'Strange changes': indigenous perspectives of climate change and adaptation in NE Arnhem Land (Australia)

'Strange changes': Indigenous perspectives of climate change and adaptation in NE Arnhem Land (Australia)

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Abstract

Despite growing global attention to the development of strategies and policy for climate change adaptation, there has been little allowance for input from Indigenous people. In this study we aimed to improve understanding of factors important in integration of Yolngu perspectives in planning adaptation policy in North East Arnhem Land (Australia). We conducted workshops and in-depth interviews in two 'communities' to develop insight into Yolngu peoples' observations and perspectives on climate change, and their ideas and preferences for adaptation. All participants reported observing changes in their ecological landscape, which they attributed to mining, tourism 'development', and climate change. '*Strange changes'* noticed particularly in the last five years, had caused concern and anxiety among many participants. Despite their concern about ecological changes, participants were primarily worried about other issues affecting their community's general welfare. The results suggest that strategies and policies are needed to strengthen adaptive capacity of communities to mitigate over-arching poverty and well-being issues, as well as respond to changes in climate. Participants believed major constraints to strengthening adaptive capacity had external origins, at regional, state and federal levels. Examples are poor communication and engagement, top-down institutional processes that allow little Indigenous voice, and lack of recognition of Indigenous culture and practices. Participants' preferences for strategies to strengthen community adaptive capacity

tended to be those that lead towards greater self-sufficiency, independence, empowerment, resilience and close contact with the natural environment. Based on the results, we developed a simple model to highlight main determinants of community vulnerability. A second model highlights components important in facilitating discourse on enhancing community capacity to adapt to climatic and other stressors.

Key words*: climate change; vulnerability; adaptive capacity; Indigenous; adaptation; Australia.*

1 Introduction

1.1 Considering 'adaptation' to climate change

Internationally there is growing recognition of climate change and the need for urgent attention to the development of climate change policy. While early policy debates tended to focus on 'mitigation' of climate change, i.e. *interventions* to reduce (or increase sinks of) greenhouse gases, the concept of 'adaptation' to climate change has increasingly gained prominence (Campbell 2009; IPCC 2007).

In the climate change context, adaptation is commonly seen as a set of actions and decision making processes (Nelson *et al.* 2007). Adger *et al*. (2009:341) claim that the goals of adaptation differ depending on '*who or what is adapting'*. They explain that some societies may strive to adapt to climate change while maintaining a current standard of living – whereas others may aim to adapt simultaneously with improving the standard of living of their citizens. The adaptation may be anticipatory or reactive to changes, private or public, and the scale can vary (Klein 2003). For example adaptation policy may be implemented regionally in a public manner – such as the construction of cyclone shelters in towns. Or it may involve private, local action by individuals or a community.

Most research on climate change has been dominated by studies in the physical and biological sciences – aimed mainly towards prediction of effects and seeking technological or infrastructural solutions (Braaf 1999:102). Many such '*first generation'* adaptation studies (Burton *et al.* 2002) are based on the premise that

human vulnerability is a function of physical characteristics of climate events. These studies often aim to measure or model the relative vulnerability of regions or communities to predicted changes (e.g. Brooks *et al*. 2005). While studies based on hard science are vital, it can be argued that lack of attention to social aspects has often led to a rather limited analysis of 'adaptation' - which can underplay the complex relationships between people and their environment (Klein *et al.* 2007). In recent '*second generation'* adaptation research (Burton *et al*. 2002) there has been a greater emphasis on understanding political, economic and social conditions that make societies susceptible to environmental stress. Smit and Wandel (2006) suggest that these can provide practical understanding of the social-ecological drivers and factors that affect a system's vulnerability, and the '*adaptive capacity'* of communities. Some of these studies focus on *current* vulnerability of societies, as a central concept in understanding adaptation (e.g. Ford and Smit 2004).

In the context of climate change, adaptive capacity is usually defined as the ability of a community (or social system) to withstand environmental changes (e.g. IPCC 2001). Some claim that a community with generally high adaptive capacity will be less vulnerable in the future than other communities to the potentially detrimental (and often unpredictable) effects of climate change (and other stresses) on their landscape and lives (Pelling *et al*. 2008; Roncoli 2006).

1.2 Indigenous people, poverty and climate change

In this paper,we draw from OECD (2001) and Eriksen and O'Brien (2007) who define poverty as characterised by low opportunity to: (1) meet material and resource needs,

(2) exercise rights, and express voice, (3) maintain health and basic levels of education, (4) freely practise and share cultural and social practices.

There is increasing evidence globally that poor and minority people, particularly marginalised Indigenous people and small island populations, will face the brunt of negative climate change effects (IPCC 2001). There are concerns that poor people will fall even deeper into poverty and face further livelihood problems (Eriksen and O'Brien 2007).

Sokona and Denton (2001) stress the importance of including Indigenous people and their perspectives in discussion of development issues, for reasons of equity and justice, and Patt and Schröter (2008) advise their inclusion to ensure effectiveness of adaptation policy. Yet Indigenous and poor people have often been marginalised in debates on climate change at the local, national or international level - and to date there has been relatively little research on climate change adaptation that incorporates their perspectives (exceptions include Byg and Salick 2009; Ford *et al,* 2006; Salick and Ross 2009; Tscharkert 2007).

1.3 This research

In this paper we describe research in two coastal communities[1] in Arnhem Land, Australia, where we sought to gain insight into perspectives of Indigenous inhabitants

[1] The term 'community' is used loosely in this paper for residents of a particular area - in this case our two research sites. Australian Indigenous communities can be very heterogeneous, with a variety of clan groups, and hence there can be many different perspectives within a community. Community can also have different meanings to different groups. Campbell and Christie (2009) explain that often Yolngu 'invest identities' more commonly in traditional clan and family groups.

on climate change and adaptation. This was intended to reveal factors important in the integration of Indigenous perspectives on climate change, for planning adaptation policy. Initially we tried to ascertain views on climate change and on specific strategies that participants would prefer to adopt under potential climate change scenarios. However, early in the research people showed unwillingness to suggest adaptations specifically to climate change, but were keen to discuss ways of adapting to more pressing issues. Consequently it was deemed more feasible and useful to develop an understanding of factors that influence general vulnerability (and adaptive capacity) in the context of both poverty[2] and climate change. Because it became clear that much knowledge could be usefully shared between the researchers and participants, the research was designed to promote two-way sharing of information, i.e. on concepts of climate change, adaptation, and the local context.

