurity (Beaumier & Ford, 2010; Harper, Zeller, Hauzer, Pauly, & Sumaila, 2013). In hunter-gatherer societies in the Arctic region, research has demonstrated that environmental change from climate-induced situations has put

stress on local food sources, leading to food insecurity, particularly among women. In response, women take on coping strategies to reduce food consumption for the benefit of the household. This makes women particularly vulnerable to flow-on negative health effects (Beaumier & Ford, 2010). Building community resilience to climate change requires consideration of the perspectives of women who can play an important role in adaptation in coastal regions (Harper et al., 2013). Thus perspectives were deliberately sought here from women. A special focus was placed on understanding ways emergent forms of collective action among women might be built through the research process.

3. Case study site

The research was carried out in Warruwi, a small settlement on South Goulburn Island. South Goulburn is about 280 km northeast of Darwin, and 3 km off the West Arnhem Land coast (Figure 1). The island lies between two other Indigenous communities, Minjilang (Croker Island) and Maningrida on the mainland. A daily 'mail plane' connects the community to Darwin, but the plane's travel to the island becomes inconsistent during the wet season. In 1916, the Goulburn Island Mission was established on South Goulburn Island, the first and longest standing Methodist mission in the NT until it was replaced with a village council in the 1960s (Ellemor, 1966). The island became Aboriginal freehold land following the Aboriginal Land Rights Act in 1976 (Gould, 2010). However, it has since been placed under freehold lease by the NT Government, which gives the Government greater control over the region.

There are about 391 Indigenous people based in the community of Warruwi, i.e. about 95% of the population (ABS, 2012). For most of the population, English is not the first language and some members speak two or three different Aboriginal languages; Maung is the most widely spoken (Gould, 2010) followed by Walang, Gunwinggu and Galpu. Outstations on the island are inhabited for short periods only through the year, and include Ararlagu, Illiaru (Weira, North Goulburn), Injalatparri, Waminari (Waminara Bay), Wigu, Ngijipin, Armorran and Ngarlu (Gould, 2010). During the dry season there is a high degree of mobility particularly to and from neighbouring Croker Island and Darwin.

People on Goulburn Island follow a patrilineal descent system, which gives the five major clan (*nguya*) groups on the island ownership of particular areas (estates or country) of land, estuaries, beaches, sea and offshore reefs and islands. Goulburn Islanders collectively refer to themselves as 'Madjugurr' or 'people of the islands' (Gould, 2010, p. 24). Rights to 'sea country' or 'saltwater country' and responsibility for it are also obtained through matrilineal affiliations where people are classified as *jungai* (loosely translated as 'managers') for particular estates. The application of traditional laws and practices for access and use of the sea and land, spiritual belief systems and cultural sites of significance is fundamental to Aboriginal systems of creation, ceremony and religion and cultural traditions from the distant past (Smyth, 2004). All people at birth are assigned to a moiety – Dhuwa or Yirritja (everyone or everything is classified as either one or the other). People are associated with a totem (usually a plant or animal) which may play a factor in what they can and cannot hunt and eat (Gould, 2010; Henry & Lyle, 2003).

Figure 1. Map showing location of South Goulburn Island (and the community of Warruwi).

One trading store, community owned, but managed by the Arnhem Land Progress Association is located on the island that provides basic food and goods. A local school provides primary and high school education. A 'meals on wheels' service provides food for the elderly – run largely by volunteers. Other services and facilities on the island include a social security office, Mardbalk Arts and Craft Centre, church services, garden nursery and a land and sea ranger programme. Most of people's incomes come via social security payments. Some people receive extra 'top-up' wages above their social security payments from profits made by community organizations or from other Government sources. Health data were not available, but the Heath Centre staff (Department of Health, NT Government) consider the major health problems to be diabetes, heart disease and obesity – all thought to be related to poor diet and little exercise (see also Gould, 2010).

4. Conceptual framework and theory

As a framework for this study, a form of action research was adopted where both research (understanding) and action (change) were pursued in addressing the research questions. Hence the research process was guided by the results that emerged from the study. In particular, a 'research-oriented action research' approach was followed, whereby change during the research project was a 'desired but not an essential outcome' (Dick, Strong, & Huxham, 2002, p. 162). This change might include both cognitive change in the minds of participants during learning processes, and potential behavioural change as an outcome of learning processes. In this action research approach, participants were invited to take part in research activities as co-researchers during parts of the project design, and during data collection and analysis.

In this study 'learning' was considered a process that occurs naturally, but which can also be encouraged and deepened through skilled facilitation (Leeuwis, 2004). The project utilized various tools, with a strong emphasis on visual tools, to help facilitate co-learning processes among participants and researchers.

In working with participants and also analysing the results, a sustainable livelihoods framework (SLF) was adopted to guide the process. Typically the SLF consists of five types of capital (or assets): natural (e.g. fish stocks, and sea and land areas owned); social (e.g. networks, associations, membership organizations and levels of trust); human (e.g. education, knowledge, skills and health); physical (e.g. boats, gear, housing and roads and infrastructure) and financial (e.g. savings, credit, insurance and cash inflows). In our study we included a sixth category, 'cultural assets' – defined broadly as values, ethics and cultural and social preferences (Cochrane, 2006).

4.1. Grounded theory

The data collection, sampling and analysis (data coding) for this project followed grounded theory and were part of a continuous cycle (Elliot & Lazenbatt, 2005). The 'data' were the words and meanings derived from verbal responses, and researcher observations. Data from interviews and workshops were recorded by hand and/or on video and later transcribed to a word processor. Visual data, such as photographs, video and diagrams, were also recorded, together with participants' oral interpretations of these (in the form of text). Analysis of data (words) was conducted manually and involved 'substantive' and 'theoretical' coding (Fernandez, 2005). Substantive coding led to the identification of main themes and categories, and became the basis of the results under each research objective. Theories and frameworks emerged through theoretical coding – and these explain people's perceptions as expressed (or grounded) in the data. The results were considered and reported in the context of secondary data from the literature.

5. Field activities – data collection and analysis

Fieldwork in Waruwi was carried out over 5 visits from February 2012 to February 2013 and involved meetings, 5 key workshops attended almost exclusively by women, 30 semi-structured interviews (12 men and 18 women), informal discussions and participant observation. The fieldwork was largely conducted in English, although during workshops and key informant interviews participants talked among themselves in 'language', and a co-facilitator translated between several languages and English.

The workshops were facilitated by the lead social researcher (Petheram) and a local Indigenous co-researcher (Perry) who acted as co-facilitator and translator. The workshops involved women aged from 18 to 60 years. (Some participants were in multiple workshops.) The Indigenous co-researcher (an elder in the community) as well as other local elders initially suggested a list of older and younger women to be involved in the initial discussion about these issues. Other younger and older women were later recruited to participate.

The first workshop and associated interviews focused on the general context of Waruwi life as well as marine food dependence in the region. The second was on climate change, the third on preferences for the future and adaptation to climate change, the fourth on aquaculture, and the fifth on preferences for aquaculture development (see Appendix 1). During the first and second workshops, we used the SLF with participants to frame discussions around context and future preferences. A strong emphasis was placed on participatory and visual techniques

to help in engagement and to encourage reflection, open discussion and learning on complex topics (Petheram, High, Campbell, & Stacey, 2011). Powerpoint presentations with pictures, videos relating to climate change concepts, and aquaculture examples were also developed for the workshops.