2 The context of the study

2.1 East Arnhem Land

East Arnhem Land is on the NE coast of the Northern Territory (NT) (northern Australia) and is part of an Aboriginal Land Trust, now held under inalienable freehold title by the traditional owners (except some mining lease areas and other parcels of land). About 8500 Indigenous people live in East Arnhem Land (ABS 2007), many on small homelands (also referred to as Outstations by some groups). Phillpot (2007:3) defines homelands as '*a common location occupied by the traditional owners or those people with a direct link to the traditional owner of the land...and may or may not be permanently occupied throughout the year'*

[2] Many Australian Indigenous people in remote areas are considered to be living in poverty (see Section 2.1).

The Indigenous people in this region are referred to as Yolngu and consist of more than 50 Indigenous clans. The language group is called Yolngu Matha and comprises about 12 different dialects (Omniglot 2009). For Yolngu, English is not usually the first language spoken. Since European colonisation Yolngu (and other Aboriginal and Torres Strait Islander people) have faced significant disempowerment, struggle for land rights and survival, and tragedy (Maddison 2009; Trudgen 2000).

In 1963 the Federal Government excised part of East Arnhem Land for a bauxite mine under operation of Nabalco (now Rio Tinto Alcan) and the mining town of Nhulunbuy (population 4 000) was established for non-Indigenous mine workers from outside the region. Many Yolngu were strongly against the development of the mine. So in a landmark process in 1971 the Yolngu took the issue to the courts. Yolngu lost the case, but the process brought to the judge's attention the fact that Yolngu have a comprehensive legal system. Although this loss was unsettling to many Yolngu, it is believed to have played a key role later in the work towards establishment of Aboriginal Land Rights (ALR) in Australia in 1976 (Cleworth *et al*. 2008).

Today many communities face severe socio-economic disadvantage. The incidence of "western health problems" (e.g. diabetes and heart disease) in many Yolngu and other Indigenous communities is alarmingly high. Many communities lack basic infrastructure, have limited options or access to western education and employment, and many members are dependent on government welfare payments (SCRGSP 2009).

A number of dramatic policy reforms have recently been introduced into remote

Indigenous communities. In June 2007, after a report documenting alarming incidence of child abuse in remote communities, the Government undertook 'emergency response' and deployed military and police forces into 73 NT communities as part of '*the intervention*' (Stringer 2007). There is mixed opinion about the *intervention* from non-Indigenous and Indigenous observers Some claim the situation in many communities is so extreme that intervention is justified (e.g. Sutton 2009), while others criticise the approach as ill-considered and paternalistic (e.g. Altman and Hinkson 2007). Many opponents also claim *the intervention* took place in some communities with little local communication about the process. There are reports of much confusion, and of people being scared when troops appeared in their communities – some believing World War III had started (Trudgen 2008) or that their children were going to be taken from them (McMillan 2007). A United Nations (UN) Special Rapporteur on Indigenous human rights condemned *the intervention*, claiming it breached a number of international treaties (UN 2009).

In 2009 there were announcements of policy to restrict government support to a limited subset of existing NT communities ('A Working Future' policy: NT Government, 2009). This prioritisation process is likely to force remote Indigenous Australians to relocate to main hubs or centres. However, critics claim that forcing Indigenous people to live in larger centres with many other clan groups could result in further disruption to social cohesion and higher incidence of ill-health and addiction problems (Altman *et al.* 2009). Some believe that support should (instead) be given for Indigenous people to remain 'on country' where they are likely to more resilient, i.e. through greater independence and economic, health, social, and ecological benefits (Altman 2007; Burgess *et al.* 2008; Garnett *et al*. 2009; McDermott *et al.*

1998; O'Dea 1988). Some Indigenous people living on homelands are engaged in environmental management and have helped to maintain biodiversity services, such as through Indigenous Ranger Programs and/or customary management (NLC 2006). However, Luckert *et al.* (2007) and others claim that most environmental services rendered by Indigenous people go largely unrecognised, unsupported and unpaid.

2.2 Climate change in East Arnhem Land

Predictions for changes in climate in Northern Australia include higher temperatures, sea level rise, more extreme cyclonic events and associated storm surges[3]. Sea levels rose 7-10 millimetres per year along Australia's northern coastline between 1993-2009 – about three times the rate on southern and eastern coastlines (CSIRO and BOM 2010). Many off-shore islands, wetland areas, and coastlines are believed to be vulnerable to erosion and saltwater intrusion (Green 2008). And significant impacts are expected on the future distribution of plant and animal species (Dunlop and Brown 2008).

Various reports have forewarned that remote Indigenous communities, particularly in coastal areas, will be highly vulnerable to climate changes (e.g. Altman and Jordon 2008; Green 2008; Hennessy *et al.* 2007,). Several have also discussed negative impacts on health of Indigenous communities (e.g. Braaf 1999; Green 2006). Yet, virtually no research has been conducted on ways that the adaptive capacity of Indigenous Australians in remote areas can be improved – in the context of climate change. Much of the international literature on climate change adaptation relating to Indigenous people focuses on agricultural communities (e.g. Patt and Schröter 2008;

[3] Cyclone frequency and intensity is debated (Walsh *et al.* 2008).

Ziervogel *et al.* 2006) and therefore has little relevance in northern Australia, where Indigenous communities have a historic tradition of hunting, gathering and trading. There are some parallels in lifestyle with communities in the Arctic regions of Canada (e.g. Ford and Smit 2004) and consequently research from those areas has been highly informative in the design and analysis of this research.

3 Research sites and methodology

We conducted fieldwork over six visits during a two year period between 2008 and 2010 to communities at Yirrkala and Wallaby Beach, located 18km and 10 km from the mining town of Nhulunbuy (approximately 660km East of Darwin). There has always been a Yolngu presence in Yirrkala but it became more concentrated after the establishment of a Methodist mission in 1935. After closure of the mission in the 1970s and establishment of Nhulunbuy, many people dispersed to their traditional homelands across Arnhem Land. Today there are about 800 people living in Yirrkala. There are currently about 50 Yolngu residents at Wallaby Beach who were forced to relocate there by the shire in 2008 from a nearby location named Galaru[4].