Participants were encouraged to use still and video cameras during the workshops to record the processes, and at the end of workshops, they usually recorded video summaries of members talking about the major themes and reflections from the workshops, to provide a means of review at the next workshops, for participants to view in their own time and for use in other communication material. Participants were also engaged in diagramming – particularly in describing their local environment and visioning future scenarios. A board game on climate change and aquaculture was also developed by the researchers and used with participants in the final workshop. The objective of this game was to encourage participants (and researchers) to discuss and reflect on the types of choices participants might make under various climate change and aquaculture scenarios, and ways that these decisions might impact on the local community, environment and aquaculture enterprises. This tool was chosen (at a later stage) of the study because it became apparent from emergent results that participants were having difficulty imagining future scenarios and the logistics involved in starting an aquaculture enterprise, as well as ways in which an enterprise might be impacted by climate and other events.

An interactive iBook (for a community iPad) was also developed with assistance from participants, which incorporated photos, video clips and text that summarized the results of the project.

Before and after workshops, interviews were conducted with males and females aged 18–65 years (some of whom had attended workshops) from the community. Interviews covered participants' understandings of climate change, preferences for adaptation, understanding of aquaculture and receptiveness to and preferences for aquaculture. Sometimes the iBook was used during later interviews to explain to participants some of the discussions that had occurred during the earlier workshops, to elicit further response from participant interviewees and to communicate workshop processes, discussions and outcomes.

Brochures explaining climate change concepts (derived from lessons learnt during the workshops) and a summary of the research project were developed and shared with participants and other community members at the end of the project and a radio presentation was also prepared by one of the women for the local community. A final field visit was arranged to report research results through these brochures and the iBook, and to verify results among research participants.

6. Results, discussion and future considerations

6.1. *Understanding and observing 'climate change'; a foreign term?*

Western concepts of climate change were quite unfamiliar to most local residents on South Goulburn Island, prior to the discussions in this research. Many said they had not heard of the term climate change, but it became apparent during the research that most participants had heard of the term and its associated concepts through the television, media and Internet, and also from a social researcher who had come to the island a few years earlier to investigate climate change and disaster response. However, many participants felt they could not claim knowledge about the concept, as its meanings and causes were still very foreign to them. One participant explained that the term climate change had not yet been shared in formal ways through community.

Many participants explained that they previously thought climate change was a phenomenon happening elsewhere in the world. Even though many had noticed unusual changes in their landscape, they had not generally considered the possibility that these may be caused by climate change, until they became involved in these workshops and discussions. According to Barber (2011), this is a common finding from research among other remote and Indigenous peoples. This suggests that media communications, as well as exposure by visiting groups discussing this complex topic, can be confusing and misleading to people communicating across different cultural and language backgrounds. It seems likely that the concepts would be especially confusing when the language and terms used relate to very distant symbolologies, such as 'polar bears' and 'ice caps'. From discussions with participants it also appeared that local explanations of causal agents may not yet have been developed to explain these changes among the community – especially in relation to broader, worldwide changes being associated with 'climate change'. Some research among Australian Indigenous communities in other regions indicates that Indigenous people are familiar with the term climate change, but also have misunderstandings about the concept and do not have direct translations for much of the western terminology associated to it (see, e.g. Petheram et al., 2010 for East Arnhem Land and Leonard et al., 2013 for the Kimberley region).

6.2. *Types of changes people have been observing*

During workshops and interviews, once conversations were initiated on recent possible changes in natural patterns and phenomena, people mentioned many observations that they had made. Examples were sea level rise (mentioned by all), warmer temperatures, unusual weather patterns, bigger cyclones and plants and some shellfish dying unexpectedly.

People observed that ‘the water is coming up and swallowing up the beach’, ‘some oysters and mussels don’t taste the same’, ‘the pandanus used for dark colour dye (for baskets) isn’t quite the right shade colour’ and ‘seasons aren’t quite right’. Commonly reported were ‘beach erosion’, and ‘a lot of trees getting washed away’. ‘Sometimes we get early wet or late wet, funny kind of weather’. ‘Seem to be more trees damaged’. ‘Billabongs dying out quickly – dead horses and pigs’ (multiple participant responses from workshops and interviews).