Many Yolngu in these communities are highly mobile and spend considerable time travelling over 'country' to and from remote homelands, for purposes such as hunting, ceremonies, and visiting kin. The situation in these two research sites may differ quite markedly from that of homeland communities more remote from Nhulunbuy. The close proximity to Nhulunbuy means there is relatively easy access to services such as certain medical facilities and training centres, but also to alcohol.

[4] Located three kilometres from Nhulunbuy.

3.1 Sampling, research process and data analysis

For sampling, we drew from elements of Glaser's (1992) grounded theory methodology. Initial selection of participants was defined by the research situation (contacts and available participants), and later guided by emergent data and theory - in a process of 'theoretical sampling'. The total number of participants involved was 21. For fieldwork we conducted initial scoping, semi-structured (individual and small group) interviews, followed by workshops, and further interviews. We conducted four workshops; two with a total of 9 male Indigenous land/sea Rangers[5] from the Dhimurru Aboriginal Corporation[6], and two workshops with a total of 12 female participants from a womens' organization and local households.. We selected a combination of older and younger men and women. All participants consented to be involved in this research. In the Results, we coded the source of quotations from interviews and workshops in a way that identifies gender and age group. Some individuals did not wish to be identified with their statements.

An important consideration was that Yolngu people have different roles, responsibilities and laws regulating the type of knowledge they are able to share, especially to those outside their clan. Generally, older members (especially land owners in that region) are considered to have greater 'license' to talk about certain topics (Hunt *et al.,* 2008). We have taken into account that in some instances, responses from participants was limited by rules pertaining to the holding and sharing of knowledge.

[5] Rangers are paid by agencies for work in environmental protection and management

[6] An incorporated Aboriginal organisation established by Yolngu land-owners in NE Arnhem Land, that has jurisdiction over approximately 8,500km^2 of traditional lands..

During workshops and interviews we initially sought perspectives on general social-ecological landscape factors, and climate change. Male and female participants guided researchers to different areas and showed aspects of the landscape discussed during workshops and interviews, and shared art work, singing and dancing relating to topic areas. At a later stage, we were also involved in sharing scientific understandings of climate change with participants, often using short videos and photos to explain technical and scientific concepts. Developing understanding with participants of differences between these knowledge systems, gave valuable insight into participants' perspectives and preferences for adaptation.

During workshops we placed strong emphasis on the use of visual techniques to support discussion, reflection and interaction (Petheram *et al.* unpublished a). Techniques used included:

- 'rich picture diagramming' (RPD), where participants drew their landscape which generated learning and insight into different elements of their lives (Checkland 1981)
- 'participatory sculpting' which was used in a similar way to RPD, but involved sculpting with play-doh (Petheram *et al.* unpublished a)
- 'participant generated photography', was used in a similar way to RPD, but with cameras (Frohman 2005).

We used these techniques during workshops and interviews, to develop understandings of general perspectives and to facilitate learning and communication. Scenario building was commonly used to encourage consideration of future changes and understand preferred futures (Evans *et al.* 2008). Video recording, and interactive DVDs (compiled as part of research) were used to help organise and present results,

verify data with participants, and later to communicate perspectives to other stakeholders (such as policy makers and researchers; Petheram *et al.* unpublished b). Questionnaires and visual choice modeling experiments were also administered in a related study (Zander and Petheram unpublished).

We involved a translator where participants were less familiar with English. During workshops and group interviews participants would usually speak in their language among each other and return to researchers with responses. It could be said that in publishing these results in an English journal, layers of meaning are likely to be lost. Our intention was to bring out the core meanings and allow an international audience access to Yolngu perspectives on climate change.

The research process involved continuous data gathering and analysis, drawing on one of the central ideas of Glaser's (1992) Grounded Theory methodology. We recorded data from interviews and workshops by hand and/or on video and later transcribed to word processor. We also recorded visual data, such as photographs, video, diagrams, 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 2004). Substantive coding led to the identification of main themes and categories, and became the basis for the development of theories and frameworks through theoretical coding - to explain peoples' perceptions as expressed (or grounded) in the data.

We used an interview guide in checking that all topics of interest were covered in workshops and interviews. However, we modified this guide over the course of the

project, as important new themes arose. We validated interpretations of data and theories by a process involving constant verification of meanings with participants. We concluded fieldwork after 'theoretical saturation', i.e. when no new insights were obtained and no new themes arose (Bowen 2008).

3.2 Conceptual framework and outline

In this study we used the broad research epistemology of constructivism, in which it is held that people construct knowledge and meaning from their social interactions and experiences (Berger and Luckmann 1967).

We designed interviews and workshops to involve participants in learning and communication processes (Leeuwis 2002) that, on analysis of data, would provide insights into participants' perspectives on their environment, living situation and climate change. Following the theory of constructivism, we assume that participants' perspectives are derived from their experiences of their social and physical environment, as well as from discussions with other participants (and to some degree, with researchers) during workshops and group interviews.

'Current vulnerability' of communities emerged as a central concept from the results of research, and five themes were identified as critical in working with Indigenous people to understand factors that influence vulnerability. We dealt with these themes and their sub-themes under Results in Sections 4-8, then discuss these results in Section 9 and suggest an approach for 'untangling' vulnerability. We also discuss an approach to facilitating discourse on adaptation with communities. Finally, in Section 10 we describe recommendations for exploring and strengthening community

adaptive capacity, based on our findings and related literature.

4 Results: peoples' perspectives on their natural environment

4.1 Connections with country

All research respondents exhibited strong connection to place, and sensitivity to natural landscape. They talked of the social, cultural and physical features in their landscape in a multilayered and interconnected way. Strong emphasis was placed on the importance of maintaining traditional knowledge, values embodied in nature, health of future generations, and the landscape.

Participants often talked of their enjoyment in 'taking care of country' (i.e. the areas covered by their clan). They referred to their deep connections with 'country' and the way that the condition of their country affects their cultural, mental and physical health. Participants often talked of the mine's negative impacts on the environment, and how this affected them to their core. This was expressed in an emotional manner at one of the workshops, when a participant sang a song he had composed.

'White man's mine' (chorus)

'Can't you see what its done to me
Can't you see what it means to me?
Yolngu people have so long cherished the land
In our culture we love to share
But you are taking it over again
What do we get in return?'
(M:20s)[7]

[7] M = Male, F= Female, Number = Age range

4.2 Differences in worldview, and miscommunication

In group discussions participants expressed (and sometimes became quite emotional about) the hurt and frustration they felt over the mistreatment of previous generations and their land, and the continued exclusion of their people from decision making and administration of their community and management of land. It was evident that miscommunication has also played a significant role in further feelings of mistrust, frustration and misunderstanding. The federal and state politicians and bureaucrats, the mining company and other 'Balanda (non-Indigenous Australians)' were often referred to (collectively) as '*they'* or '*them',* and with suspicion. Some participants emphasised the extreme difference between Balanda and Yolngu worldviews '*We see the land through painting, stories, songs, totem lines. Balanda don't understand how Yolngu connect and relate to the land' 'They see totally opposite. They see career, money and future' (Two Ms: 20s).* Also discussed was *'brainwashin*g' and persuasion by government for Yolngu to become integrated into mainstream society - '*They are wiping out our identity and our minds' (M:20s)*

Participants showed surprise that the government would not know already what the community's perspectives were in regard to their landscape, and what people wanted: '*But they [the government] already know what we think!' (M:20s).*

Many assumed that their perspectives and preferences were well known by the public and Government groups – because their hurt and suffering seemed so obvious to them. This further emphasised the level of miscommunication between their communities and external groups.

Despite this history of miscommunication and mistrust, there was a desire for different groups to work together. One participant described the need for this collaboration by quoting an expression commonly used by many Indigenous people (Yunupingu 1991) *'… like salt water and fresh water mixing as the water goes out to sea' 'Different waters can mix together to become one'(M:20s).* Also, most participants were very generous in sharing personal (traditional and contemporary) songs, stories, chanting, dancing and art during engagement with our non-Indigenous research team. Strong pride was shown in expressing such art forms, which further demonstrated the importance of Yolngu tradition and culture to peoples' sense of identity and well-being.

4.3 Preferred way of life

Most participants involved with the Dhimurru Aboriginal Corporation or in the Women's resource centre, talked with pride of their work. Many stated they found this type of work very rewarding because it contributed towards the community, environment and future generations. However, all participants were very concerned about the current and future situation of their communities and wanted change, to relieve poverty and other worrying issues. There was a desire for greater respect and decision-making power to be given to Yolngu, and for the community freedom, empowerment, independence and action that would arise from this shift in thinking.

In initial discussions, most participants talked of services, such as shops and medical facilities, as being unnecessary to their communities. There was a strong rhetoric that their people did not need these. But after involvement in scenario building activities and discussion, many participants concluded that most of these services were

important in their lifestyles – although some services made them less independent. For example, shops selling expensive and unhealthy foods increased the incidence of western style diseases, which raised peoples' need for western medicine. Some individuals resented this dependence on some of the services, yet had little or no alternatives available to them.

Participants explained that they needed the freedom to use traditional knowledge and practices – while having access to basic services and infrastructure that other Australians take for granted. However, it was important to many participants that the type of services, and way they are implemented, do not clash with traditional values and normative behaviour.

4.4 Current (non-climate) issues

There was an overwhelming view among respondents that climate change issues could not be considered in isolation from current non-climate (social) issues. So it was important that participants be allowed to explain their most dominant concerns. These varied somewhat between males and females, and between communities, but all participants consistently talked of the underlying lack of empowerment of Yolngu, and lack of voice, communication and transparency, and about 'top-down' management and decision making by the dominant elements of Australian society (e.g government agencies and mining company). The main issues mentioned are listed in Table 1.

Table 1.

5 Results: peoples' perceptions on climate change

Although all participants were familiar with the term climate change and had many ideas relating to its occurrence and potential changes, it became evident that many were unclear about western notions of the concept. Most said they had heard of the term 'climate change' through media, mostly television. Two participants talked of climate change as being about '*Polar caps melting affecting polar bears*'. There were various misconceptions about certain aspects of climate change, which seem likely to be related to language and misinterpretation. One participant believed climate change was '*… when the sun goes over and gets into that hole and it gets really hot'*. And the 'hole in the ozone layer' was referred to as being a '*black hole*' and by another participant as being like the *' eye of a tornado…that sucks everything up*'.

Before discussions specifically on climate change began, women participants ranked other problems (e.g. youth sniffing petrol and drinking alcohol, mining degradation, housing overcrowding) as among their most important concerns (this ranking exercise was only conducted during the women workshops). No participants listed climate change as one of their most significant concerns. When discussing the likely effects of climate change and possible ways to adapt, participants invariably linked the topic closely with current wider problems. Many emphasised that these problems would become worse as the negative effects of climate increased. For example, if temperature increased it was likely that medical problems would become more exacerbated.

After discussions on climate change, participants were more concerned about the way it threatened their communities and country, and particularly future generations. Most participants were keen to learn more and some Rangers stressed the need to raise awareness about details of climate change among their communities, especially among school children, '*so they know what is happening, what to do - and so they don't get worried' (M:20s)*

When discussing general landscape change –- almost all participants stated they had noticed '*strange changes'* (M:20s) in their landscape, particularly in the last five years. Many thought these may be related to climate change. Some people were unsure why the climate was changing, but many attributed this to human sources, such as '*big cities'*. The women especially talked of impacts of climate change and the mine on the landscape, as being closely connected. One said climate is changing because of *'what we are doing to mother nature. Mother nature is now weeping' (F:40s Yirrkala).* A few female participants talked of spirits being involved. The Rangers also mentioned other factors that could be involved in the landscape changes they were observing, such as the increase in recreational fishing and tourism. Most Rangers (and a proportion of women) believed strongly that climate change was occurring. When discussing the fact that some people (and certain politicians) do not believe climate change is occurring, one Ranger stated '*they should get out of their office more and take a look!'* (M:20s)

6 Results: observed (ecological) landscape changes

Some older participants mentioned changes they had noticed in their landscape over the years, many associated with development of the mine in Nhulunbuy and increase in recreational tourism. For example there was a drop in numbers of certain animal and plant species. These changes were often discussed in a way that suggested they were affecting participants on a deep emotional level – '*Since we were children we have seen big changes. In the time the changes have already happened and they are here - we are tying to deal with it and trying to be strong' (M:40s).* Participants had also noticed more recent and dramatic, '*strange changes'* in recent years as described previously. Women commonly mentioned intuitive changes '*we can sense something… there is also this strange roaring in the water – I've never heard that I don't know what it is (F:40s Yirrkala)' 'Spirits are visiting people in dreams more often' (F:60 Yirrkala).* Changes cited by Rangers were mostly specific physical landscape changes. Participants believed that these changes were a result of a combination of climate change and mining and development. Some recent ecological changes mentioned are summarized in Table 2.