The more obvious physical changes, such as beach erosion and rise in sea level and surges, appeared to be particularly distressing to people. Many older participants said their concern was based on the fact that their island home may disappear. Some people later in discussions mentioned that it seemed likely that climate change was being caused by people in other places, such as big cities, or as one woman said, ‘probably the government’s fault’.

Despite viewing climate change predominantly as ‘happening elsewhere’, many participants had been concerned about changes they had observed in their own landscape. This varied from a peripheral concern by some, especially younger people, to deeper, more emotive concern, especially by older participants. Older participants seemed relatively confident of their own skills in responding to these changes, but had less faith in the younger generation who they believed had less customary knowledge and skills.

However, participants generally had greater concerns about other future issues, such as employment, housing and way of life for the younger generation. When focusing in workshops on types of change that may occur in the future, most participants expressed concern that their other social and economic problems would become exacerbated by climate change. Most participants, particularly older generations expressed a strong desire to learn more about climate change, and to communicate and explain it to the rest of the community in ways that they would understand.

Although participants talked about changes they had noted, it appeared that some could not comment on changes relating to specific places, as they did not have ownership over these places. Like other Indigenous groups in Arnhem Land, there were strict limitations on the way individuals could talk about aspects of a landscape (especially the ‘country’ of others). As Barber (2011, p. 93) explains from research in East Arnhem Land with Yolngu people, ‘speaking about places is another means of performing ownership, and therefore conversations about changes in places can be limited by the degree to which people feel it is appropriate for them to comment’.

Those participants who had not previously made connections between observed changes in landscape and natural patterns and climate change did so easily after

scientific concepts of climate change were explained to them. Although western concepts of climate change were mainly new, the basic concepts were grasped relatively easily by participants and integrated with local knowledge systems and observations. It must also be acknowledged that these local knowledge systems partly comprise western knowledge systems as well. As Veland et al. (2013) and Deloria (1995) warn, Indigenous and western knowledge should not be polarized, as people live in blended worlds.

6.3. *Connections to nature and views about the causes of climate change*

It was evident through conversations that people had a strong connection to nature and its interrelated components. Many, particularly middle-aged and older participants, were very intuitive and knowledgeable about their landscape, including some people originating from other areas. For example, some people talked about a subtle change in the taste of oysters and of the slight change in colour seen in pandanus leaves when dying these for weaving fibre art. It emerged that people’s observation of environmental change involved much more than observing physical phenomena, but experiencing changes through other senses and through close relationships with nature and spirits. These strong, sentient connections with elements of the environment appeared to result in concern about impacts of climate change at a deep emotional level, especially among older participants.

Because components of nature (including people’s animal totems) and their sound management are an important part of people’s identity, it is probable that future environmental changes (and an inability to effectively manage them) could be deeply disempowering to many people. This conclusion is consistent with comments made by Veland et al. (2013, p. 321) in her social research with people in this region: ‘... people are not separate from changes to country, but experience themselves as a continuation of country, and are acutely sensitive to and aware of its change’.

Contrary to popular rhetoric that concepts of anthropogenic climate change are not compatible with many Indigenous people’s spiritual beliefs, all participants appeared to easily grasp the concept that humans are impacting upon the environment and contributing to greenhouse warming. This ready understanding appears in stark contrast to the denial evident in many of the wider Australian population. The ready acceptance seems likely to be largely explained by people’s closeness to nature, and their highly interconnected view of elements in the world around them, including the belief that human and non-human actors interact to cause environmental change. Barber (2011, pp. 94–95) explains that Yolgnu people (in East Arnhem Land) are comfortable in the way

weather can be a consequence of agency generally and human agency in particular... Nevertheless, the concept that humans can influence the weather is, in Yolngu terms, a relatively unproblematic one, perhaps far less problematic than for those who originally generated this account of the future and are still experiencing such trouble in reaching general social acceptance of it.