All respondents talked of the impacts of climate change being closely connected with wider community issues, and about current problems being exacerbated by climate change. They commonly mentioned that impaired health of the natural landscape would have negative impacts on their mental and physical health. *'We'll become dimmer and dimmer like a candle' (F:50s WB)*

Female participants believed that higher temperatures and greater intensity of cyclones would be the most difficult direct threats of climate changes for communities to deal with. People described the interconnections between different dynamics

(ecological and social) in the system and how these would all be affected by climate change. For example, the altered distribution and abundance of animal and plant species would markedly affect hunting and other cultural practices, and exacerbate current health problems.

Table 2.

7 Results: current adaptive strategies (climate and non-climate-related)

Current ways of dealing with both social and environmental problems often arose in discussions. Participants talked primarily of the value of utilising traditional practices as a way of dealing with their problems and '*staying strong*': maintaining cultural as well as physical and emotional health was seen as vital. Connected strongly to this, respondents talked of the importance of 'being on country', and moving between different areas for hunting, ceremony and other traditional practices. Music, singing, art/craft and passing down knowledge were seen as important for 'survival' of their community. Participants stressed the importance of dealing with problems in culturally acceptable ways. For example, women in Yirrkala mentioned programs at their women's resource centre in which pregnant women are taken out food-gathering by older women. This encourages consumption of important nutrients from fresh bushfoods, passes on traditional and ecological knowledge, empowers younger and older women, and maintains and strengthens kin relationships.

Close observation and understanding of the natural environment (and connected cultural practices) were seen as an essential part of enabling people to adapt to stresses caused by all changes throughout the seasons, including climatic events such as cyclones. Some older participants talked about utilising 'other options' or knowledge of the natural environment when necessary – for example harvesting water from particular trees in dry conditions, or drying and preserving food for storage without refrigeration.

Kinship support was also considered essential to community survival. Past and current practices of sharing (e.g. food) among kin were seen as important, as was the bartering of items and resources between groups.

Current government and non-government policies, projects and schemes that participants valued for their effectiveness included programs for Indigenous Ranger groups, Community Development Employment Programs (CDEP: an employment creation and income support scheme, currently undergoing major changes and soon will not be available in many areas), resource and art centres, and certain Indigenous alliances and organisations (e.g. North Australia Indigenous Land and Sea Management Alliance: NAILSMA). Approaches that use innovative ways of engaging community and recording traditional knowledge, particularly in language and culturally appropriate ways (such as some health programs that use video stories) were also highly valued. Approaches that actively involved participants were most highly regarded.

8 Results: preferences on ways to adapt to climate change

Although we sought participants' views specifically on adaptation to climate change, in responding most participants continually returned to discuss current (non-climate-related) problems. Lengthy discussion in workshops invariably led to participants concluding strongly that climate change adaptation policies would need to address current non-climate issues too — because they were so interconnected and over-whelming in comparison to climate change. It became clear that supporting climate change adaptation would require good understanding of the interconnections and the development of strategies that could be used to improve the general adaptive capacity of these communities.

Adaptive strategies suggested by participants are summarised in Appendix 1. These tended to be of an anticipatory nature, rather than reactive - and were mostly ones that would strengthen general adaptive capacity to current community issues, although a few were specifically about climate change (e.g. new infrastructure, awareness raising and relocation). Some strategies entailed suggestions about external institutions and governance (e.g. greater Yolngu input into decision making) and others related to community-driven strategies that may require policy change, training or funding (e.g. for recording traditional knowledge).

There was some uncertainty among participants about whether their communities would be able to carry out some of these strategies, but at the same time there was a strong desire for communities to be independent and self-sufficient. While some ideas for adaptation could be implemented by communities alone, most would need support

and/or policy change from local administration and government on a regional and national level.

In the discussion on adaptation, many participants were in favour of relocating their families temporarily in response to extreme climatic conditions. Participants were thus willing to consider moving away from their current community locations if the climate became severe, but only as part of the continued movement to and from homelands This desire for movement between seasons and different climatic events is important in the context of the current debate about restricting government support to a limited subset of existing communities ('A Working Futures' policy).

All the adaptive strategies identified indicated a strong desire for greater value to be placed by government on traditional and cultural practices. Strategies that fostered self sufficiency, independence, empowerment and ecological sustainability were also highly valued. Note that, the term 'sustainable' was not often used – but many statements inferred concepts of sustainability, such as mention of 'caring for country for future generations'. Even technological and infrastructural strategies for dealing directly with hazardous climate conditions tended to align with these values, e.g. construction of shelters and houses that have low impact on the surrounding environment. Participants expressed desire to be involved in making mining practices and regeneration more sustainable – through decision making and employment.

The strategies most commonly referred to by participants emphasised the need felt for better communication, community engagement and decision making with the government and mining company. People wanted officials to come out on country to

engage with their leaders and the community '*at the grass roots level*' '*and talk … face to face' (W:40's Yirrkala)*

9 Discussion: integrating Indigenous perspectives into future planning and policy on adaptation

The finding that participants invariably considered adaptation to climate change in the context of wider current issues led later in the research process to a focus on the determinants of current general vulnerability - as a useful way to plan for improvement in community adaptation. The groups of factors that emerged as important in determining community vulnerability are depicted in the model in Figure 1.

The model is intended as a guide to 'untangling' community vulnerability, by highlighting the main groups of factors involved, based on results of this study. The untangling process though, requires careful discourse with communities to ensure sound awareness of the complexities of the context, such as land rights and governance, as well as climate and other issues specific to that region.