The interconnected way in which many of the participants tend to frame their social and ecological worlds is likely to contrast strongly with more mainstream views of environment and planning – which commonly emphasize dichotomies between humans and the environment. This could present some difficulties in the incorporation of local Indigenous perspectives and preferences into western-based adaptation planning in this region. It seems essential that in engaging with local Indigenous communities on adaptation planning, there is a fundamental need for sound awareness of peoples' different ways of living, knowing and relating to the environment, people and change. Hulme (2009, p. xxvi) explains that different outlooks on climate change are 'rooted much more deeply than (merely) in contrasting interpretations of the scientific narrative of climate change'; different outlooks also exist on 'risk, technology and wellbeing, our different ethical and ideological beliefs; our different interpretations of the past and our competing visions of the future'. Therefore, we need to pay attention to hearing and understanding these discordant voices (Hulme, 2009, p. xxvi). As Howitt, Havnen, and Veland (2011) explain, continuing to exclude people from decisions about their future can create new traumas and risks in Indigenous people's responses to both every day and emergency circumstances.

6.4. *The importance of bushfoods for well-being and resilience*

During the research, many conversations around climate change and aquaculture focused around participants' deep connection to marine foods and the complex interactions between these resources, other elements in the landscape and humans. It was evident that participants felt a very intuitive connection to the natural environment – and gave strong agency to many elements in the land/seascape, such as their close relationships with plants and animals. It was clear that maintaining connections to nature, such as through harvesting and eating bushfoods, played an essential role in people's identity and well-being; a finding supported by much other literature (e.g. Buchanan & May, 2012; Meehan, 1982; Povinelli, 1994). Many women claimed that approaches that help strengthen general community resilience to shocks and pressures would be appealing as strategies towards adaptation. Some talked about the need for an adaptation strategy to promote and encourage more hunting and gathering. Examples given were the use of a minivan to take people out hunting on a regular

basis, and community organization of bushfood 'cook ups' and school hunting trips.

Reoccurring discussions with participants around the importance of bushfoods, particularly marine foods, to local people's mental, emotional and physical well-being suggest that supporting participants' desire for hunting/collecting and eating of bushfoods could play a role generally in strengthening community resilience to future shocks. While such support may seem trivial from a western viewpoint, these 'nature-connecting' activities could be an important integral component in adaptation strategies to enable improved well-being for greater resilience to uncertainty under future climate change and food insecurity. However, there are constraints to achieving this among many Indigenous communities.

6.5. *Planning and focusing on the future*

After involvement in workshops on various aspects of climate change and future scenarios, many people wanted to know how things could be 'fixed'. For example, participants asked: 'How do you stop beach erosion?', 'Can you stop the water from rising?', 'Can you build walls on the beach?', 'Are there trees that you can plant that are better for the environment?'

Initially it appeared that participants often expected government and other agencies to provide significant support in addressing changes. This is not surprising given that Indigenous people in this region have little voice in decision-making and management of their livelihoods (Petheram et al., 2010). Later, when discussing the potential impacts of climate change on the community and possible types of adaptation (using ideas from other countries), participants became enthused about areas where the community could take action and work together in decision-making.

There was a strong desire to learn more about climate change and to investigate options to both mitigate and adapt. In particular, people wanted to address obvious and confronting physical changes, such as beach erosion. People talked about the need to combine western scientific knowledge with customary knowledge. Some expressed the need for enforcing more clearly traditional ecological management, such as traditional fire management. Participants were surprised that non-Indigenous people (especially scientists) would be interested in their local knowledge and current observations relating to environmental change.

There seemed to be a relatively high degree of respect for both customary and scientific knowledge in seeking to design solutions. There was also a strong interest in further use of renewable energy in the community, and in other ways to reduce energy – and in communicating these concepts within the community. There was a particularly strong desire to communicate awareness of climate

change to the rest of the community, especially children – from both western and Indigenous perspectives. People discussed how they might be able to communicate with other Indigenous and local communities (in Australia and overseas) about climate change, along with the different types of changes and the ways people are dealing with these.