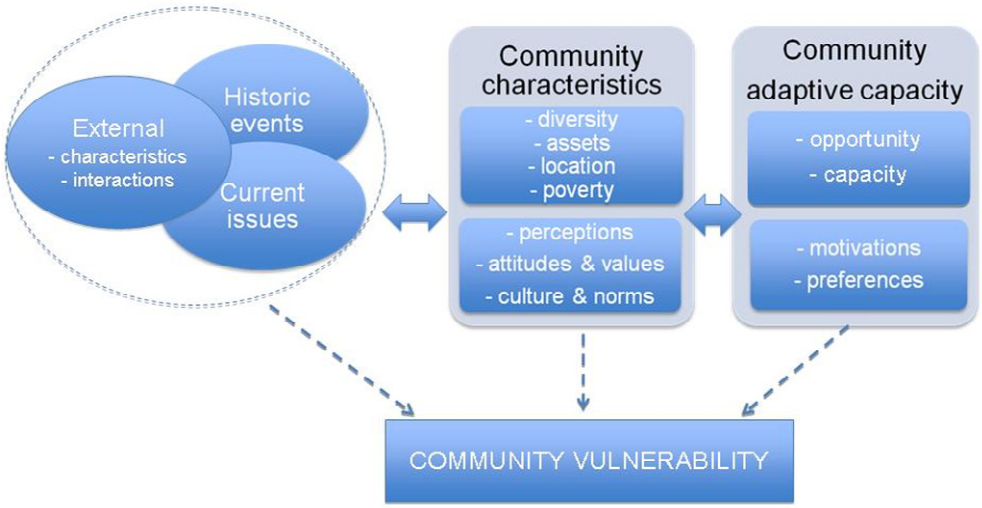

Figure 1. Groups of factors influencing community vulnerability

Notes on Figure 1

The box 'Community characteristics' comprises:
Diversity*:* The different groups (e.g. clans) within the community and their relationships. Also includes internal layers of governance within the community.
Assets: Community assets, such as social assets (e.g networks), human assets (e.g. quality of health) natural assets (e.g. wildlife abundance), financial assets (e.g. access to savings), physical assets (e.g. shelter) cultural assets (freedom to carry out cultural practices) (The term 'Assets' here is drawn from the Sustainable Livelihoods Framework (DFID 1999, Bebbington 1999).
Socio-eco location: The social-ecological characteristics of that location, e.g distance to services and markets, vicinity to storm surge zone.
Poverty characteristics*:* Specific poverty features relating to community needs and situation, i.e. opportunity to (1) meet material and resource needs: (2) exercise rights, and express voice; (3) maintain health and basic levels of education, (4) freely practise and share cultural and social practices (OECD 2001).
Perceptions, attitudes, values, culture and norms: These elements all drive behaviour as well as preferences and motivations for adaptation..

The box 'Community adaptive capacity' comprises:
Opportunity: The prospects for community to adapt in a particular way (e.g. policy may or may not allow a community to carry out a particular strategy or action).
Capacity: Current capability of a community to adapt in a particular way.
Preferences and motivations: Community members are likely to prefer and be motivated to carry out particular strategies that align with community values, attitudes and norms. Perceptions can also influence these preferences and motivations.

External issues' commonly referred to by respondents included various top-down governance structures and the dominant position of the mine in the region. These were often closely linked to 'Historical factors' and 'Current issues'. As we depict in Figure 1 these three groups of factors influence the 'Community characteristics', which in turn determine the 'Adaptive capacity' – and hence the overall 'Community vulnerability'. (A focus on 'clan vulnerability' may be more appropriate in some areas).

Our results suggest that external factors and historical or current events combine to create a general sense of disempowerment, leading members to perceive their community as unable to take on particular adaptive strategies. Conversely, it appears that those with strong community self-image and higher trust in government are likely to be more capable than groups with low esteem and trust in authorities.

The research showed also that appropriate discourse with community members is essential for understanding preferred adaptive strategies in building community adaptive capacity. Members are more likely to be motivated to adapt if strategies are guided by ideas identified from within their community. Focusing discourse on adaptation on both current vulnerability and climate change knowledge (local and western), was seen as a useful approach in understanding how to improve a community's adaptive capacity. In this way, strategies could be identified that help to strengthen general adaptive capacity to current issues, while being mindful of possible future climate changes impacts. The model in Figure 2 is intended to encapsulate the important components of facilitation needed in discourse with communities in planning adaptation to current issues including climate. It places strong emphasis on

understanding current community vulnerability and on ways to improve general adaptive capacity, while clarifying climate change issues.

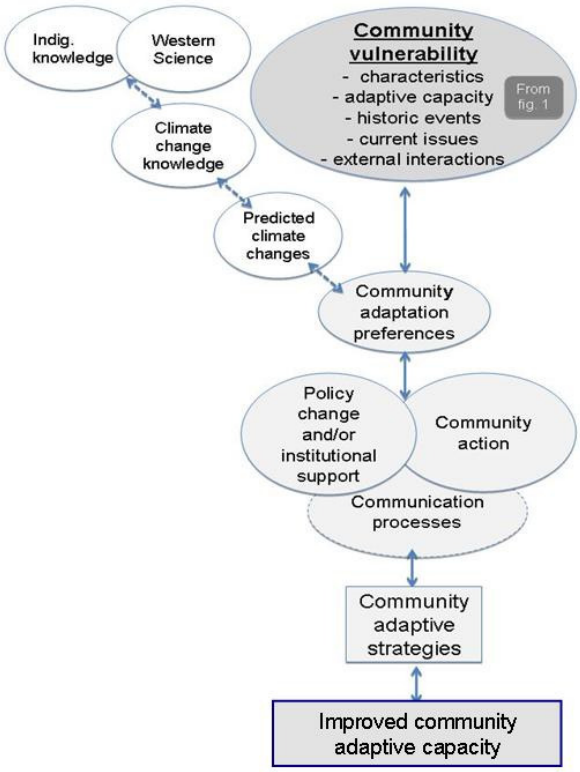

Figure 2. Factors to consider in facilitating discourse - in building community adaptive capacity

The process outlined in Figure 2 starts with analysis of community vulnerability in general (from Figure 1) but includes sharing of knowledge on climate change between local people and facilitators. This should help to develop understanding of local perceptions (and observations) of climate change and also to reduce misconceptions. Our findings indicate that the planning of adaptation should not initially focus on ***predictions*** on climate change but on understanding perceptions and current vulnerabilities in general.

Discourse with communities (Figure 2) should involve seeking ways in which 'policy change and institutional support' and 'community action' can best work together in achieving sound adaptation strategies. Our results suggest that providing greater Indigenous autonomy, input and partnerships, would be key components. Placing attention on appropriate ways of communicating during various stages of engagement, planning and action would be vital in this discourse.

Information from this study in two sites close to a fairly major mine settlement cannot be claimed to apply to all remote Indigenous communities in north Australia. However, we feel that, as an initial study of this topic, the research has revealed valuable understandings and lessons about factors important in developing policy for adaptation, particularly for people living in poverty.

10. Conclusion: into the future

Although Indigenous people comprise only 2.5% of the Australian population (ABS 2005), they own and occupy vast expanses of the country's remote areas, so their adaptation strategies can have a significant impact on the nation's environment and economy.

Because the global environment is so highly complex and spatially variable, we have an incomplete vision of future climate change and its precise impacts on particular social-ecological microcosms. Our research indicates that a key requirement in preparing for the risks associated with future changes for those living in poverty, is to

understand the determinants of community vulnerability generally (i.e. to poverty and climate change) - so that policy makers can plan to support and build on existing adaptive capacities of communities and strengthen these in effective ways.

Ensor and Berger (2009) support this finding, and claim that placing attention on understanding ways to improve the general adaptive capacity – derived from perspectives from within the community - is a valuable approach in strengthening adaptation to climate change. Other authors, such as Robinson *et al.* (2006) and Eriksen and O'Brien (2007), recommend further that in some locations the frame of climate change needs to be shifted to (a broader) one of sustainable development.

This study also highlighted the value of incorporating climate change considerations into policy planning and management across a range of areas (and Departments and agencies), from natural resource management, to health, infrastructure, training and education. Smit and Wandel (2006) support this view in their statement that community vulnerability can be most effectively reduced as part of other strategies and plans.

The importance of respect for Indigenous views and their incorporation in development planning was emphasised by research participants. As we indicate in Figure 2, adaptive capacity is defined not only by a community's capacity, but also their opportunity, motivation and preferences to adapt. Greater local involvement in adaptation planning is likely to reveal insight into policy and structures that may enable communities to adapt in ways suited to their context. For this involvement there needs to be greater attention placed on local engagement.

There is much experience to suggest that engagement is most effective when long-term relationships and levels of trust are built with communities (Campbell and Christie 2009) and when intricacies relating to governance, clan groups (and their inter-relationships), responsibilities of community members, cultural taboos and other local factors, are taken into account (Gorman and Garnett 2009). Also, recognition of Indigenous co-researchers can provide effective means of engaging and sharing knowledge with communities as well as helping improve local capacity and implementation of research results (Sithole *et al*. 2009).

Discourse, specifically the facilitation of learning and deliberation processes with participants, was shown in this study to be effective in generating discussion and understanding of factors influencing community vulnerability, including climate change. These processes provided insight into perceptions and attitudes that influence motivation and preferences to adapt (as depicted by Figure 1). We support Pelling *et al.* (2008) who claim that making explicit underlying community values that shape preferences and decisions is an important step in adaptation. From such enquiry and dialogue, enhanced empowerment and communication is likely to occur, and other internal limitations to adaptive capacity, such as low perceived community self-efficacy and perceptions of low risk of climate change, may be mitigated.

The finding that serious levels of miscommunication and mistrust exist between Indigenous communities and some agencies and organisations implies that there is need for a major paradigm shift in the way that general Indigenous engagement, communication and consultation occur in northern Australia, particularly at higher

levels of National government and some industry groups. Participants in this study also stressed the need for greater Indigenous autonomy in remote communities; a view supporting claims made by Maddison (2008) and others.

In calling for a paradigm shift, we caution against unconstructive blame and accusations about past approaches.. However, as Lea (2008) emphasises there is a danger of being so embroiled in the bureaucratic culture and rhetoric of 'helping' Indigenous people that critical faculties and technical proficiency are not employed. She warns this can result in paternalistic provision, perpetuating an unintentional co-dependence between service providers and communities (Lea 2008). There is a clear need for greater balance and reflexivity among all stakeholders.

There seems to be a danger that the implementation of many current and proposed top-down policy reforms in remote communities may negatively affect the adaptive capacity of people in these and other remote Indigenous communities. Our study indicates that homeland movement may be integral to the health of many Yolgnu – a theory supported by data from other studies (e.g. Garnett *et al*. 2009). Rigid policy that discourages movement to homelands could reduce the adaptive capacity of many people.

The maintenance of basic infrastructure in remote regions and continued support for currently effective programs in these areas (e.g. Ranger groups and womens' associations) could play an important role in improving capacity to adapt to climate change and other future stresses. Participants' views support the notion that promoting environmental services schemes and community support groups could offer potential

for enhancing general adaptive capacity though improving financial security, and building skills and esteem. This would also align well with preferences for staying on country, and maintaining traditional values, self sufficiency and sustainability.

Support for Yolngu in these regions to continue traditional practices on country could be a key to providing the capacity, opportunity and motivation they need to become more resilient to climate change and other issues they face – as well as helping to manage the natural environment.

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Appendix 1*: Improving adaptive capacity in communities – suggestions by participants (ordered alphabetically)*

e or effect	Strategy	People's views, and themes (arising from research)	*Requirements / solutions*
ential) future gerous living lition	**Temporary relocation**	Some participants claimed that it may be necessary to relocate temporarily in extreme circumstances. Many felt confident that they could continue to be mobile and travel to traditional homelands – and return when necessary.	➢ Allow continued access to traditional homelands. It is important that infrastructure, such and water access and sewerage and other services are maintained in homeland areas.
tration over lack of sparency, munication and genous input (re: ning and agement of their and land)	**Improved communication, engagement, decision making (and management)**	The most commonly mentioned adaptation strategy was for better communication between Yolngu and government/and the mining company. Participants wanted greater: - two-way communication (dialogue) - voice and input into decision making - transparency and honesty in management Many participants talked of the need for different groups to work together and be more cooperative	➢ Change the way Government views Indigenous issues; recognition of Yolngu politics, le language and other cultural aspects ➢ Ensure proper communication with Yolngu (in language and culturally appropriate ways ➢ Genuine engagement of Yolngu traditional leaders, including ongoing involvement in de making ➢ Strengthen and build new relationships between communities and other stakeholders ➢ Invest in Indigenous groups & corporations
k of dialogue with M agencies **k of sharing of wledge & rvations on scape and climate nges**	**Knowledge sharing on NRM and climate change**	There was desire for sharing western knowledge (e.g predictions of climate change and policy and economic options) and Indigenous and traditional knowledge There was an interest (particularly by Rangers) in improvement and strengthening of links between research, and government NRM groups	➢ Promote learning, building and investment in successful programs/networks (e.g Ranger Programs, NAILSMA) ➢ Encourage scientists to work with Yolngu and share knowledge in a way that is culturall linguistically appropriate (two-way sharing) ➢ Increase efforts to disseminate results of research ➢ Allow greater Indigenous input into land management
of esteem, pendence and self ciency **of traditional wledge and osition of other ures ways and values** **of culture and ity through lost act with natural oundings**	**Utilisation and promotion of traditional knowledge**	Participants talked of returning to more traditional practices to enable greater self sufficiency and less dependence on services – as well as maintaining culture. This included: - more hunting and gathering of traditional foods - greater use of traditional healing and medicine - using traditional survival practices, such as water harvesting from particular trees, and storing food - continuation of local language to provide meaning and logic to cultural knowledge - support for traditional understandings, monitoring and management of dynamics in landscape - greater sharing of knowledge from older to younger people integration of traditional knowledge with western knowledge	➢ Support the recording of traditional knowledge (for younger generations, e.g. video/audio ➢ Invest time and resources to find ways to integrate traditional and western knowledge on change ➢ Support practices for sound caring for country, such as Ranger programs, and other servi
k of suitable housing	**Improved**	There was desire for:	➢ Construct housing and infrastructure in 'sustainable' ways, with Yolngu input - and emp