Participants were very receptive to videos of climate change that were shown, particularly those with examples of local and Indigenous people (e.g. from other remote communities in Australia and other countries) who were talking about their thoughts on climate change, observations they had made and actions they had taken in response to those changes. Participants were especially interested in knowing what had happened to those places and people since the videos were taken. When prompted, many people were very receptive to the idea of developing some form of network to connect with other groups. Many participants were also particularly responsive to diagrams (e.g. the brochure on global warming) and simple videos explaining global warming and also the global cycle of carbon. Talking about other types of gases in the atmosphere often became a bit too detailed for many participants.

No one seemed to be aware of the concept or existence of government ‘policy’ or of the need for policy development relating to adaptation, but once this topic was raised, people, particularly women, expressed a strong interest to be involved in discussions. Some participants, particularly men, expressed the need for more funding to employ people and provide resources for general (coastal) natural resource management.

Interestingly, people talked little, even when prompted, about past adaptations (or ways of dealing with change) by individuals or the community. There was some discussion about ancestors having dealt with change when it occurred (for instance, cyclones and the closing of missions), rather than anticipating potential changes long in advance. Most participants talked about mobility as being an important adaptation strategy (i.e. travel to safer areas, or travel to more resource-rich locations when needed, caring for country). Generally, participants perceived ancestors as having drawn strongly on customary knowledge to deal with difficulties. Strong leadership and decision-making among the whole community were perceived as important in deciding on ways to adapt.

Participants also responded positively in discussing ways the community’s general capacity could be strengthened and future opportunities realized through adapting to the threats of climate changes. Although participants felt they needed outside support, they seemed particularly inspired by approaches that could encourage community autonomy, independence, resilience and empowerment. Many participants were interested in examples where other Indigenous people were involved in land and sea

management and able to integrate aspects of customary knowledge in ways that were recognized in part by other elements of western society, such as through economics and politics. An example was carbon trading in the Western Arnhem Land Fire Abatement project (Barnsley & NAILSMA, 2009). Participants also often referred to the newly developed local Board (with representation from each language group on the island) and discussed the way the Board would need to be closely involved in any adaptation discussions and planning.

During discussions on all topics, many older participants commonly returned to explaining very fondly the way life was during mission times. Older participants suggested there needed to be a return to those productive times, when food was healthier and more abundant, there was greater exposure to other knowledge and skills, people carried out more customary practices and the community was more self-sufficient and independent. Goulburn Island may present a unique situation where mission times are generally looked upon in a more positive light than in other regions, such as Croker Island where mission policies were apparently more oppressive (A. Perry, personal communication, 2012).

Participants preferred to discuss climate change concepts and potential adaptations in the context of other (higher priority) community issues and aspirations. This was a similar finding to those reported from research in East Arnhem Land by Petheram et al. (2010). Some of these priorities included lack of housing and resources in education, and lack of voice in local decision-making. This emphasizes the importance of considering other issues being faced by community, in tandem to climate change, that integrates local aspirations and needs, and develops adaptation strategies that would lead towards escape from the ‘normalcy’ of already low poverty levels. Schipper (2009) and others argue that in working in poverty contexts, there is a need for strong integration of disaster risk reduction (and other adaptation approaches) with development. In Australia Bardsley and Wiseman (2012) also argue that this integration needs to occur with other socio-ecosystems’ risk assessments and management, and there needs to be better understandings of the ways these systems interact with climate.

As mentioned previously, connections to nature and the health of the environment are an important part of people’s identity. It appears that signs of environmental degradation, as well as an inability to be involved in governance and decisions about ‘their country’ could lead to disempowerment and loss of identity, and hence to reduced resilience and well-being. It seems clear that decision-making around land and sea management and future adaptation will need to involve Indigenous people in a meaningful manner that acknowledges different ways of viewing the world and responding to it – so they can be active agents in determining their own futures.

6.5.1. *Relationships with, and perspectives of, temporal space – and implications for planning*

In the research discussions, participants of different ages talked a lot about the past (their youth and prior to their birth) and about the current time, but rarely about the future. Although participants were encouraged at length to propose and discuss ways that local residents currently (and in the past) planned for the future, few examples were forthcoming. It appeared that community members tended to be mainly reactive to sudden changes in their living or natural environment, or responsive to very slow, progressive and subtle changes in the distribution of plant and animal species. Many of the older generation felt a degree of self-efficacy in their knowledge and ability to respond to subtle changes in the landscape, but were concerned about the younger generation who many perceived as not having as much knowledge or resilience.

Examples the community gave of more anticipatory responses (i.e. advanced planning) were very rare and usually related to ceremonial and other customary activities. Some philosophers and economists have developed models of rationality and exchange that recognize that people have different relationships with present and future selves (e.g. Zimbardo, Keough, & Boyd, 1997) and that these can be ‘... distinct entities that exist in life space and engage in social interaction’ (Cerulo, 2009, p. 537). In some other cases individuals are believed to view ‘past, present and future selves as integrated parts of a single whole’ (Cerulo, 2009, p. 538). Some research suggests that those who only frame their past or future selves, and do not attempt to inhabit those entities (particularly relating to emotions) ‘experience past and future selves as object rather than subject’ (Cerulo, 2009, p. 539; Trope & Liberman, 2003).

The results of this research suggest that many participants in this region had strong relationships with their past and current selves – but less of an (emotional) relationship with their ‘future’ selves. Rose (2004) explains that western and Indigenous storytelling use very different temporal reference points, are cyclical and are diagrammatically opposed. Western worldviews present the future in a linear perspective of history where characters live once, and important names and events are recorded in books. Rose (2004) further explains that on the other hand Indigenous storytelling tends to be directed towards the origins of creation: people come from the earth, and go back to the earth at death, as a circle of life (Christie, 1992; Ingold, 2006; Rose, 1996; Veland et al., 2010). Narratives of Indigenous Australia do not have spatial or temporal coherence, and this truth depends on the narrative context (Law, 2004). Howitt and Suchet (2006) further argue that these different world views can lead to problems in the conceptualization of planning and management, which are usually reflected by dominant Eurocentric

ways of knowing. They suggest that many assumptions are embedded in planning and managing, where time is seen to travel linearly in bounded and static space, and is dependent on deliberate human intervention which prioritizes ‘achieving’ and ‘goal setting’ (Howitt & Suchet, 2006, p. 329). This worldview is likely to have significant implications for the way climate change adaptation policy is discussed and developed between policy-makers, Indigenous local people and other stakeholders. To appropriately engage Indigenous people in adaptation planning will require stakeholders to break down these concepts, and design and discuss ways that acknowledge these differences in cultural framing. In some cases this may include carefully designed visioning exercises that align with local Indigenous ways of viewing the future and appropriate ways of intervention. It is likely that conventional risk management and climate adaptation approaches will need to integrate concepts of community-based adaptation (Huq & Reid, 2007) and adaptive management that can involve local people, researchers, policy-makers and other stakeholders in testing ideas, monitoring and evaluating and developing workable solutions to help provide more inclusive, open and flexible approaches. The engagement of knowledge brokers, including translators, to work between the community and other stakeholders may be important to help break down climate, adaptation and planning concepts. It is also likely that new partnerships will need to develop. Participants often mentioned their strong desire to engage with other Indigenous groups in Australia and overseas. Encouraging these networks may help provide support and learning among groups for inspiration and finding new ways of integrating different ways of viewing and operating in the world.