basic facilities for thy, safe lifestyle	**Infrastructure**	-'sustainable' housing construction tolerant to climate changes and built in ways suited to Yolngu lifestyle. - improvement of unsealed roads in some areas to improve access to hunting areas and ceremonial areas - category 5 cyclone shelter in Yirrkala - renewable energy, such as solar panels and wind energy - public transport.	community. Should be suited to lifestyle and culture of Yolngu as well as future climate ➢ Improve roads and public transport where needed ➢ Provide adequate resources for construction or modification of buildings (e.g cyclone sh ➢ Invest more resources towards renewable energy
of biodiversity and e of natural ronment / nges in natural scape	**Programs for conservation of natural resources**	Many Rangers want changes in NRM policy for conservation, such as: - tighter restrictions and control on (further) mining activity and recreational fishing and development - Indigenous monitoring of species such as turtles and dugong, sea grass etc - recognition of some marine areas as needing protection - 'caring for country' in traditional ways	➢ Allow greater Yolngu input in environmental decision making and management ➢ Allocate some regions as protected areas ➢ Promote recognition, support and resources towards schemes such as Ranger programs ➢ Support Indigenous landscape and climate monitoring ➢ Community may need to modify hunting methods (e.g. locations and some practices) ➢ Employ Yolngu in mine revegetation jobs
tal and physical th problems k of fresh, healthy options	**Promotion of community independence and health**	Participants stressed the importance of: - traditional knowledge and practices, such as hunting - improved mental and physical health of youth, men and women - community gardens, growing foods (local agricultural business in Yirrkala)	➢ Implement knowledge sharing programs ➢ Implement a men's support group - a place men can go to practice and learn hunting, a singing, dance and other traditional practices (in Yirrkala) ➢ Train people on growing local produce

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Table 1. Main issues affecting peoples' lives - expressed by participants (ordered alphabetically)

Issue	**Concerns and feelings expressed**
Ecological changes	- Concern about changes in distribution and abundance of animal and plant species (including pollution problems.
Excessive development	- Disapproval over excessive building and 'development' associated with the mine, developm
Health problems	- Concern about lack of access to healthy foods, high incidence of diabetes and depression, ar
Infrastructure problems	- Concern over overcrowded housing in Yirrkala; asbestos houses in Wallaby Beach; degrada supply.
Land rights	- Frustration and anger about uncertainty over rights to land and sea. '*No land - we are nothi*
Loss of traditional knowledge	- Strong concern about traditional knowledge being lost and hence not being passed down to *generation singing on our land. Too much drugs are coming in. We need to teach others to show how important our land is' (M:40s).*
New policies	- Anger over aspects of *the intervention 'They just came in here and no-one told us what was* - Worry about consequences of the 'Working Futures' policy (Some women). - Confusion and mistrust over the new shire and the way members are elected. The whole of also seen as too large for this shire. '*That's too much of a big area' 'what is the shire even*
Societal problems	- Concern about youth suicide, drinking and petrol sniffing, lack of school attendance (Yirrka communities (Women in Yirrkala.)
The mine	- The mine affects people negatively in physical and emotional ways; *'they are digging up the* - Resentment over the way Yolngu had been misrepresented in mine development, and in fail - Dislike of the 'secrecy' of mine management: activities perceived to be carried out in non-tr - Resentment of the 'power' held by mine and disempowerment of Yolngu: *'the mine is like a is out'. 'Its like you can't get out of the water, its stopping you' (2M's:20s).* - Desire for greater Yolngu employment by the mine – particularly on vegetation rehabilitatio

Table 2. Ecological changes to landscape observed by participants in recent years

(ordered alphabetically).

Change	**Examples**
Coastal changes	- Yirrkala creek getting smaller, less healthy, sandy and infiltrated with seawater, with less fish. - Surface of some beaches becoming uneven - '*like a ramp, you know' (M: 20s).* - In some areas turtles no longer come to nest - '*they are confused with the erosion and changes' (M:20s).* - Sea level (surges) are higher.
Hazardous events	- Cyclones becoming *'angrier'*. Cyclone Monica that hit the region in 2006, was thought to be particularly intense – with many coastal changes noticed after that event *'Monica came with a big metal rake and cleared everything up, like she was raking a big paddock!' (M:20s).*
Marine wildlife less abundant and in decreased quality	- In some places oysters have changed colour and taste different. - *'Everything connected to the corals is moving out…because corals are dying' (M:20s Ranger).* - Reduction in the amount of sea grass, as well as in numbers of crayfish and certain fish (e.g. sting rays). - Dugong numbers recorded during aerial surveys by Rangers have declined in the last four years (M: 20s).
Seasonal changes (Yolngu in this region have a six season calendar that includes information about winds, temperature, rain, vegetation, animals and other factors)	- The seasonal calendar is *'all mixed up' (M:20s).* - Winds coming at the wrong time. - Higher temperatures. *'The wet season is late this year…we are hot and we are waiting' (M:40s).* *'Why is it so hot now?' (F:60s Wallaby Beach.)* - Unusual rainfall and at strange times.
Terrestrial fauna less abundant	- Kangaroos, emus, certain snakes are '*harder to find'*, '*we have to go further for hunting '(M: 40s).*
Vegetation less abundant, or flowering at unexpected times	- *Casuarina* trees dying along the coastline. - Green Plum tree flowers normally indicate that sting rays are '*fat and ready to eat* '*… right now they are flowering and the rays are not ready' (M:20s Ranger).* - Yams are less abundant.