7. Final comments

Findings of this research suggest that in engaging with Indigenous communities on planning for adaptation it will be essential to discuss climate change and adaptation in ways that acknowledge differences in knowledge systems. Policy-makers and specialists will need to learn ways to listen closely and be aware of peoples’ different ways of living, knowing and relating to the world. However, it must also be acknowledged that although Indigenous ways of viewing the world are different, these can vary a lot between individuals, communities and contexts and are also nowadays greatly intertwined with western knowledge systems. The simplistic depiction of Indigenous peoples as ‘vulnerable’ and passive victims of climate change needs to be challenged. This research indicates that people of Waruwi have unique knowledge, skills and belief systems that can contribute to their resilience and capacity to respond and adapt to changing conditions, but this needs to be supported through allowing greater autonomy in decision-making and adaptation planning.

There is a danger that implementation of many current and proposed top-down policy reforms in remote communities may negatively affect the resilience of people in remote Indigenous communities. If adaptation responses continue to be imposed in this manner, this could inhibit both peoples' resilience and their well-being. As Howitt et al. (2011) explain, excluding people from decisions about their futures may impose new traumas and risks in their lives, and consequently their ability to respond to both every day and emergency circumstances. Adaptation responses will need to seriously take into account how Indigenous voice can be integrated into decision-making – in ways that acknowledge often unrecognized threats to remote communities, such as external political and economic factors (Barber, 2011; Veland et al., 2010). Initiating discussion on planning around future changes in climate requires a careful and deliberate approach, mainly because there are ethical considerations in introducing and effectively communicating confronting information, as well as differences between western and Indigenous ways of viewing the future and planning. Developing better understandings of local Indigenous ways of relating to the future and how to do this consistent with local ways of viewing time and space is important. Scenario building is one technique that, if used sensitively, could help people conceptualize potential future climate change and uncertainty. It is necessary in these processes to better understand concepts of well-being and resilience, and the tensions and trade-offs between these that can operate at different scales. Finally, we need to consider the agency of Indigenous and non-Indigenous groups in negotiating adaptation strategies, the appropriateness of this agency from an Indigenous perspective and how it can feed back into community resilience and well-being.

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Notes

1. Or 'bushfoods', a term used in Australia that refers to fauna or flora that are used for culinary or medicinal purposes.
2. A secondary objective of the project was to explore Indigenous perspectives and preferences for aquaculture as an option in adapting to future uncertainty of climate change and related marine impacts. That component of the research is reported in another paper under preparation.

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Appendix 1

Table A1. Techniques used during workshops and interviews.

Technique/activity	Description
Participatory diagramming	Participants drew features of their landscape that are important to them (positive or negative). They also drew future scenarios (e.g. sea level rise and rising temperatures)
Participant generated still photography and video	Participants were given a still or video camera to record processes during workshops, and also to record features (and changes) of their landscape – and to later explain these. Some photos and video were used later in interviews and workshops to help remind participants of these images and also to elicit responses from other participants
Video summaries	During and at the end of workshops, video cameras were used to record participant views, seek feedback and/or verify perspectives on particular topics, e.g. reoccurring themes, controversial opinions and workshop synthesis. (video was taken by participants and/or researcher/s)
Photo and video elicitation and communication	Photos/video collected by researcher (or taken by participants) was used to explain or demonstrate a concept or to elicit feedback about particular landscapes/practices or to generate discussion about a particular topic. These were used in interviews and workshops
Sustainable livelihoods framework	During workshops, participants developed diagrams of six livelihood assets to represent strengths and weaknesses of current (and desired) community characteristics (physical, financial, natural, human, social and personal)
Ranking exercise iBook	Participants were asked to rank the most positive and negative aspects of life in their community Photos, video and text summarizing workshop and interview results were compiled into an interactive 'iBook' – with input from participants. This iBook was shown during workshops to verify interpretation of results with participants, and to summarize and remind participants of previous workshop conversations. The iBook was also used during some interviews to communicate workshop discussions and to elicit responses from participants
Board game	A board game on aquaculture and climate change was developed where participant teams chose different aquaculture enterprises and were required to make various management decisions relating to climate change and aquaculture scenarios